TARTALOM /*CONTENTS*

ÖKOLÓGIAI FOLYOSÓK A KÁRPÁTOK-RÉGIÓJÁBAN

A CONNECTGREEN PROJEKT

ECOLOGICAL CORRIDORS IN THE CARPATHIANS

THE CONNECTGREEN PROJECT

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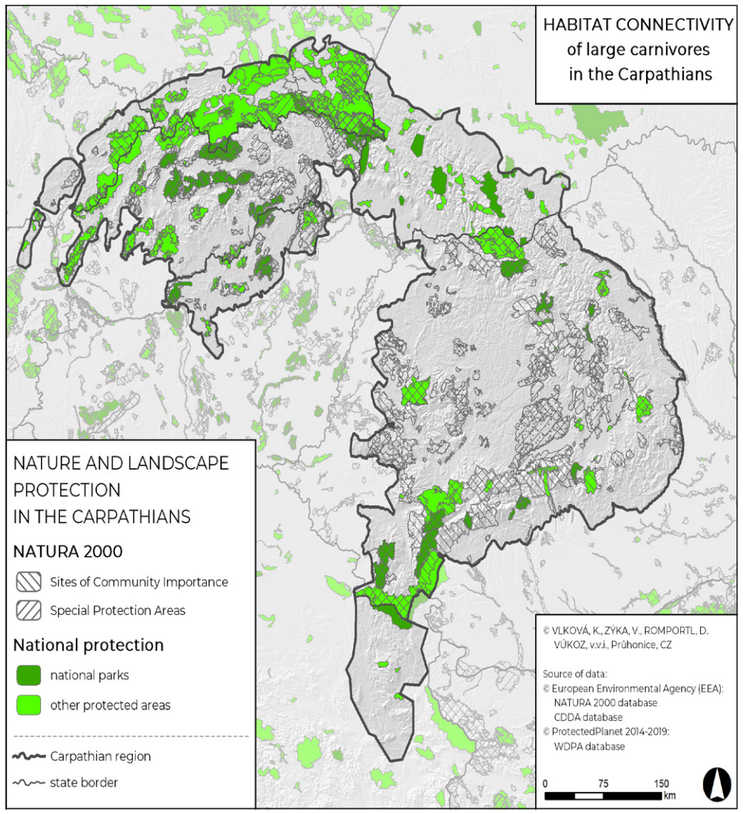

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1. ábra/Fig. 1:
A Kárpátok-régió elhelyezkedése és a természetvédelmi területek a partnerországokban / *The location of the Carpathian region and nature protection areas in the partnercountries* (FORRÁS/SOURCE: VÚKOZ)

1. BEVEZETÉS

A Kárpátok több országon átnyúló hegyvidéki régiója kiemelkedő ökológiai értékkel rendelkezik, Európa legjelentősebb nagyvad populációja számára nyújt élőhelyet. A Kárpátok tekinthető Európa egyik legnagyobb kiterjedésű, összefüggő hálózatot biztosító természes élőhelyének, amely az európai nagyragadozók harmadának (barnamedve, farkas, hiúz, európai bölény és parlagi sas) nyújt otthont. A régió gazdaságai nagy ütemben fejlődnek, amely jelentős mértékű infrastruktúra fejlesztést von maga után, ezáltal a táj fragmentációját, átjárhatóságának sérülését okozzák. A konfliktusok megelőzése érdekében elengedhetetlen a fejlesztési igények és a természetvédelmi, élőhelymegőrzési elvárások összehangolása. A tervezési gyakorlat sajnos nem képes megfelelően kezelni a problémákat, biztosítani az ökológiai folyosók hatékony működésének feltételeit. Az élőhelyek folyamatos csökkenése miatt fontos, hogy összhangot teremtsünk a társadalom igényei és a megmaradt természeti értékek védelme között, ami leghatékonyabban nemzetközi összefogásban valósulhat meg.

A ConnectGREEN nemzetközi projekt, amely 5 ország kutatási, tervezési intézményeit fogja össze, célul tűzte ki a magterületek közötti potenciális ökológiai kapcsolat feltérképezését és három célterületen az ökológiai folyosók helyreállítását.

A projekt céljai:

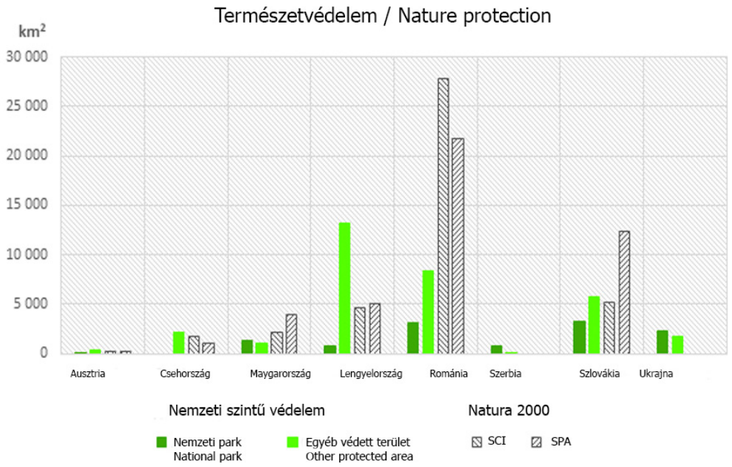
- Innovatív megoldások és irányelvek kidolgozása az ökológiai folyosók, és

1. INTRODUCTION

The Carpathian region covering the territory of several countries is possessing outstanding ecological values, as it offers habitat for the largest population of large carnivores in Europe. The Charpatians offer the largest, natural, intact habitat network for one third of large carnivores in Europe (brown bear, wolf, lynx, European bison and imperial eagle). The economies of the region develope by an intense rate with great scale infrastructure planning and construction causing the fragmentation of landscape connectivity. To avoid the conflicts it is inevitable to harmonize the needs of development and nature protection. Unfortunately, the planning practice cannot prevent the problems and maintain the functionality of ecological corridors. To avoid the continuous loss of habitats it is important to harmonise the needs of the society and protection of natural values by cooperation on intenational level.

The ConnectGREEN international project covering 5 countries and various fields of activity (spatial planning, research, government, biodiversity conservation) joined forces to increase the capacity of ecological corridors identification and management and to restore ecological corridors in 3 pilot areas. The objectives of the project:

- Developing innovative solutions and guidance to identify ecological corridors and connectivity gaps in a harmonized way across the Carpathian ecoregion to maintain



2. ábra/Fig. 2:
Természet- és tájvédelem arányai a Kárpátok-régiójának országaiban / *Protected areas in the countries of Carpatian region*
(FORRÁS/SOURCE: D321. REPORT)

a kapcsolati hiányok azonosítására annak érdekében, hogy a Kárpátok régióban hosszútávon fenntartható legyen a régió magas szintű biodiverzitása, amelynek alapvető feltétele az élővilág szabad mozgása, határokon átívelő vándorlása.

• Több szakterület együttműködésének biztosítása (területi tervezők, természetvédők, hatóságok) az ökológiai folyosók meghatározásához és fenntartásához szükséges integrált szemlélet megalapozásához.

• A természetvédelem, a területi tervezés és fejlesztési tevékenységek összehangolása a védett területeken, az ökológiai folyosók területén a stratégiai fejlesztési irányelvek és eszközök, gyakorlatok meghatározásával, megvalósításával.

A területi tervezés tekinthető a legfontosabb eszköznek a társadalom, a gazdaság és a környezet gyakran egymással ellentétes igényeinek harmonizálásában. A területi tervezés az adottságoknak, hagyományoknak köszönhetően minden országban más, azonban alapjellemzőiben hasonló (Koresawa – Konvitz 2001). A komplex projekt egyik első lépése átfogó elemzés készítése volt a partner országok területi tervezésének rendszeréről, valamint az ökológiai hálózat-tervezés és területi tervezés kapcsolatáról, beágyazottságáról. Célunk az volt, hogy feltárjuk, hol vannak a legfontosabb hiányok, konfliktusok az ökológiai folyosók meghatározásában és fenntartásában. A hagyományos természetvédelmi területek nem biztosítanak összefüggő hálózatot (1. ábra)

Majd abba a folyamatba nyújtunk betekintést, hogy a projekt feltérképezve a nagyragadozók természetes élőhelyeit milyen módszereket, lehetőségeket keres a vándorlási útvpnalak és ökológiai folyosók feltérképezésére, a szükséges kapcsolati hiányok feltárására.

2. ANYAG ÉS MÓDSZER

Az ökológiai hálózat hatékony fejlesztése, védelme elképzelhetelen anélkül, hogy nagy hangsúllyal meg ne jelenjen a területi tervezésben. Cikkünkben a partnerek számára kiküldött tematikus kérdőívek összesített eredményét mutatjuk be. Első lépésben a területi tervezési rendszerek különbségeit tártuk fel, majd a második kérdéscsoportban az ökológiai hálózat meghatározásához kapcsolódó hiányokat, konfliktusokat igyekeztünk feltárni és kiemelni a jó gyakorlatokat.

long-term, cross-border wildlife movement, associated ecosystem services and a high level of biodiversity in the region.

• Engaging experts from diferent fields (protected area site managers, conservationists, spatial planners and other key stakeholders) in an integrated approach for strengthening the capacity for identifying and managing ecological corridors.

• Reconciling nature conservation and spatial planning and development in ecological corridors and Natura 2000 sites by identifying and implementing strategic directions and instruments and practices.

Spatial planning is the most important tool for balancing the needs of the society, economy and the environment. Spatial planning differs from one country to another due to the different conditions and historical background, but there are major similar characteristics (Koresawa and Konvitz, 2001). In the first phase of the project, we elaborated a comparison analysis about the spatial planning system of partner countries and the relation and integration of ecological network planning and spatial planning. Our objective was to explore the major problems, gaps in the identification and maintenance of ecological corridors. The traditional nature protection areas do not provide an interconnected network (Figure 1.).

After mapping of natural habitats of large carnivores we give an overview about the methods and tools of the project about defining and exploring the migration routes and ecological corridors and missing connections.

2. MATERIALS AND METHODS:

Without integration into the spatial planning system and process it is impossible to protect and develop the ecological network. In our study we present the results of questionnaires sent to the partner countries. First we analysed the specifics of the spatial planning system of the partner countries, and afterwards we defined the gaps and conflicts related to identification of ecological network and we highlight best practices.

We have sent two questionnaires for the partners including 23 questions in the following fields:

- Comaprison analysis of the spatial planning systems
  - Legal and institutional framework of spatial planning
  - Cordination mechanisms, inclusion of local stakeholders
  - Implementation of plans, strategic planning approach, monitoring
- Strategic Environmental Assessment in planning
  - Gaps and problems in the identification and maintenance of ecological corridors
  - Legal framework related to ecological corridors
  - Participatory planning, inclusion of local stakeholders,
  - Ecological Network (EN) in spatial planning

In the frames of the project the next steps were the identification of the habitats and migration routes of the large carnivores. Based on occurance data a habitat suitability modell was elaborated using and modifiying the spatial categories of IUCN rekated

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1. Táblázat/ Table 1: A nagyaragadozók élőlyeheinek, vándorlási útvonalainak kategóriái és területi feltételei / *Types and criterias of core habitats and migration corridors of large carnivores* (FORRÁS/SOURCE: VÚKOZ)

2. Táblázat/ Table 2: A területi tervek rendszere két partnerországban / *Hierarchy of spatial plans in the partner countries*

IUCN		**ConnectGreen**	
Kategóriák	**Fő kategóriák**	**Alkategóriák**	**Területi korlátok**
Fokozottan védett terület / *Protected areas*	**1. Élőhelyfoltok / *1. Patches of suitable habitat***	**1.1 Magterület / *Core area***	
Egyértelműen lehatárolt földrajzi terület, amelyet egyértelműen hosszútávú természetvédelmi céloknak megfelelően tartanak fenn. Természetvédelem az elsődleges cél. / *A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values. Conservation is primary objective.*	Nagyragadozók számára optimális állandó vagy ideiglenes élőhely / *Optimal habitat for long term or temporal occurrence of large carnivores*	az adott faj igényeitnek mind minőségi mind területi kiterjedés szempontjából megfelelő terület / meets both qualitative and spatial requirements of particular species	
		elsődlegesen természetes, összefüggő élőhely (általában erdő) / *it is primarily a natural continuous habitat (usually forest)*	≥ 300 km2 szélesség / *width* ≥ 1 km
Természetvédelmi terület / *Conserved Areas (OECMs)*		**1.2 Lépegető kövek / *Stepping stones***	
Földrajzilag meghatározott terület (eltér a Fokozottan védett területtől) amelynek a fenntartásának célja a boodiverzitás helyben való megőrzése a hosszútávú célja a kapcsolódó ökoszisztéma funkciókkal és szolgáltatásokkal és ahol lehetséges a kulturális, spirituális, társadalmi-gazdasági vagy egyéb egyedi értékekkel. In-szitu védelem tekintet nélkül a fő célokra. / *A geographically defined area other than a Protected Area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the in situ conservation of biodiversity with associated ecosystem functions and services and where applicable, cultural, spiritual, socio–economic, and other locally relevant values. Delivers the effective in-situ conservation of biodiversity, regardless of its objectives.*		megfelelő élőhelyek kisebb foltjai / *smaller patch of suitable habitat*	
		vándorlás vagy terjeszkedés során egyedek által használt terület / *used by individuals as transitional site during migration or dispersal*	10 ≤ area < 300 km2 szélesség / width ≥ 1 km
Ökológiai folyosók / *Ecological corridors*	**2. Migrációs zóna / *Migration zone***	**2.1 Linkage area / *Kapcsolatot biztosító terület***	
Világosan lehatárolt, de nem fokozottan védett vagy természetvédelmi terület, amelyet olyan módon tartanak fenn és kezelnek, hogy az ökológiai kapcsolatok megőrződjenek és helyreálljanak. / *A clearly defined geographical space, not recognised as a 'protected area' or an 'other effective area-based conservation measure, that is governed and managed over the long-term to conserve or restore effective ecological connectivity, with associated ecosystem services and cultural and spiritual values.*	Többé-kevésbé megfelelő élőhely, amelyet az ökológiai kapcsolatok védelme érdekében fenn kell tartani a megfelelő élőhelyfoltok között. / *Relatively suitable habitat, which must be preserved in order to maintain the landscape connectivity between patches of suitable habitat*	többé-kevésbé megfelelő heterogén élőhely, de ahol az ökológiai folyosó nem határolható le egyértelműen / *area of relatively suitable heterogeneous habitat, but in which the corridor cannot be clearly defined*	
		kettő vagy több megfelelő minőségű élőhelyet köt össze / *connects two or more patches of suitable habitat*	
		2.2 Migrációs folyosó / *Migration corridor*	
		egy „klassikus" folyosó, amely élőhelyeket köt össze (through a relatively permeable landscape) / *a "classic" corridor that connects patches of suitable habitat through a relatively permeable landscape*	szélesség / width ≥ 0.5 km
	3. Kritikus zóna / *Critical zone*	**3.1 Kritikus kapcsolati szektor / *Critical connectivity sector***	
	Az átjárhatóságot gátló tényezőkkel terhelt terület,például vonalas létesítmények – közutak vagy települések vagy többszörösen összeadódó gáthatások / *Zones critical in terms of barrier permeability, ie. places where migration is directly threatened mainly by line barriers (highways, settlements etc.) and/or by cumulative effect of barriers*	szűk vagy átjárhatóságot azért lehetővé tevő vonalas infrastruktúra elem / *narrow and / or single permeable linear infrastructure sector*	
		3.2 Kritikus kapcsolati térség / *Critical connectivity area*	
		a „széles és rövid folyosó" speciális esete / *special type of "wide & short corridors"*	
		élőhelyeket összekapcsoló terület, ahol van valiféle gáthatás (pl. alacsonyrendű út és környezete, ami megszakítja az erdőt) / *an area that connects suitable habitats divided by a barrier (e.g. a narrow lane of road and surroundings that cuts through a continuous forest)*	
		szűk áteresztőképességű terület valamely gát mentén / *it may also be more narrow throughput sectors on individual or parallel barriers*	

Szlovákia / *Slovakia*	**Stratégiai/Gazdasági társadalmi fókuszú terv / *Strategic, social-economic plan***	**Területrendezési fókuszú terv / *Land use planning instrument***
Nemzeti / *National*	Országos területfejlesztési stratégia/ *National regional development strategy*	Területi fejlődés perspektívája / *Spatial development perspective*
		Ökológiai Stabilitás Területi Rendszere / *Territorial System of Ecological Stability*
Regionális / *Regional*	Önkormányzati régiók társadalmi gazdasági fejlesztési programja / *Program of social and economic development of the self-governmental region*	Régió területrendezési terve / *Land-use plan of the region*
		Önkormányzati régió területrendezési terve / *Land-use plan of self-governmental region*
		Regionális tájökológiai terv / *Landscape – ecologic plan at the regional level*
	Településcsoport társadalmi gazdasági fejlesztési programja / *Program of social and economic development of a group of municipalities*	Településcsoprt területrendezési terve / *Land-use plan of a group of municipalities*
Helyi / *Local*	Település társadalmi gazdasági fejlesztési programja / *Program of social and economic development of a municipality*	Településrendezési terv / *Land-use plan of a municipality*
		Települési szintű tájökológiai terv / *Landscape – ecologic plan at the municipal level*
Románia / *Romania*	**Stratégiai/Gazdasági társadalmi fókuszú terv / *Strategic, social-economic plan***	**Területrendezési fókuszú terv / *Land use planning instrument***
Nemzeti / *National*	Románia Területfejlesztési stratégiája / *Spatial Development Strategy of Romania*	Nemzeti területi terv / *National Spatial Plan*
Regionális / *Regional*	Regionális fejlesztési stratégia / *Regional development strategies*	Rergionális területi terv / *Regional Spatial Plans*
		Megyei terv / *Inter County Plan*
		Városi vagy települési szabályozási terv, Határtérség szabályozási terv / *Inter-urban or Inter-communal Zone Plan; Frontier Zonal Plan*
	Megyei területfejlesztési stratégiák / *County territorial development strategies*	Nagyobb városok és közösségek agglomerációs vagy peri-urban terve / *Metropolitan, peri-urban plan of major cities and municipalities*
Helyi / *Local*	Településfejlesztési stratégia / *Development Strategy of the Town / Commune*	Általános településrendezési terv / *General Urban Plan of the Town / Commune*

to ecological corridors and core area based on the needs of LC (Table 1.). To explore the potential migration routes it was important to identify the barriers, so the experts mapped all the existing and planned infrastructure elements in the region (Report D.3.2.1).

3. RESULTS

3.1. Ecological network in spatial planning

Considering territorial governance the partner countries are decentralized unitary countries (Illés 2011), the regional level plays a considerable role in spatial planning but mostly with limited competences. Meanwhile the national level forms the framework for spatial development, elaborates the legal background, the regions carry out the detailed spatial plans under national control. In Sebia and Romania, the national authorities elaborate the regional plans. In all the countries but especially in Slovakia and Hungary, the effectiveness of planning and implamantation is not appropriate because of the fact that spatial planning has a strong multisectoral approach which is resulted in a shared responsibility especially on national level and there are conflicts in the cooperation. Mostly the regional level means NUTS3 regions in the analyzed countries with the exception of Serbia and Romania, where for the NUTS2 units also plans are elaborated. In all countries, the local level has the strongest authority in land use planning (local level plans, zonal plans, building permissions). In some countries next to the general master plans more detailed plans are elaborated for specific areas of the settlement or for specific regions (world heritage sites, tourist destinations, strictly protected areas in Romania in a common planning process with national authorities).

Spatial planning mostly cover two types of planning: social-economic, strategic approach and land use planning

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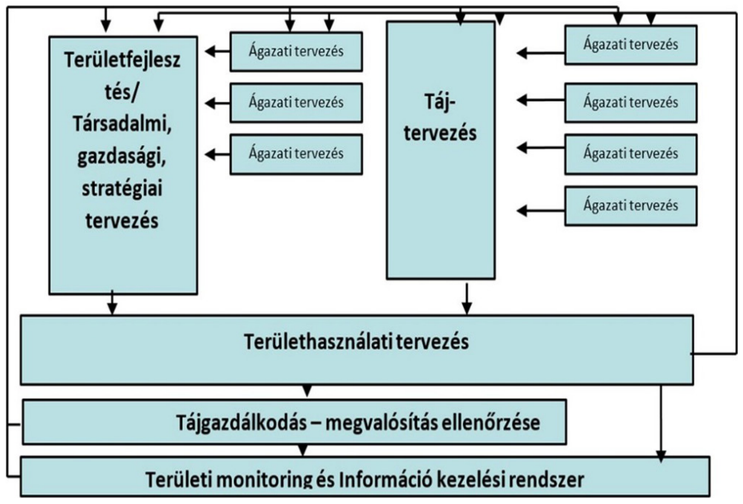
3. ábra/Fig. 3:
A területi tervezés rendszere Szlovákiában / *System of spatial planning in Slovakia* (FORRÁS/SOURCE: REPORT D.3.3.1.)



A partnerek részére két részletben küldtünk ki kérdőíveket és az alábbi témakörökben összesen 23 kérdést fogalmaztunk meg:

- Területi tervezési rendszerek összehasonlító elemzése
  - A területi tervezés jogszabályi, intézményi keretei, rendszere
  - Ko-ordinációs mechanizmusok, helyi szereplők bevonása
  - Tervek megvalósítása, stratégiai tervezési megközelítés alkalmazása, monitoring
  - Stratégiai környezeti vizsgálat megvalósítása a területi tervezésben
- Hiányok és problémák az ökológiai folyosók meghatározásához és védelméhez kapcsolódóan a tervezési folyamatban
  - Az ökológiai hálózathoz kapcsolódó jogszabályi keretrendszer
  - Részvételi tervezés és helyi szereplők bevonása
  - Ökológiai hálózat (ÖH) a területi tervezésben

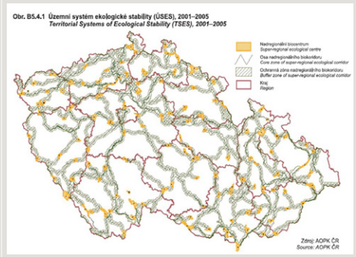
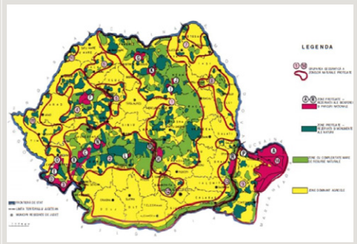
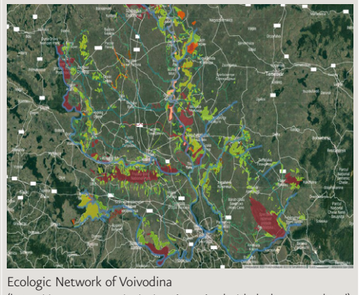
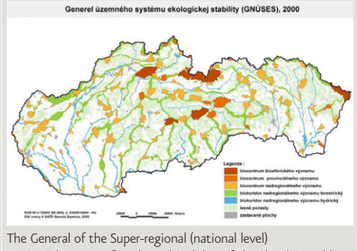
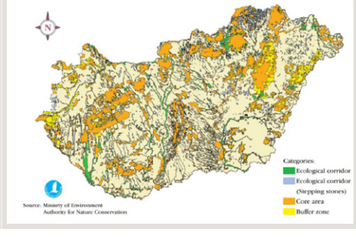
A projekt keretében a következő lépések a nagyragadozók élőhelyének azonosítása és a magterületek közötti vándorlási útvonalak hiányainak azonosítása volt. Első lépésként a szakértők a nagyragadozók előfordulási adatai alapján feltérképezték a potenciális élőhelyeket, a IUCN ökológiai folyosókhoz és magterületekhez kidolgozott területi kritériumait alkalmazták a nagyragadozók életmódjához igazítva (1. táblázat). A vándorlási útvonalak azonosításához további fontos lépés a korlátok, akadályok feltérképezése volt, a szakértők számba vették a legfontosabb meglévő és tervezett infrastruktúra elemeket (Report D.3.2.1).

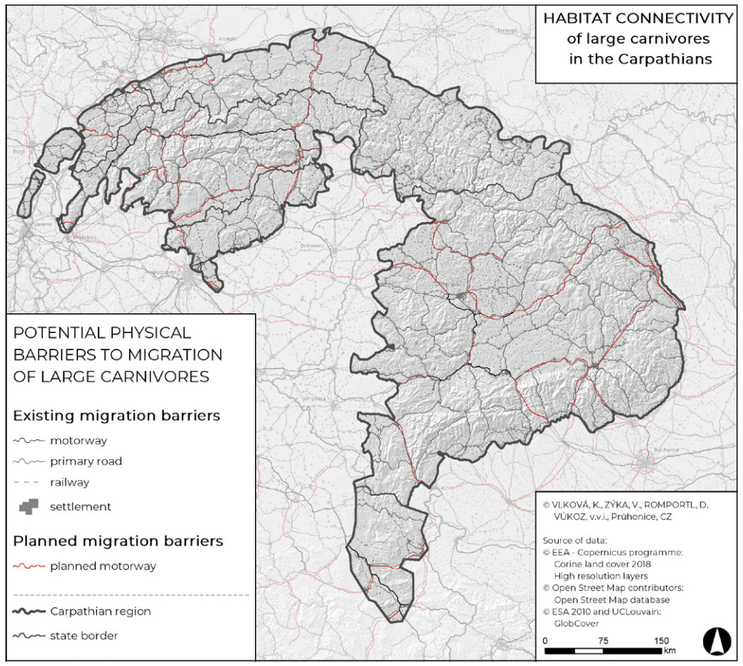
3. EREDMÉNYEK

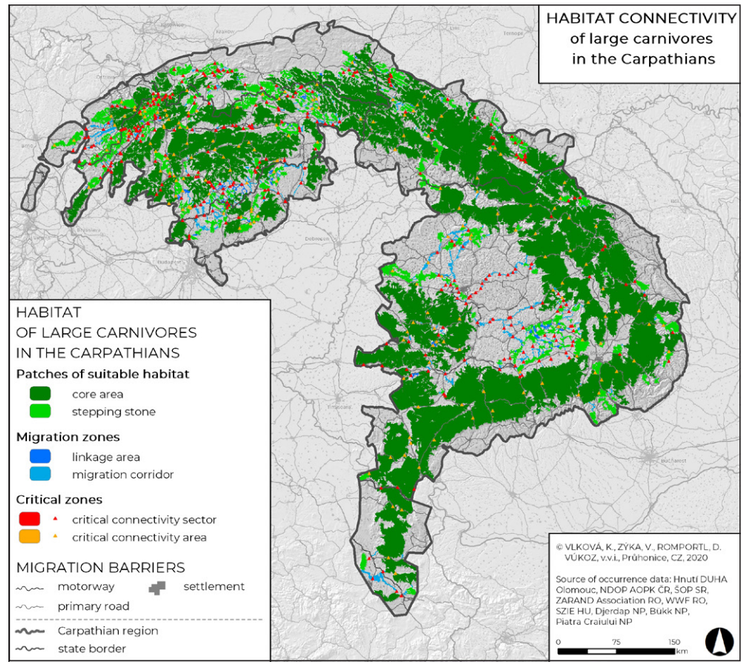
3.1. Ökológiai hálózat a területi tervezésben

A partner országok döntően decentralizált unitáris országoknak tekinthetők a hatalom területi megosztását illetően, ami azt jelenti, hogy a régiók bizonyos hatáskörökkel rendelkeznek a területi tervezésben, bár szerepük korlátozott (Illés 2011). Országos szinten dolgozzák ki a tervezés legfontosabb keretrendszerét, jogszabályi hátterét és a régiók az országos szintnél részletesebb terveket dolgoznak ki a nemzeti hatóságok kontrollja mellett (2. táblázat). Szerbia és Románia esetében a központi hatóságok dolgozzák ki a regionális terveket is. A tervezés és a tervek megvalósulásának hatékonyságát rontja, hogy a területi tervezés multi-szektorális jellegéből fakadóan a nemzeti hatóságok között megoszlanak a felelősségek és az együttműködés sem zökkenőmentes, ami különösen jellemző Szlovákiára és Magyarországra. A regionális szintet a legtöbb országban NUTS3 régiók jelentik kivéve Szerbiát és Romániát ahol a NUTS2 régiókra is készülnek tervek. A helyi szint rendelkezik legerősebb jogosultságokkal a területrendezés terén (helyi szabályozási, övezeti tervek, építési engedély). Egyes országokban részletesebb tervek is készülnek az általános rendezési tervek mellett a település egyes részterületeire

3. Táblázat/ Table 3:
Az ökológiai hálózat integrációja a területi tervezésbe / *Integration of ecological network into spatial planning* (FORRÁS/SOURCE: REPORT D.3.3.2.)

Ökológiai Hálózat a területi tervezésben			
Csehország/ *Czechia*	Az „Ökológiai Stabilitás Területi Rendszere" az egyetlen olyan természetvédelmi eszköz Csehországban, amely a tájléptékű ökológiai hálózatot biztosítja és integráns része a területi tervezésnek. Az ÖSTR természetes és természetszerű ökoszisztémák összefüggő hálózatát foglalja magába és 3 alapelemből épül fel: biocentrum/ magterületek, folyosók és interaktív elemek. A biocentrumok élőhelyek és élőhelyek rendszerét képezik, a biofolyosók a fajok terjedését és vándorlását biztosítják. Az interaktív elemek foltszerű, gyakran izolált élőhelyek.	*The Territorial System of Ecological Stability of the Landscape (TSES) is the only nature conservation tool constituting an ecological network in the landscape integrated in the spatial planning system. The TSES as an interconnected system of both natural semi-natural ecosystems, consists of three basic elements – biocentres, biocorridors and interactive elements. A biocentre (existing and planned) is a habitat or a system of habitats. Biocorridors as biotic dispersal & migration corridors. The interactive elements are small areas/patches/plots (often spatially isolated).*	 http://www.ceeweb.org/work-areas/priority-areas/green-infrastructure/maps/
Románia/ *Romania*	Romániában a 350/2001 tv. A Területi és várostervezésről a területi célok között említi a természeti és települési táj védelmét, az ökológiai folytonosság biztosítását. Az országos területi terv tartalmazza a nemzetközi és nemzeti jelentőségű magterületeket, Natura2000, Emerald, és Pán-Európai Ökológiai Hálózatot. A megyei/regionális tervek kijelölik a magterületeket (10-100 km2) és a folyosókat. Az Átfogó Települési Tervek határozzák meg a kisméretű élőhelyek, facsoportok, vizes élőhelyek, gyepek, tavak (<10km2) és a kapcsolódó folyosók (patakpartok, mezővédő erdősávok, szegélyek, árkok) rendszerét, funkcióját.	*In Romania Law 350/2001 on Spatial and Urban Planning specifies that territorial management aims, among others, to ensure the protection of natural and built landscapes, the creation of ecological continuity.* *The National Plan indicates core areas of international and national importance and corridors and include international nature conservation priorities: Natura 2000, Emerald, PEEN.* *The County/Regional plans determine core areas (10-100 KMp) and connecting corridors. The Comprehensive Urban Plans determine the function of small habitats, woodlots, wetlands, grassland, patches, ponds (<10 Kmp) and connecting corridors (stream banks, hedgerows, field verges and ditches).*	 https://www.siugrc-cjph.ro/c/document_library/get_file?uuid=2175fc9d-e8de-4f50-bf15-92fe80187ee8&groupId=10157
Szerbia/ *Serbia*	Szerbiában a természetvédelméről szóló tv. nem szabályozza az ökológiai folyosók védelmét, az ökológiai hálózat részét képezik speciális korlátozások nélkül. Az ökológiai folyosókat a természet- és tájvédelem közvetett eszközökkel védi. A területi tervekben formalizált módon szerepelnek az ökológiai folyosók.	*In Serbia the Nature Protection Act the protection of the ecological corridors is not clearly defined, it is treated as a part of ecological network without specified restrictions. Ecological corridors are indirectly covered by the provisions relating to the protection of nature and landscape. In spatial planning practice ecological corridors have been formally developed in spatial plans at different levels of planning.*	 Ecologic Network of Voivodina (http://www.pzzp.rs/rs/sr/zastita-prirode/ekoloska-mreza.html)
Szlovákia/ *Slovakia*	Szlovákiában a „Tájökológiai terv" a területrendezési és településrendezési tervek készítése során kerül kidolgozásra, fókuszában tájökológiai elemzéssel, és a területhasználat funkcionális értékelésével, optimalizálásával a tájökológiai potenciál és a gazdasági fejlődés korlátainak összehangolásával. Az „Ökológiai Stabilitás Területei Rendszere" összhangban van a területi tervekkel, amely a Természet és a táj védelméről szóló tv. (543/2002.) meghatározása alapján összekapcsolt ökoszisztémák hálózata, biocentrumok és biokorridorok valamint egymással kölcsönhatásban lévő elemeket tartalmaz makro-regionális, regionális és helyi szinten.	*In Slovakia Landscape ecologic plan is the document elaborated as a part of the procurement of land-use plans at regional and municipal level with the focus on landscape ecologic analyses, assessment and optimisation of functional use in the harmony with landscape ecologic potentials and limits for the development. The plans of the Territorial Systems of Ecologic Stability are in accordance with the Law on land-use planning supportive documents As defined in the Act Nr. 543/2002 on Nature and Landscape protection: The Territorial System of Ecological Stability is such a spatial structure of interconnected ecosystems, consisting of biocenters, biocorridors and interacting elements of supra-regional, regional or local importance.*	 The General of the Super-regional (national level) Territorial System of Ecological Stability of the Slovak Republic (Source: SEA SR)
Magyarország/ *Hungary*	Magyaországon az ökológiai hálózat a területi tervek része. Megkülönböztetünk az Ökológiai hálózaton belül magterület, puffer terület és ökológiai folyosó övezeteket. A magterület és ökológiai folyosók övezetben korlátozások vonatkoznak a fejlesztési területek kijelölésére, közlekedési és közmű infrastruktúra elemek tájbaillesztésére.	*In Hungary the ecological network is integrated into the spatial plans. The National ecologic network zone include the core areas, the buffer zones and the ecological corridors as well. In the zone of core areas and ecological corridors the rules restrict the designation of areas for development, the placement of transport infrastructure and new surface mines, as well as the prescription that the utility lines fit into the landscape.*	





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4. ábra/Fig. 4:
A projekt egyik első lépése volt a térségben az ökológiai hálózatot megszakító akadályok feltárása, azonosítása, így többek között a meglévő és tervezett közlekedési infrastruktúra hálózat feltárása / *One of the first steps of the project was to explore the barriers of the ecological network, so among others defining the existing and planned transportation infrastructure network* (FORRÁS/SOURCE: D.321. REPORT ON IDENTIFYING BARRIERS)

5. ábra/Fig. 5:
A nagyragadozók élőhelyei, vándorlási útvonalak és a kapcsolati hiányokat okozó kritikus területek / *Core habitats, migration routes and critical zones due to linkage gaps* (FORRÁS/SOURCE: VÚKOZ, 2020)

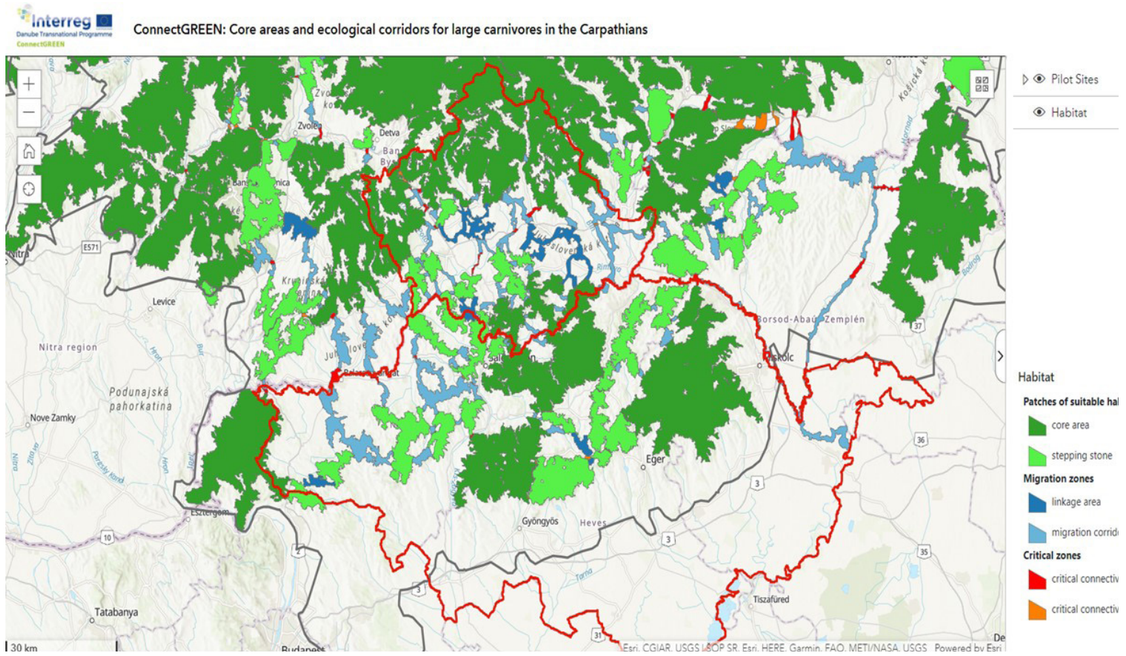
vagy a kiemelten védett területekre (Romániában világörökségi helyszínekre, turisztikai desztinációkra a központi hatóságokkal közösen készülnek tervek).

Általában két tervtípust különböztethetünk meg a területi tervezésben stratégiai/fejlesztési tervezést és területrendezési tervezést, kivéve Szerbiát, ahol regionális szintre csak egy, átfogó területi terv készül (2. táblázat). Mind a fejlesztési mind a rendezési tervek általában részletes társadalmi, gazdasági és környezeti elemzéseken alapulnak, de a tájtervezés (3. ábra) általában nem jelenik meg önálló tervtípusként, kivéve Szlovákiát, ahol a tájökológiai terv a területi tervezés folyamatának első, megalapozó lépéseként szolgál, magában foglalva egy tájökológiai elemzést az optimális területhasználatok értékelésével a tájpotenciál és a fejlesztés korlátainak feltárásával (Kozová, 2007). Csehországban is készül egy hasonló elemzés: Ökológiai Stabilitás Területi Rendszere (ÖSTR) címmel (Territorial System of Ecological Stability-TSES) (Görner – Kosejk 2011).

Az ökológiai hálózat (Internet-1), különböző módon ugyan, de minden országban integrált része a területi tervezés rendszerének, folyamatának, a partnerországokban alkalmazott különböző módszerekről a 3. táblázat ad áttekintést. Annak ellenére, hogy az ökológiai hálózat minden országban fontos része a területi tervezésnek, hangsúlyosan jelenik meg a politikában, a gyakorlatban számtalan konfliktus tárható fel, de leggyakrabban a megvalósítás terén hiányosságok vannak. A válaszok alapján 5 területen azonosítottuk a legfontosabb hiányosságokat: 1. Módszertan; 2. ÖH kijelölése; 3. Szabályozások típusai és egymásra hatásuk; 4. Társadalmi elfogadottság és érdekkülönbségek; 5. Intézményrendszer. Minden országban alkalmaznak indikátorrendszert az ÖH kijelölésére, amelyek alapvetően a Natura 2000 és a Pán-Európai Ökológiai Hálózat kijelölésének módszertanához kapcsolódnak, de az alkalmazott indikátorok és jelentőségük különbözik, ami megnehezíti az egyes országok között az ökowith the exception of Serbia where as regional plan a complex strategic plan is elaborated (Table 2.). The elaboration of strategies and land use plans is based on detailed analysis of social, economic, environmental and landscape conditions but in most of the countries landscape planning does not occur as an independent planning activity as in Slovakia. Next to strategic and land use plans in Slovakia the Landscape ecological plan is the document elaborated as a part of the procurement of land-use plans at regional and municipal level with the focus on landscape ecological analysis, assessment and optimisation of functional use in the harmony with landscape ecologic potentials and limits for the development (Kozová, 2007). In the Check Republic similar analysis is carried out: Territorial System of Ecological Stability (Görner – Kosejk 2011).

In all countries the ecological network is an important part of spatal planning system and process, but in by different tools. Table 2. gives an overview about the applied tools in the partner countries. In spite the fact that in general, all of the analysed countries expressed the importance of ecological networks and ecological corridors in their policy framework, there are a lot of conflicts in the practice. Unfortunately, in many cases the implementation of this idea is weak. Based on the answers 5 main problem areas were identified: 1. Methodology; 2. Definition; 3. Types of regulations and consistency; 4. Social agreement and conflicting interests; 5. Institutional framework (Table 4.). All countries use indicators for definition of EN, mostly based on the methodology of Natura 2000 and Pan European Ecological Network. Unfortunatle there are great differences between the applied indicators, which cause problems in connecting the national networks and implementation a common ecological network.

The ecological network is based in Serbia on the Emerald network



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6. ábra/Fig. 6: A Magyar és szlovák vizsgálati terület a projekt keretében készülű interaktív térképen az élőhelyekkel és potenciális kapcsoló elemekkel/ folyosókkal / *The Slovakian and Hungarian pilot areas highlighted the core habitats with the potential corridors on the interactive map elaborated by the project* (FORRÁS: INTERNET-3)

lógiai hálózatok összehangolását, egységes, komplex rendszer kialakítását.

Az ökológiai hálózatot Szerbiában alapvetően az ún. Emerald hálózat jelenti, amely a Natura 2000 hálózat EU-n kívüli kiegészítője (a Berni Egyezmény céljainak megvalósítására hozták létre), legnagyobb hiányossága, hogy csak foltokban jelölték ki és nem működik összefüggő hálózatként (Internet-2).

További konfliktus Szerbiában, hogy nincs jogszabályi kötelezettség az ökológiai folyosók meghatározására és védelmére, amely a meglévő ökológiai folyosó elemeinek további erózióját okozza. Az ökológiai hálózat tervezett létrehozását sok esetben az egyéb meghatározó ágazatok hátráltatják.

Az összes elemzett országban az ökológiai hálózat szorosan integráltan jelenik meg a területi tervekben, bár különböző szinten és mértékben. Regionális szinten speciális térképek készültek az ökológiai hálózatról a területi tervekben, kivéve Szerbiát, ahol csak általános, formalizált módon jelenik meg az ökológiai hálózat a regionális tervekben (kivételes jó példaként a Vajdasági területi terv említhető). A legtöbb probléma helyi szinten jelenik meg, gyakran az információk elavultak, csak egyes országrészekre érhetők el (Csehország), vagy digitális formában még nem elérhetők. A védett területekhez kapcsolódó szabályozások, korlátozások hasonlóak a vizsgált országokban: az ökológiai stabilitást zavaró tevékenységek tiltottak (például bizonyos közlekedési típusok, erdőgazdálkodási formák, vadászat, halászat, egyes gyepgazdálkodási formák, turizmus egyes fajtái). Ez azt jelenti, hogy általában korlátok közé szoríthatók, de megelőzni ezek a szabályok nem tudják a kedvezőtlen irányú változásokat.

Szerbiában sokáig problémát okozott, hogy az ÖH-ra vonatkozó ajánlások nem integrálódtak a fejlesztési tervekbe. Jó példaként említhető a bevezetésre kerülő Tájterv (regionális és helyi szinten) Romániában, ami a természet- és épített örökség védelmének integrációját segíti.

A szakértők szerint a megvalósítás, a programok, a tervek kivitelezése, és az ökológiai folyosók hatékony működési feltételeinek hosszú távú biztosítása nem tekinthető sikeresnek. A szakértők legygyakrabban a finanszírozás, az elégtelen kommunikációt és együttműködést, a tényleges közösségi részvétel hiányát, az adatok rossz elérhetőségét említették problémaként. Komoly hiányosságként említették több országban az érdekütközést, érdekellentéteket (Magyraország, Szlovákia és Románia), továbbá a szakértők (it was defined to comply with Bern Convention), which represent the supplementary network of Natura 2000 network in non-EU member European states, unfortunately it doen't really function as a network because it contains mostly core areas.

There are no legal regulations in Serbia for the definitation and protection of ecological networks which cause the further loss of elements of ecological network.The implementation process is lhindered by the dominant economic sectors.

In all the analysed countries, the EN is strongly integrated into the spatial planning system however on different levels and forms. On regional level as special maps are the elements of the EN integrated into spatial plans with the exception of Serbia where the ecological networks are formally treated (but Voivodina spatial planis an exceptional good example). Usually conflicts occure on local level: information is outdated, their availability id limited for certain regions (Check Republic) or are not in digital format. The types of limitations, rules are very similar in all of the countries: disturbing activities and activities that reduce ecological stability are forbidden (e.g. certain types of transport, certain forestry, hunting or fishing activities, some sort of grassland management or tourism activities). It means, usually they can limit but not prescribe the changes. In Serbia caused problems that the suggestions related to the EN were not integrated into the spatal plans. We can mention as a good and new initiative: the Landscape plan in Romania.

The experts reported problems especially related to the implementation of the programs and the plans and the long-term maintenenace of functionality of ecological corridors. The majority of the gaps are related to the lack of communication and cooperation between the sectors, lack of real public participation, barriers within the public administrations and interest conflicts (e.g. Slovakia, the Czech Republic, and Hungary). Serbian and Hungarian experts considered the financial resources inadequate.

Gaps and weaknesses were identified regarding the monitoring activities. Only 2 countries (the Czech Republic and Romania) have got direct monitoring activities. However, the other three countries also have got optional, indirect monitoring activity, but these are usually related to certain projects or researches.

In most of the countries, the land awners get compensations because of the land use limitations on protected areas. Major conflicts were reported from Serbia and Slovakia because of lack of compensiation or methods of compensation were not defined.

3.2. Development possibilities of ecological network

As the next steps in the project experts identified the core habitats of large carnivores and the possible and missing

emberek hiányát. A pénzügyi eszközöket főleg Szerbiában és Magyarországon tartották elégtelennek a szakemberek.

Legtöbb esetben a monitoring tevékenységhez kapcsolódóan tártak fel a kollégák hiányosságokat. Két ország esetében beszélhetünk direkt (Csehország és Románia) monitoring tevékenységről, de a többi országban is van természetesen monitoring de ezek gyakran valamilyen projekthez, kutatáshoz kapcsolódnak. Az országok többségében a földtulajdonosok kompenzációt kapnak a védelmi korlátozásokért. Itt elsősorban Szerbiában és Szlovákiában vannak a legjelentősebb konfliktusok, a kompenzáció hiánya illetve a feltételek tisztázatlansága miatt.

3.2. Az ökológiai hálózat fejlesztésének lehetőségei

A projektben a nagyragadozók előfordulási adatai és különböző környezeti indikátorok, elsősorban abiotikus, élőhelyi, és antropogén tényezők (ESRI 100x100 m négyzetrácsban) alapján a szakértők kidolgozták a potenciális élőhelyeket bemutató modellt, amely segítségével magterületeket, és ún. lépegető kő élőhelyeket határoltak le. A fragmentációt jelentő elemek feltérképezésével feltárták a táj összakapcsoltságát és „átjárhatóságát" a nagyragadozók számára. A különböző rétegek egymásrahelyezésével a magterületek, folyosók komplex hálózatát dolgozták ki. A szakértők az IUCN kategóriái és a nagyragadozók élőhelyi igényei alapján határozták meg az élőhelyek és ökológiai folyosók területi feltételeit (Report D.3.2.1).

A projekt a hiányzó ökológiai kapcsolatok helyreállítását három célterületen tűzte ki célul, de hosszútávon a cél, hogy elinduljon egy egyeztetési folyamat, párbeszéd, hogy a területi tervekbe is bekerüljenek a kritikus ökológiai kapcsolatok vagyis a jövő fejlesztési döntéseiben ezek az igények hangsúlyosabban jelenhessenek meg. Különösen fontos lehet minden országban a regionális és helyi szint szerepe hiszen a helyi adottságok, problémák azonosítása hatékonyabban megtörténhet.

KÖSZÖNETNYILVÁNÍTÁS

A tanulmány az INTERREG, Duna Transznacionális Együttműködési Program 2014-2020 által finanszírozott ConnectGREEN projekt keretében végzett kutatás eredményeit tartalmazza. A tanulmány az alábbi projekt eredmények alapján készült: 3.3.1. State of the Art Report on the existing planning system and their application for ecological corridor identification and management in the Carpathians, ConnectGREEN projektreport és a 3.3.2. GAP analysis on the identification of the needs for improving the planning processes and tools related to ecological corridors identification and preservation, ConnectGREEN projektreport; Kristýna Vlková, Vladimír Zýka & Dušan Romportl (2019): D.3.2.1. Report on Identified conflicts between conservation and spatial planning and development, VÚKOZ Průhonice, Czech Republic.

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7 8

7. ábra/Fig. 7:
Észak-Bükk térsége /
Northern-Bükk
8. ábra/Fig. 8:
Cserhát térsége /
Area of Cserhát

migration routes between them as it is shown in the first draft maps.

The experts based on actual occurrence data of large and a set of environmental variables including abiotic, habitat and anthropogenic factors (in ESRI grid 100x100 m) elaborated the habitat suitability modell, consisting of core areas and potential habitats and "stepping stones". Parallel to that a resistance surface map was derived from the habitat suitability model and fragmentation geometry, to express landscape connectivity and permeability for large carnivores. The experts based on IUCN categories defined the spatial criteria of habitats and ecological corridors (Report D.3.2.1).

The objectives of the projects are to restore ecological corridors on three pilot areas, but on the long run the most crucial is to enhance the dialogue between stakeholders and a stronger integration of ecological corridors into the spatial planning process, to stress their criterias, aspects in future development decisions.

ACKNOWLEDGEMENT

The study was elaborated based on research carried out in th frames of ConnectGREEN project financed by INTERREG Danube Transnational Programme 2014-2020. The study used the following project results: .3.1. State of the Art Report on the existing planning system and their application for ecological corridor identification and management in the Carpathians, ConnectGREEN projektreport and 3.3.2. GAP analysis on the identification of the needs for improving the planning processes and tools related to ecological corridors identification and preservation, ConnectGREEN projektreport; Kristýna Vlková, Vladimír Zýka & Dušan Romportl (2019): D.3.2.1. Report on Identified conflicts between conservation and spatial planning and development, VÚKOZ Průhonice, Czech Republic.

TENDENCIES AND SPATIAL PATTERN OF URBAN GROWTH IN THE CATCHMENT AREA OF HUNGARIAN MIDDLE CITIES BETWEEN 1990-2018

A VÁROSI NÖVEKEDÉS TRENDJEI ÉS MORFOLÓGIÁJA MAGYARORSZÁGI KÖZÉPVÁROSOK VONZÁSKÖRZETÉBEN 1990 ÉS 2018 KÖZÖTT

SZERZŐ/*BY:* IVÁNCSICS VERA, FILEPNÉ KOVÁCS KRISZTINA

HTTPS://DOI.ORG/10.36249/57.2

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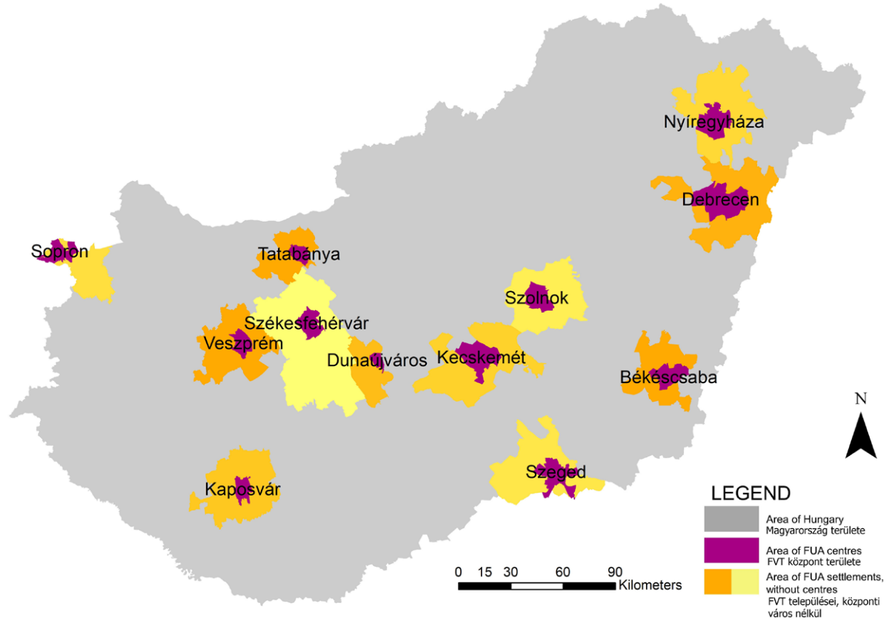
1. ábra/Fig. 1:
A vizsgált FVT-k területe / *The area of the analysed FUAs*



INTRODUCTION

Highlighted challenges of landscape management and urban policy are land use and urban sprawl management (EEA 2016, EEA 2007). Important concerns occurred from the aspect of landscape architecture, like sustainability, disproportional land take, loss of natural habitats, as well as traditional land use (Artmann et al. 2019; Antrop 2004). Nevertheless, the concept of *urban sprawl* is commonly used, several qualitative and quantitative definitions exist (some examples: Steurer and Bayr 2020; Luc-Normand 2020; Szirmai 2011; Ewing 2008; Galster et al. 2001) it is hard to define precisely (Tsai 2005). Egidi et al. (2020: 4) highlights "sprawl still remains a mixed morphological and functional issue, e.g., in terms of housing, land-use, fragmentation, and confusion of landscape characters" referring to Colantoni et al. (2015) and Di Feliciantonio and Salvati (2014).

The analyses of different spatial patterns or morphological distribution of urban sprawl is a core topic of urban planning (Angel et al. 2010; Schneider and Woodcock 2008; Schwarz, 2010; Galster et al. 2001). Compact city, as an objective for urban planning is on the political agenda, to foster organic growth of urban areas and fill the gaps within the urban tissue (CEC 1990, 1996; Kasanko et al. 2005; Batty et al. 2003). In the literature, the most influenced territories are in focus: the central city and its settlement network (Szirmai 2011) and also the periphery, edge, peri urban territories (Lennert 2018; Csemez 2008; Antrop 2004). The definitions of *functional urban area* (FUA) (OECD 2013; 2012) or *urban settlement groups* (KSH 2014) are integrated into the international and national discussions and the statistical systems as well. FUA regions are determined on the basis of population density and continuity of integration. The definition of *urban settlement group,* just like *agglomeration* and *agglomerating area* are used in Hungarian context, determined by multiple indicators by KSH Inostroza et al. (2013) distinguish three main spatial pattern infill, axial and isolated development. By all new development, that is taking place in adjacency with the pre-existing urban tissue, infilling increase compactness, axial growth follows the main development axis, and is strongly determined by infrastructure. No doubt, spatial analyses of urban sprawl needs to be the basis of urban planning an overall review from this respect has not appeared yet from Hungary.

The motivation for compact urban planning was missing from the regulatory environment until 2019 (Act CXXXIX of on Land Use Framework Plan of Hungary and Priority Areas, OTrT). The country-level studies focus on the Budapest agglomeration (for example Lennert et al. 2020; Kovács et al. 2019; Cegielska et al. 2018; Egyedné Gergely 2014; Schuchmann 2013; Tosics 1998). However, on the situation of smaller towns, only short term or case-focused studies were born (Hoyk et al. 2020).

	Corine nomenclature			Simplification and terms in this study	
Code	Class 1	Class 2	Class 3	Main categories	Further categories
1.1.1			Continuous urban fabric		
1.1.2		Urban fabric	Discontinuous urban fabric		Urban fabric
1.2.1			Industrial and commercial units		Industrial and commercial units (abbr. industrial units)
1.2.2			Road and rail network and associated lands		
1.2.3		Industrial, commercial and Transport units	Port areas		
1.2.4			Airports		Transport units
1.3.1			Mineral extraction sites		
1.3.2			Dump sites		Mine, dump sites (abbr. mine sites)
1.3.3		Mine, dump and construction sites	Construction sites		Manually categorised according to the satellite photo from Google Earth 2020.
1.4.1		Artificial, non-agricultural vegetated area	Green urban areas		Artificial, non-agricultural vegetated area (abbr. urban green areas)
1.4.2	Artificial surfaces		Sport and leisure facilities	Artificial surfaces	
2.	Agricultural areas	…	…	Agricultural areas	
3	Forest and semi natural areas	…	…	Natural, semi natural areas (abbr. natural areas)	
4	Wetlands	…	…		
5	Water bodies	…	…		

The present paper explores the trends of spatial growth of functional urban area (FUA) of 12 second-tier Hungarian towns since 1990.

METHODS

The Corine Land Use Change (CLC CHA) database – initiated by European Commission from 1990, 2000, 2006, 2012 and 2018 – serves as the basis of the research. The CLC CHA data was recalculated per analysed areas and visualized to 12 second-tier Hungarian towns and its functional urban areas (FUA): Békéscsaba, Debrecen, Dunaújváros, Kaposvár, Kecskemét, Nyíregyháza, Sopron, Szeged, Székesfehérvár, Szolnok, Tatabánya, Veszprém (Fig. 1,2). The area of selected regions falls between 37,320 ha (Tatabánya FUA) and 165,200 ha (Székesfehérvár FUA). The population ranges between 86,757 inhabitants (Dunaújváros FUA) and 331,648 inhabitants (Debrecen FUA) (Fig. 2), as comparison Budapest agglomeration covers 253,800 ha and has 2.5 million inhabitants (2014).

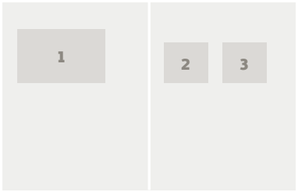
The selection on such areas, where the FUA category and urban settlement groups parallel exists according to delineation of Urban Atlas (2012), OECD (2013) and KSH (2014).[1] The analyses of spatial pattern of artificial areas were categorised according to the distribution of areas between central town and other FUA settlements. An overview was also made according to the categories of Inostroza et al. (2013): infill, axial and isolated development.

The Geographical Information Systems (GIS) – ArcMap software 10.2.2. was used to delineate, visualise and calculate the different land use change categories. Based on the Corine land use nomenclature, several categories were aggregated and grouped in order to highlight the urban sprawl (Table 1).

The direction of the changes was also detected. If the given area stayed within the category of three main land use patterns (Artificial, Agricultural and Natural). In order to determine the characteristics of urban sprawl and find explanation for the trends, artificial surfaces were divided into 5 further categories: (i) urban fabric, (ii) industrial and commercial units, (iii) transport units, (iv) mine sites, (v) urban green areas.

The spatial pattern of new artificial areas between 1990–2018 is compared to the existing urban fabric, visualised according to Urban Atlas 2012 Database (Artificial surfaces). Unfortunately, the Urban Atlas 2018 Database was not available for all analysed settlements. Also, the lowest area of artificial surfaces appeared in Dunaújváros FUA between 1990–2000, in Kaposvár FUA between 2000–2006 and in Debrecen FUA between 2006–2012 and 2012–2018.

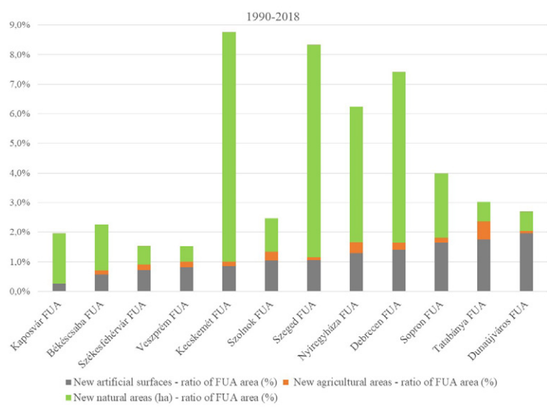
1 FUA regions are determined on the basis of population density and continuity of integration according to internationally accepted methodology (OECD 2013). According to the Hungarian methodology, the agglomeration linkage is determined by 10 indicators by KSH (2014). Urban settlement group means a tighter connection between the central town and settlements around than a neighbourhood relation, but a weaker connection than agglomeration or agglomeration area.

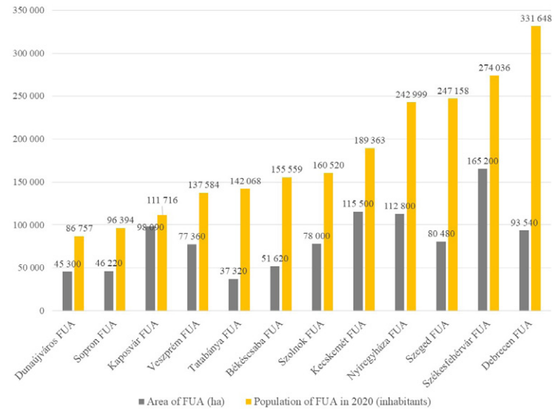


1. táblázat/ Table 1: Az elemzés során alkalmazott felszínborítási kategóriák a Corine kódok alapján nomenclature (Bossard et al. 2000; Heymann et al. 1994) / *The applied land use categories of the analyses, based on Corine nomenclature (Bossard et al. 2000; Heymann et al. 1994)*

2. ábra/Fig. 2: FVT területe és népessége / *The centre, the area and the population of analysed FUAs* (FORRÁS/SOURCE: URBAN ATLAS 2012; TERÜLETI ATLASZ KSH, 2020 / *URBAN ATLAS* 2012; *DETAILED GAZETTEER OF HUNGARY FROM KSH*, 2020)

3. ábra/Fig. 3: Az új területek a teljes FVT terület százalékában 1990 és 2018 között / *Newly appeared areas in ratio of whole FUA area between 1990 and 2018*





RESULTS

Major changes

Firstly, changes were analysed to reveal the difference between the three main categories (Table 2, Fig. 2). However, the role of new agricultural areas are marginal, the ratio of new natural areas show territorial inequalities. It is also in accordance with the FUAs, where changes are significant: Kecskemét, Szeged, Nyíregyháza and Debrecen. Appearance of new artificial surfaces (Fig. 3) is balanced in the examined regions, the values fall between 259 and 1458 hectares between 1990 and 2018. Large areas turned into artificial surfaces in the following FUAs: Dunaújváros, Kecskemét, Székesfehérvár, Debrecen and Nyíregyháza; marginal growth is experienced in this respect in Kaposvár and Békéscsaba FUAs. In different time periods, the largest area of artificial surfaces appeared in Tatabánya FUA between 1990–2000, in Nyíregyháza FUA between 2000–2006 and 2006-2012 and in Debrecen FUA between 2012–2018.

The intensity of new artificial surfaces is varying within the country. In the period after the transition (1990–2000), the newly appearing artificial surfaces were dominant in the Western Region, while the Eastern part of Hungary joined after 2000 to this trend with Nyíregyháza, Szeged and Debrecen FUAs. However, some FUAs (Békéscsaba, Kaposvár) are lagging behind the dominant ones from both parts of the country.

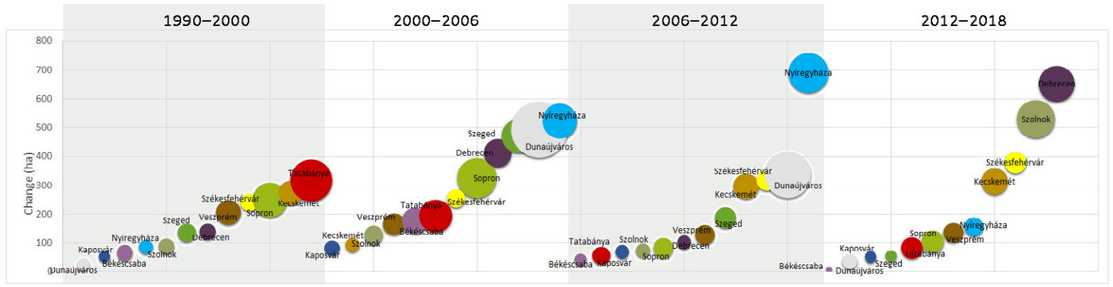
Within the category of artificial surfaces (Fig. 3–5) between 1990 and 2018, i.e. in the whole examined period new industrial sites were considered remarkable in the Tatabánya, the Nyíregyháza, the Székesfehérvár and the Kecskemét FUAs with the change affected more than 300 hectares. Also, with less than 50 hectares change marked as marginal in the Békéscsaba and the Kaposvár FUAs. In the Kecskemét FUA, new industrial sites give 47% of all new artificial surfaces, while in the Tatabánya FUA the same amounts to 49%.

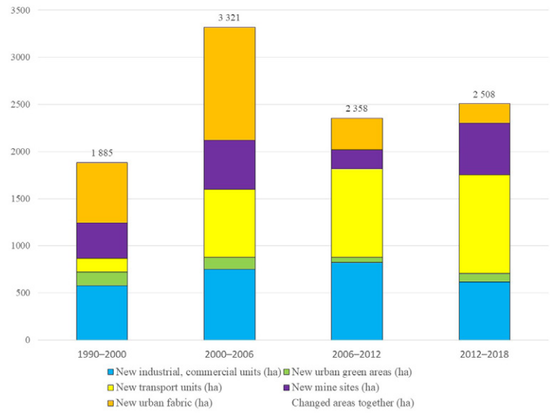
4 5 6

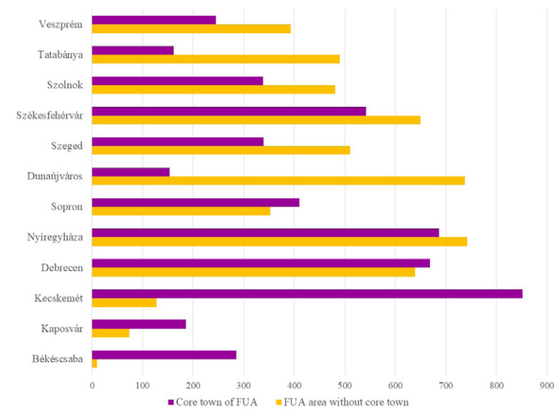
4. ábra/Fig. 4: Az FVT-k területén az új mesterséges felszín a vizsgált peródusokban / *The new artificial surfaces during the examined periods in FUA areas. The size of the bubble indicates the share of the changed areas to the FUA area*

5. ábra/Fig. 5: Az új mesterséges felszín a 12 FVT területén a vizsgált peródusokban / *New artificial surfaces in all 12 FUAs in the examined periods*

6. ábra/Fig. 6: Az új mesterszége felszín megoszlása (ha) a központi város és az FVT területén 1990 és 2018 között / *Distribution of new artificial surfaces (ha) between the core town and FUA area without core town between 1990 and 2018*







New transportation units are dominant in the following FUAs: Székesfehérvár, Szolnok, Debrecen, Dunaújváros, Nyíregyháza. In the Nyíregyháza FUA, 52% of new artificial surfaces fall into this category with 742.5 hectares, while in the Dunaújváros FUA the same value is 76%.

New mine sites appeared to a larger extent in the Szeged, Szolnok, Székesfehérvár FUAs, with more than 200 hectares, and to a smaller extent in the Sopron, Kaposvár, Kecskemét FUAs. In the Békéscsaba FUA, the area of new mine sites did not grow after 2012, but still this category gives 48% all the new artificial surfaces in the whole period. In parallel, in the Dunaújváros FUA, no new mine sites were opened during the whole period.

New urban fabric is dominant in the following FUAs, with over 200 hectares: Nyíregyháza, Kecskemét, Szeged, Sopron (60% of all new artificial surface), Debrecen (42% of all new artificial surface). In the Békéscsaba and Dunaújváros FUAs less than 50 hectares of new urban fabric appeared.

New urban green areas are not so dominant within artificial surfaces. A remarkable change was detected in Veszprém, with 111.6 hectares, but in several FUAs no new urban green areas appeared: Békéscsaba, Dunaújváros, Szolnok, Nyíregyháza, Kecskemét.

Spatial pattern of new artificial surfaces

The visual analyses of spatial pattern of new artificial surfaces is made within the area of central towns, also within the area of the whole FUA. Among the analysed areas, different limitations can be detected that may influence the spatial distribution of new artificial areas.

- Country border that is a strong barrier of FUA delineation as well. It is very spectacular in the case of Sopron, but a section of the border of the FUA is the country border at the Szeged and Debrecen FUAs as well.
- Relief, like the neighbourhood of the River Danube (Tatabánya, Dunaújváros) or the River Tisza (Szeged, Szolnok) or hills (Sopron, Kaposvár, Tatabánya, Veszprém) or plain (Szeged, Debrecen, Nyíregyháza, Szolnok, Békéscsaba) also influences development.
- Local characteristics, like settlement structure, traditional land use patterns, situation of transportation network (Cieslak et al. 2019) should also be taken into consideration.

The distribution of new artificial surfaces between the core town and agglomeration area around it (FUA area without core town) gives an overview about the centralised or scattered nature of urban sprawl (Fig. 6, Table 2). According to the results three group is seen:

- New artificial surfaces are centralised to the administrative area of core town: Békéscsaba, Kaposvár, Kecskemét
- New artificial surfaces are scattered in the settlements of FUA area: Dunaújváros, Szeged, Székesfehérvár, Szolnok, Tatabánya, Veszprém
- Balanced appearance between the areas: Debrecen, Nyíregyháza, Sopron

The spatial pattern of new artificial surfaces shows different distribution in the regions. To highlight further characteristics that are visible from the map analyses (Fig. 7,8; Table 2), the categories of Inostroza et al. (2013) were applied: infill, axial and isolated.

The most important difference is in the concentration that can caused by geographical and morphological reasons. It is clear, for example, that the new urban fabric strongly linked to the existing urban fabric. Also, the focus points of development are visible, the new automobile investment in the Kecskemét FUA. An axial development in the Dunaújváros, Nyíregyháza, Székesfehérvár or Szeged FUAs are indicated, because of the existence of the motorway network or a geographical barrier, like Danube. Also, in the case of Székesfehérvár and Veszprém, a horizontal (West–East) line (parallel to motorway 8) is dominant. In the case of Tatabánya, a vertical (North–South) line is characteristic thanks to the most important motorway (M1) line. The results are in accordance of former studies (Iváncsics and Filepné 2019a; 2019b).

CONCLUSION

Urban sprawl in Hungary shows strong regional differences, the nature of the process within FUA regions can be easily followed based on the results. The most important findings emphasise the temporal concentration of the new urban fabric to 1990 and 2006, that shows that suburbanisation process started explosively after 1990 – after the decades of socialism with controlled movement of people, and later slowed down (Enyedi, 2016) or was slightly modified. The Sopron FUA at the western border is an exception, though, where the geographical location and existence of iron curtain strongly modifies this trend. This trend is similar to Polish examples (Cieslak et al. 2019).

Important motivating forces for the emerging artificial surfaces are the growth of urban fabric (housing), industrial sites (economic development) and transportation units (motorway constructions).

Another regional characteristic is that the first wave of industrial renewal reached the western regions, and the eastern part of Hungary joined in only later. The results highlight the importance of motorway constructions in urban sprawl, which is in accordance with Eastern European tendencies (Feranec et al. 2017). The spatial pattern of new artificial areas also shows correlation with the motorway network, influences the axial development. However, in some cases the dominant role of the central town is visible, developments are scattered in most of the FUAs. The spatial pattern of urban sprawl is also influenced by settlement development characteristics and history. As we highlighted in the results, Kecskemét had a diffuse pattern of new artificial areas (except

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2. táblázat/ Table 2: Az új mesterséges felszín területi elhelyezkedése 1990 és 2018 között / *The different spatial distribution of new artificial surfaces between 1990 and 2018*

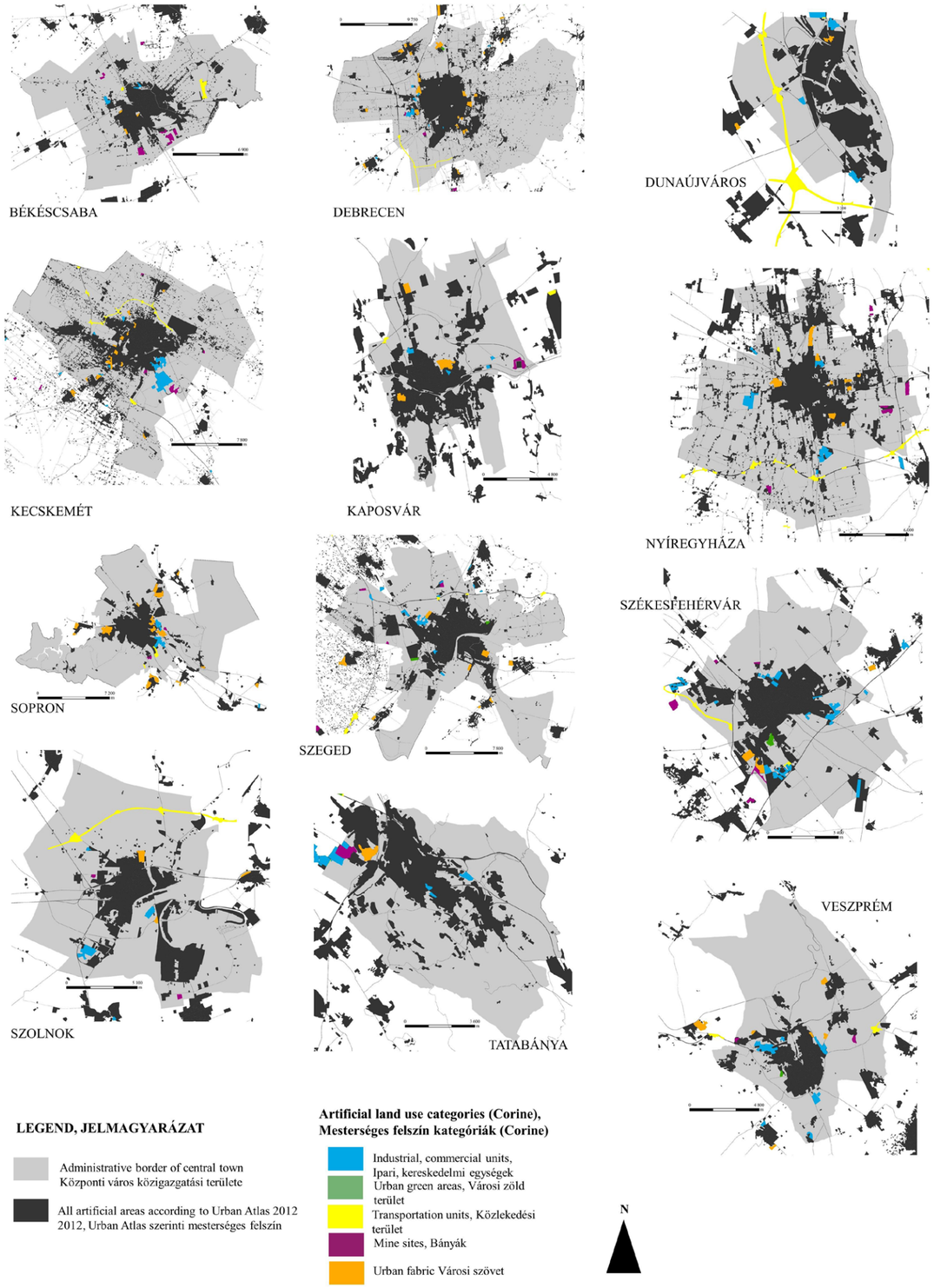
	Centralised or scattered or balanced	Infill or axial or isolated	Remarks
Békéscsaba	Centralised	Infill, isolated	Mining sites and transportation units are isolated
Kaposvár	Centralised	Infill	New developments are connected to existing ones
Kecskemét	Centralised	Infill	Except isolated investment at the South part of the town
Debrecen	Balanced	Infill and axial	Regarding new urban living areas infill, north-south axial development is seen by new industrial and transportation areas
Nyíregyháza	Balanced	Infill, axial, isolated	Infill by new urban fabric areas, axial by transportation area, isolated by industrial and some new urban fabric areas
Sopron	Balanced	Infill, isolated	infill regarding new urban fabric areas, in other FUA settlements isolated
Dunaújváros	Scattered	Axial	the direction of axial development is influenced by the north-south direction thanks to River Danube. Some new urban fabric areas infill the existing artificial surfaces.
Szeged	Scattered	Axial, infill	Industry strongly linked to road network. Infill regarding new urban fabric.
Székesfehérvár	Scattered	Axial, isolated	Industry strongly linked to road network. Isolated regarding new urban fabric.
Szolnok	Scattered	Axial, isolated	East-west axis is seen according to road network, in FUA around some isolated development.
Tatabánya	Scattered	Axial	The most important motorway (M1) influences the spatial pattern of new artificial surfaces.
Veszprém	Scattered	Axial, infill	Developments follow the transportation lines, some of them strongly connect to existing urban fabric.

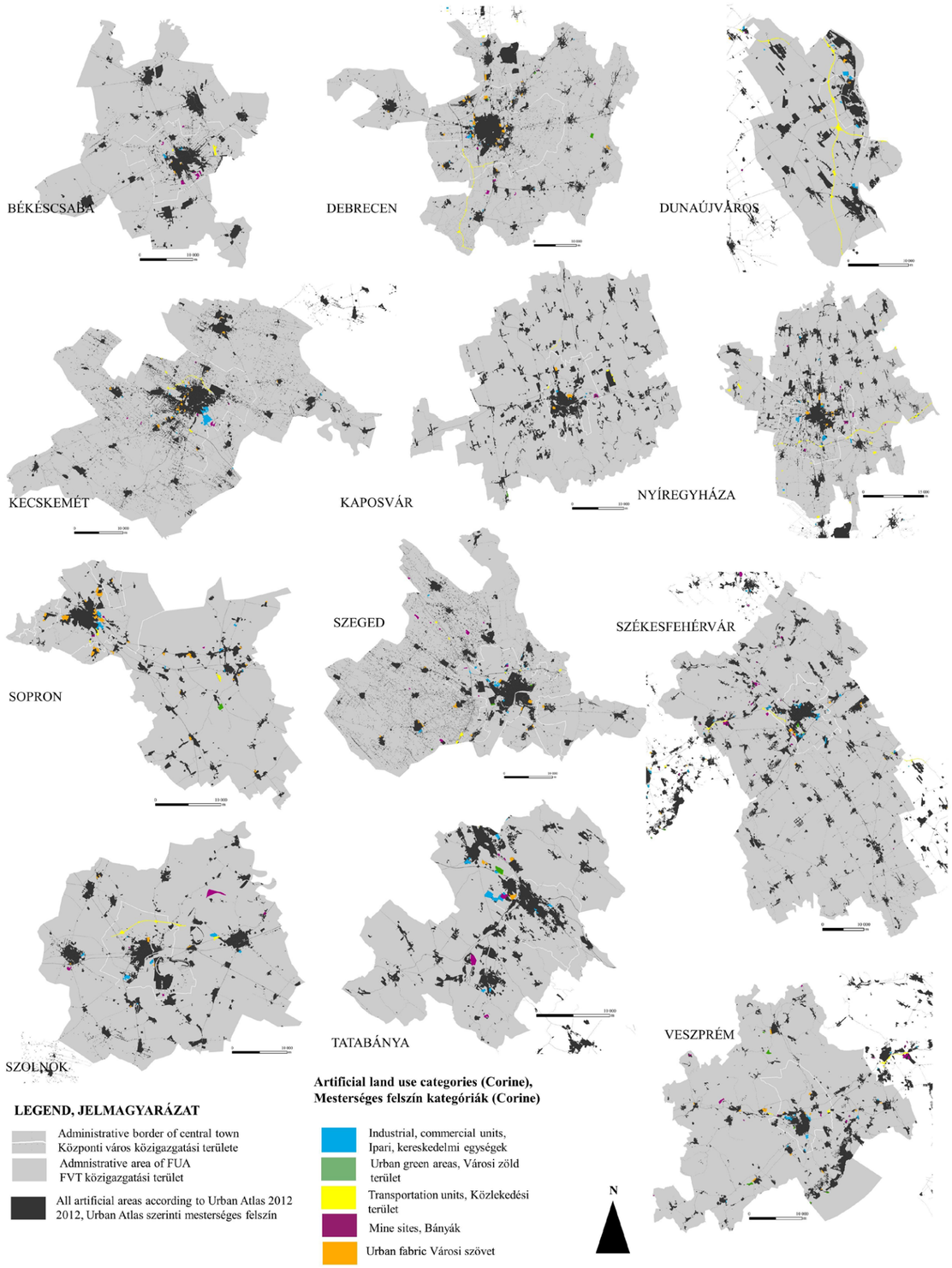
new urban fabric). This is due to the traditional urban pattern of specific regions of the Hungarian Great Plain, where sometimes 40-70% of the population of the settlement live in the outskirts in homesteads (Sikos and Beluszky 2008).

It is important to consider the limitations of the Corine database, such as errors due to scale, size of the smallest mapping unit, generalization rules (Diaz-Pacheco and Gutiérrez 2014; Mari 2010). For further analyses of spatial pattern it is need to do apply further existing calculations and methodologies. Also, overlapping areas are not detected within the category of artificial surfaces; however, within the category of new agricultural and natural areas overlapping polygons may occur.

The strong differences of urban sprawl can be explained by the late integration of the idea of "compact city" (Artmann et al. 2019), as well as by a strong influence of municipal policy making. However, legislation has an important role to control and manage urban sprawl (Geneletti et al. 2017; Ewing 2008; Antrop 2004; Allen 2003), but in Hungary national guidance for a compact city structure in the regulatory framework was pronounced only after 2018 with the Act CXXXIX of 2018 on Land Use Framework Plan of Hungary and Priority Areas. Our work draws attention to the importance of legislation both at the national and the regional levels. At the regional level, there is a relative freedom of municipalities, and they are able to influence the nature of urban sprawl with several assets, like the identification and infrastructural development of areas for urban living or industry, or long term strategic planning through land use plans (Iváncsics and Filepné Kovács 2019a; Egyedné Gergely 2014; Ricz et al. 2009). In the majority of the analysed city's strategies there is the objective of compact city development. However, these assets are just for the administrative area of the core town, they are missing from the regional perspective, due to the relatively weak role of counties or other regional public bodies.

7 ábra/Fig. 7: A központi városok területén az új felszínek elhelyezkedése 1990–2018 / *Spatial distribution of new artificial surfaces in central towns between 1990–2018*





8. ábra/Fig. 8: Az FVT-k területén az új mesterséges felszínek elhelyezkedése 1990-2018 / *Spatial distribution of new artificial surfaces in different FUAs between 1990–2018*

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ÖSSZEFOGLALÓ

A VÁROSI NÖVEKEDÉS TRENDJEI ÉS MORFOLÓGIÁJA MAGYARORSZÁGI KÖZÉPVÁROSOK VONZÁSKÖRZETÉBEN 1990 ÉS 2018 KÖZÖTT

A magyar és közép európai régióban kiemelt kutatási terület a poszt-szocialista városfejlődés. Számos tanulmány látott már napvilágot, melyek különböző aspektusokból és időben vizsgálták a jelenséget, de az középvárosok vonzáskörzetében újonnan megjelent mesterséges felületek térbeli mintázatáról még nem jelent meg átfogó tanulmány. Az írás ezt a hiányt kívánja pótolni azzal, hogy 12 hazai középváros funkcionális városi területét (FVT) elemzi a Corine Felszínborítás Adatbázis segítségével (CLC CHA, 1990-2018).

Az új mesterséges területek elhelyezkedését vizsgáltuk a központi város és a többi FVT település vetületében, továbbá elemeztük Inostroza et al. (2013) által alkalmazott kategóriákat: kitöltő, tengelymenti és izolált növekedés.

Fő célunk a változások irányának feltárása volt. Amennyiben az adott terület a három fő kategórián belül maradt (Mesterséges, Mezőgazdasági és Természetes), a változást semlegesnek minősítettük. A városi szétterülés jellegzetességeinek feltárása érdekében a mesterséges felszínt 5 alkategóriára bontottuk: (i) lakóterület, (ii) ipari és logisztikai terület, (iii) közlekedés, (iv) bánya, (v) városi zöldterület.

Az új mesterséges felszín létrejöttének aránya egyenlőtlenül oszlik el az országban. A rendszerváltozás utáni időszakban jellemzően (1990–2000) a nyugati régiókban jött létre nagyobb arányban, majd a keleti térségek 2000 után csatlakoztak ehhez a trendhez elsősorban Nyíregyháza, Szeged és Debrecen FVT térségeivel. Bár több FVT térség elmaradt a domináns változásoktól (Békéscsaba, Kaposvár) az ország mindkét részéből.

Az új mesterséges felszín kategórián belül 1990 és 2018 között jelentős ipari területek jöttek létre Tatabánya, Nyíregyháza, Székesfehérvár és Kecskemét FVT területén, több mint 300 hektár terület átalakulásával. Az új közlekedési területek létrejöttében legjelentősebb változások Székesfehérvár, Szolnok, Debrecen, Dunaújváros, Nyíregyháza térségében tapasztalhatók. Új bányaterületek legnagyobb arányban Szeged, Szolnok, Székesfehérvár FVT térségében jöttek létre, több mint 200 hektár területtel. Legnagyobb arányban új lakóterületek (200 hektár felett) Nyíregyháza, Kecskemét, Szeged, Sopron (60%-a az új mesterséges felszínnek), Debrecen (42%) térségében jöttek létre. Új városi zöldterületek létrejötte nem jellemző a mesterséges felszínen belül. Kiemelkedő Veszprém FVT, ahol 111,6 hektár új zöldterület jött létre, de több FVT területén egyáltalán nem jött létre új zöldterület (Békéscsaba, Dunaújváros, Szolnok, Nyíregyháza, Kecskemét).

A vizsgált térségekben különböző adottságok jelennek meg limitáló tényezőként a városnövekedés területi dimenziójának formálására:

- Az országhatár az FVT kiterjedését is meghatározza. Ez kiemelten látványosan megjelenik Sopron esetében, de Szeged és Debrecen FVT is az országhatár mentén helyezkedik el.
- Domborzati, földrajzi adottságok mint például Duna (Tatabánya, Dunaújváros) vagy Tisza menti elhelyezkedés (Szeged, Szolnok) vagy hegy-, dombvidéki elhelyezkedés (Sopron, Kaposvár, Tatabánya, Veszprém), síksági helyzet (Szeged, Debrecen, Nyíregyháza, Szolnok, Békéscsaba) egyaránt meghatározzák a fejlődés térbeli kereteit.
- A különböző helyi adottságokat, mint településszerkezet, hagyományos tájszerkezet, a közlekedési hálózat elhelyezkedése egyaránt fontos figyelembe venni (Cieslak et al. 2019).

Az új mesterséges felszín területek elhelyezkedése a központi város és vonzáskörzete között rávílágít a városnövekedés centralizált vagy szórt jellegére (FVT a központi város nélkül). A vizsgált területeket három csoportba tudjuk sorolni:

- Az új mesterséges felszín területek a központi város közigazgatási területéhez kapcsolódva jöttek létre: Békéscsaba, Kaposvár, Kecskemét
- Az új mesterséges felszín területek az FVT településein szórtan jelentek meg: Dunaújváros, Szeged, Székesfehérvár, Szolnok, Tatabánya, Veszprém
- Kiegyensúlyozott, mindkét jelenség erős: Debrecen, Nyíregyháza, Sopron.

A földrajzi adottságok következtében láthatunk jelentősebb különbségeket a beépített területek növekedésében. Általánosan jellemző, hogy az új lakóterületek jellemzően a meglévő lakóterületekhez kapcsolódóan épülnek ki. Továbbá jellegzetes fejlődési gócpontokat láthatunk például Kecskeméten az új autógyár. Az autópályák mint fejlődési tengely vagy a Duna vonala mint fejlődési gát Dunaújváros, Nyíregyháza, Székesfehérvár vagy Szeged FVT térségében. Székesfehérvár és Veszprém esetében, egy nyugat-keleti tengely meghatározó (M8 autópálya), míg Tatabánya térségében egy észak-déli tengely jellemző az M1 autópálya hatására.

Összegezve láthattuk, hogy a városi szétterülés mértéke jelentős regionális különbségeket mutat hazánkban, különböző hullámokban érte el a vizsgált FVT-ket. A városi szétterülés formáját számtalan sajátos földrajzi tényező, hagyományos településszerkezet befolyásolhatja.

SYSTEM OF LANDSCAPE-LEVEL COOPERATION THROUGH THE EXAMPLE OF FRENCH NATURAL PARKS

TÁJSZINTŰ EGYÜTTMŰKÖDÉSEK RENDSZERE A FRANCIA NATÚRPARKOK PÉLDÁJÁN

SZERZŐ/*BY:*
DR. SZILVÁCSKU ZSOLT

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the frameworks of use of the concept by reviewing some of the specific features of the French natural parks.

The functioning of French natural parks differs in many ways from those in German-speaking (Austrian, German, Swiss) countries, which are better known in Hungary. The overview of French experiences, the transfer and adaptation to the Hungarian conditions of knowledge accumulated in France has not yet taken place, similar to many other professional areas where, typically, we rather turn our attention to the German or, possibly, Anglo-Saxon countries.

INTRODUCTION

More than 50 years have passed since the creation of the first French Natural Park. One of the biggest tasks for the growing number of Natural Parks present in Hungary is to be the sustainable and resilient regional examples and guidelines of life in a way that they respond to the environmental, social and economic challenges of our time. The notion of landscape-level cooperation first appeared in the document titled „Professional concept of Hungarian Natural Parks", approved by the Ministry for Rural Development in 2014 and prepared, besides other actors, by the Hungarian Natural Park Association. Act LIII of 1996 on nature conservation in Hungary, which was amended in 2018 and came into effect in February 2019, specifies the renewed definition of natural parks as cooperation. The concept of landscape-level cooperation is becoming more and more common also in Hungary and it is reflected, besides others in the increasing number of studies and researches in the subject matter which try to find the correct definition of this phenomenon (Szilvácsku Zs., 2012, Korom A., 2014, Dancsokné F. E., 2020). A lot of work has to be done to find the most adequate definition and establish the right regulatory framework and the basis of these can be the research activities benefiting from the examples and experiences of landscape-level cooperation already functioning or being in the pipeline. I would like to contribute to the definition and

GENERAL CHARACTERISTICS, OBJECTIVES AND LOCATION OF FRENCH NATURAL PARKS

In France, the regional natural park (parc naturel régional) is a rural area which is acknowledged nationwide based on its valuable local heritage and landscape, its sensitive territorial characteristics and networks of cooperation. The objectives of regional natural parks, in a highly complex and integrated approach are the following:

① protection, valorisation (recognition and appreciation of its value) and presentation of the natural resources, landscapes, human resources and cultural heritage of the area,
② realisation and enforcement of innovative and environment-friendly policies and guidelines in the area of spatial planning, economic, social and cultural development,
③ regional natural parks provide education and information, and promote the combination and development of modern and traditional solutions and the elaboration of innovative solutions on the one hand
④ are the highlighted areas of recreation, recharging, leisure-time activities and catering and
⑤ for the realisation of all these, provide coordination activities promoting landscape-level cooperation on the other hand.

Mission of French regional natural parks: ① foster, protect, safeguard, defend and patronise the common cultural and natural heritage (patrimoine), ② contribute to the development of local community life, ③ promote active economic life through the enforcement and practical implementation of sustainability, ④ merger traditional (slow, local, traditional) and most recent (fast, global, technology change) knowledge, test new solutions and implement innovative initiatives under the aegis of sustainability.

The first park: 1968.
The last park: 2019.
Umbrella organisation: French Association of Regional Natural Parks (Fédération des parcs naturels régionaux de France), founded in 1971

Number and names of parks:
54 regional natural parks
(parc naturel régional)

Their area total: approx. 90,000 km²
= roughly 15% of the territory of France

Size of the parks: approx.
between 500 km² and 6,500 km²

Altogether, 4 100 000 people live on the territory of the 54 regional natural parks already created in France and

about 400 000 enterprises (including approx. 90 000 agricultural enterprises) can be found in these parks.

The total operational **basic costs** of these regional natural parks was – on an average - 1.4 million euro per park in 2018 (at that time, there were 52 natural parks). The regions contributed to this amount, on an average with 45%, the other member organisations [counties, cities and villages, and Public Establishments for Inter-Municipal Cooperation (EPCI)] with 28%, the government with 10% (in the first place, the Ministry for Environment), the EU subsidies with 4% and other funds with 13%. In addition to this operational budget, there is also a **development budget** dedicated to the natural parks, but the amount of this budget greatly varies by parks.

PROCESS AND ASPECTS OF THE ESTABLISHMENT OF FRENCH NATURAL PARKS

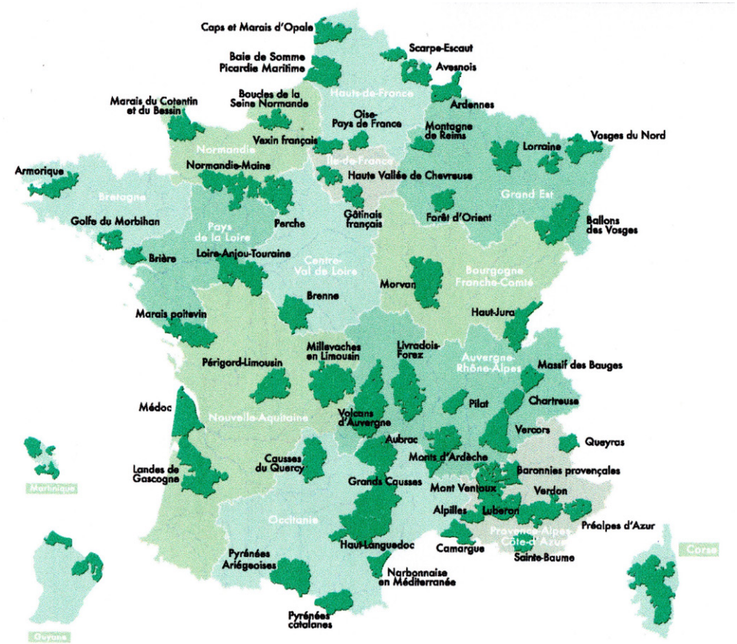
Regional natural parks are based on comprehensive and sustainable development plans (la charte paysagere, namely landscape charter) to protect and support their resources.

Regional natural parks can be designated, based on the decree of the French prime minister and with due consideration to the report of the Ministry for Environment on a given area. The designation is valid for a renewable period of 12 years. In the first phase, the participants of local initiatives, the region(s), the settlements, the private and business organisations prepare an establishing or basic study based on which decision is made on the establishment of the natural park. New initiatives on natural parks have to comply with three basic groups of criteria:

- **Quality and characteristics of the landscape and regional heritage**
  This category also includes the specific and dominant characteristics of the landscape and the region and their significance from national and international perspective, together with the identity-shaping force of the landscape and the region. The term heritage includes the elements of natural values, systems, modes of using the landscape, landscape character, social and cultural heritage and built heritage.
- **Design quality of the preliminary or establishing study**
  Quality and connections of fact-finding and the planned measures, the circle of involved and cooperating organisations and the strength, quality and characteristic features of the connection among them.
- **Organisational capacity guaranteeing operation and the implementation of the plan**
  Connection between and among the different types of organisations, ensure the personnel and financial conditions, capability and quality of managing alliance-level cooperation.

1

Fig. 1: The French regional natural parks (2020) (SOURCE: HTTPS://WWW.PARCS-NATURELS-REGIONAUX.FR)



The content of landscape charter is based on the initial examination of the territory of the potential natural park, namely on the establishing study.[1] The charter contains the following:

- protection and development plan of the territory of the future natural park for the forthcoming fifteen years and the rules and decrees prescribed by the affected parties, stakeholders for the implementation of the plan
- a map, showing the different applicable approaches in the function of the different territories of the natural park
- the managing authority
- the natural park trademark, including the logo and the name of the natural park, registered by the government at the French Institute of Intellectual Property (INPI).

Different documents have to be attached to the charter in the application for classification: a three-year action plan, the related operational budget, the organisational chart of the natural park, the hierarchical structure among the municipalities, etc.

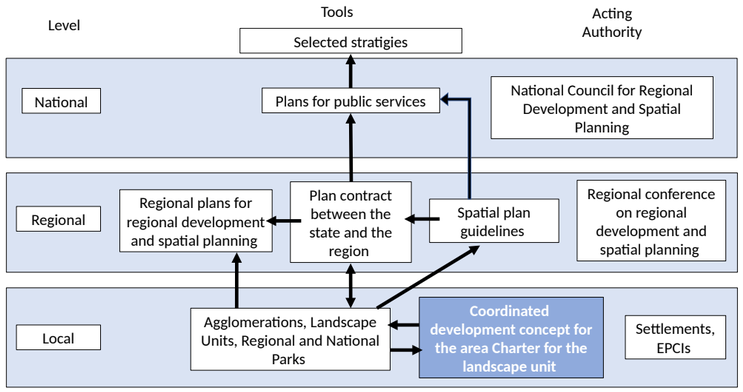
OPERATIONAL CHARACTERISTICS OF THE FRENCH NATURAL PARKS

The operation of French natural parks is defined by the landscape charter prepared with the involvement of several actors for the given natural park. The charter is a contract formalising the 12-year protection and development plan of the park. The charter specifies the objectives to be achieved, the strategy

1 The initial or establishing study contains the analysis of the challenges related to local heritage and the socio-economic situation. If the landscape charter is revised in order to renew the classification of a park, the revision and supervision evaluates the enforcement of the previous charter and the development of the territory on the basis of the initial study.

2

Fig. 2: System of French cooperation (SOURCE: BRINBAUM D. ET AL. (ED.), 2002., NOUVEAU CADRE LÉGISLATIF ET DISPOSITIF D'ACCOMPAGNEMENT DU DÉVELOPPEMENT LOCAL, CHAMBRES D'AGRICULTURE, NO.911. P. 14. ÉS KOROM 2008)



to protect, popularise and develop the park, together with the measures to be implemented. The charter facilitates consistent coordination among the measures taken by the different authorities on the territory of the park, and provides a framework for cooperation and development realised by the government, the entrepreneurs and civil entities.

The charter also manifests and represents the obligation undertaken by all the signatory organisations – cities and villages, EPCIs[2] (*établissement public de coopération intercommunale- Public Establishment for Inter-Municipal Cooperation* – the most commonly opted form of inter-municipal cooperation), the affected counties and regions – and the government approving thereof with a government decree. Otherwise, the obligations undertaken by the government are also included in the charter.

The regional natural park is managed by the association of those organisations which approved the charter of the regional natural park. During the implementation of the charter, the regional natural parks rely on the expertise of local authorities and promote cooperation among the stakeholders to realise the local nature conservation and sustainability initiatives. This way, they also contribute to the birth of exemplary innovative actions. The experiences gained by the natural parks can be beneficial also for other French and foreign regions. One of their most important characteristics is that they are obliged to evaluate their efforts jointly, giving each other this way a feedback about the influence of their activities on each other and the landscape.

The activities of regional natural parks cover a wide range of initiatives undertaken by the organisations approving the charter in the function of their field of expertise: socio-professional organisations (associations, farmers, producers, etc.) by means of partnership agreements; the government in the area of land use and regulations; the managing authority of the natural park and their multi-disciplinary technical team.

The process of drafting the charter and establishing the natural park is initiated by the regional councils. The region specifies the size of the territory of the park and entrusts a local association to prepare the draft of the charter with the involvement of all the stakeholders. Once the charter is signed by the local authorities, organisations, the EPCIs and the counties concerned, it is validated by the regional council(s) which submit(s) it, through the prefecture of the region to the Ministry for Environment, officially applying this way for the classification of the area as regional natural park.

2 EPCI – it is the most common institutional form of cooperation among the municipalities. The charter is approved by the cities, villages and the EPCIs to classify the area in order to assure that coherent decisions and measures are taken and realised in the future.

OBLIGATIONS OF THE SIGNATORIES TO THE CHARTER

According to Article L333-1 of the French Environmental Code:

- Public authorities, regions, counties, cities and villages and EPCIs[3] signing the charter are required to comply with and follow the approaches and measures presented in the charter while exercising their jurisdiction and power. In particular, the town planning documents of the local bodies have to comply with the requirements of the charter,[4] otherwise those will be revised.
- In addition, partners (for example, socio-professional organisations, "gateway-cities", etc.) can also be asked to approve the charter in order to fulfil the charter's objectives. The participation of the partners is regulated in agreements.
- The government, through its regional and county-level services and public institutions is also required to comply with the provisions of the charter.

If these commitments are not fulfilled, appeal for legal remedy can be submitted to the relevant administrative court.

TYPICAL ACTIVITIES OF NATURAL PARKS

For the purpose to implement the charter, the regional natural park relies on the expertise of local authorities and organisations and pr omotes interaction, cooperation among the stakeholders and fulfils coordination tasks in order to implement the local nature conservation and sustainable development initiatives. In addition, it carries out exemplary and innovative actions, conducts research and promotes the introduction of environmentally beneficial solutions.

The experiences of French regional natural parks are precedential also for other French or foreign regions. One of the characteristic features of the parks, worthy to mention is that it is obligatory for them to regularly evaluate their implemented measures in terms of their efficiency and results.

3 Municipal cooperation with own tax system.
4 See, the French settlement planning code (L 122-1-12, L 123-1-9 and L 124-2)

3

Fig. 3: The map in the charter of Luberon Regional Natural Park shows the "small-landscape" level cooperation

The measures of the regional natural parks cover a wide range of activities:

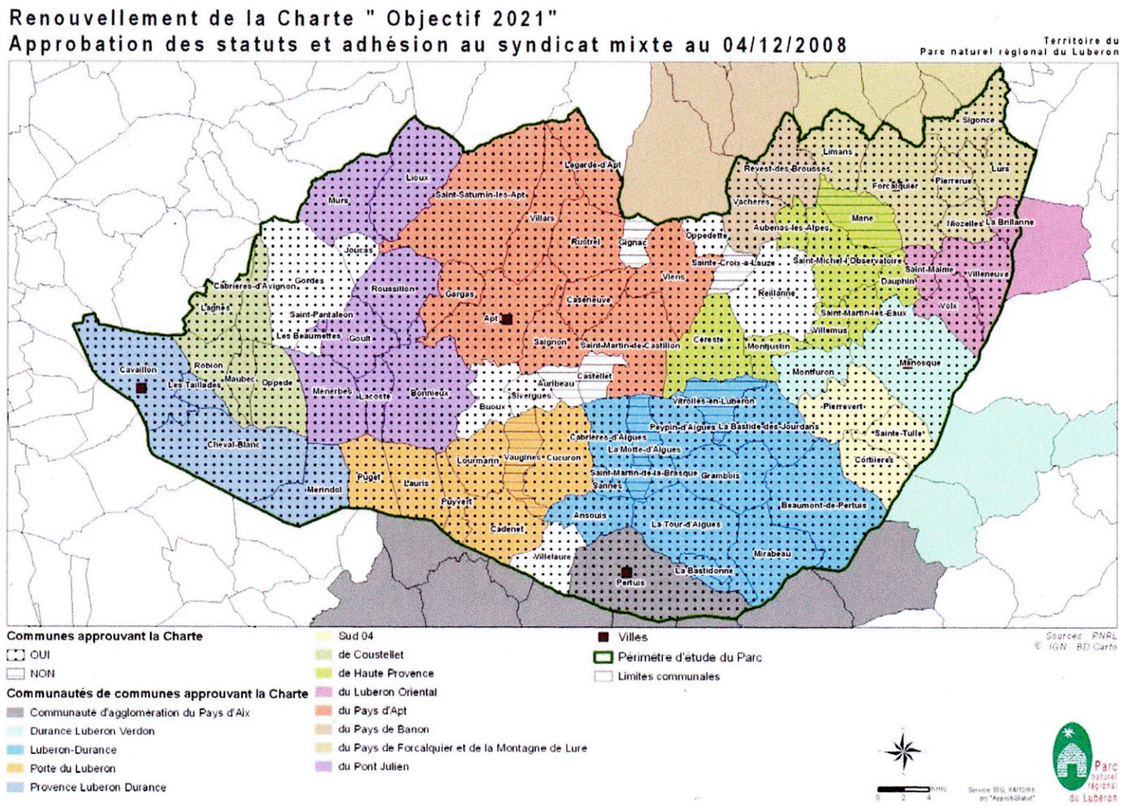
- measures of the authorities approving the charter: depending on their area of expertise, these measures may include the activities related to urban planning, local heritage, tourism and water quality,
- activities of socio-professional organisations (associations, farmers, producers, etc.) executed through partnership agreements (popularisation of local heritage, raising awareness on environment and sustainable development, promotion of measures regarding sustainable tourism and agro-environment, etc.),
- measures introduced on land-use and in the area of regulations,
- activities of the managing authority of the park, in particular that of the multi-disciplinary technical team.

The activities of the regional natural park are performed in conformity with the project specified by the charter and the challenges represented by the territory.

ORGANISATIONAL STRUCTURE OF REGIONAL NATURAL PARKS

The measures introduced by the regional natural park are defined and executed by the managing authority of the park in compliance with the charter. In legal terms, this managing authority is an association or rather an alliance gathering the representatives of the affected French region(s) and counties and those of other cities and villages approving the charter. The managing authority may include inter-municipal organisations and gateway cities as well.

The main objective of the managing authority is to cooperate, as close as possible with the local partners through working committees and consultative bodies which facilitate for the representatives of the associations, socio-economic partners and public bodies to cooperate with each other in the definition and implementation of the action plan of the park. It is the responsibility of a scientific committee to provide information, based on its expertise for the managing authority. For the purpose to elaborate and implement the programmes, the managing authority of the natural park hires a director and a permanent working group with about thirty staff members on an average. Their task is to implement the charter, give ideas and lead actions under the direct control of the managing authority or the partnership of the park. The members of the group are highly skilled in managing and planning environmental protection and land use, economic and tourism development, popularisation of local heritage and culture and provision of information and training for the general public. In general, these collaborators are either civilian employees or contractual employees of the region.



The government establishes the regional natural parks based on the proposal of the regions and then provides financial support for the operation of the park and the execution of the measures of the park. Following the revision of the charter the Ministry for Environment asks the French prime minister to classify, in a ministerial decree, the area a natural park. The government possesses the "regional natural park" trademark registered by the French Institute of Intellectual Property (INPI). Prior to the classification of the natural park, also the other ministries concerned are called upon to express their opinion to the Ministry for Environment. In addition, the government contributes to financing the regional natural park by covering 10% of its operational costs and its facilities. The subsidy provided by the Ministry for Environment can be used within the framework of the agreements (especially the "park agreements" and the special programmes, like Natura 2000 and the nature conservation areas) concluded between the government and the regions.

Each associated ministry may contribute to the funding of the regional natural parks under agreements or contracts specified in the application of the agreements concluded between the government and the regions. The charter of the natural park sets out the involvement of the government in implementing the plan in the area. In the event the government's intervention is highly inconsistent in the area of the natural park, the Ministry

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Pict. 1: Natural park settlement Cordes acknowledged with several awards (Parc naturel régional du Luberon)

for Environment may request an inter-ministerial reconciliation procedure.

RELATIONSHIP BETWEEN THE REGIONAL NATURAL PARKS AND THE MUNICIPAL STRUCTURES COVERING THEIR TERRITORY

Nowadays, some park areas overlap with the inter-municipal structures, namely with the so-called EPCIs,[5] which have their own tax system and authority in spatial planning, spatial development, environmental protection, etc. These structures can be incorporated in part or in full into the operation of the park. For example, they are involved in drafting the natural park charter and the approval of its content.

In fact, these EPCIs, which are required to abide by the signed charter, are key players in implementing the policies and guidelines of the natural park. They are also required to comply with the charter adopted by them. According to its statutes, they can be members of the managing authority of the natural park and based on agreement, they can also participate in the implementation of the charter. In the case of urban communities, in addition to the requirement for town planning documents to be compatible with the natural park charter, the municipal body may extend its cooperation with the natural park to various topics of action, including environmental education, ecological programmes, tourism and short supply chain of agricultural products.

***5** Public institutions of inter-municipal cooperation among villages, cities and urban agglomerations.*

ROLE OF SOCIO-ECONOMIC PARTNERS IN THE REGIONAL NATURAL PARKS

The socio-economic partners of the regional natural parks are local drivers, who can be:

- experts, professionals or rather their representatives (for example, partners delegated by the chambers of commerce or the trade union)
- various organisations and bodies that manage certain areas or facilities of the natural park .

These partners take part in the drafting of the charter and are also involved in the operation and action plans of the natural park. The advisors[6] act as representatives of the natural park in the working committees of the park and also when they perform special activities in the field. The partners can contribute to the implementation of the project of the natural park through their own activities.

Finally, the natural park cooperates with the local associations encouraging them to form groups along the lines of their scope of interest or within an ad hoc body often referred to as "Association of the Friends and Visitors of the Natural Park" („Association des amis et users du Parc").

RELATIONSHIP BETWEEN THE FRENCH NATURAL PARKS AND THE NEIGHBOURING CITIES, GATEWAY CITIES

The gateway city, should it be a city or an urban agglomeration is located on the periphery of the regional natural park. The regional natural parks have always maintained a privileged relationship with the neighbouring inhabitants, hosting the students of local schools, providing touristic information, increasing awareness of the local population, organising trainings and cultural activities, etc. Some gateway cities are members of the managing authority of the natural park and also

***6** Some of the bodies managing regional natural parks are "extended" associations, which – based on their own consideration – also involve public institutions, like chambers of commerce, the French National Office of Forestry and the French National Office of Hunting in addition to the government authorities.*

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Pict. 2: The Lavender Museum, established from own funding, is a good example for the cooperation among the farmers (Parc naturel régional du Luberon)

Pict 3: Green areas and village border in Cordes

provide funding. In the latter case, their cooperation is set out in the charter. Others are connected to the natural park through partnership agreements.

The relationship between the natural park and the gateway cities is based on geographical, social and economic complementarity and illustrates urban-rural cohesion.

The provisions of the natural park charter do not apply to the villages, cities and EPCIs located outside of the park's territory. However, the natural park may, from time to time cooperate with the peripheral villages, towns or EPCIs to encourage local measures and actions necessary to maintain the quality of its area. Such activities include the maintenance of rivers, management of special areas of nature, the local development plan, improvement of housing, water management, and so on. Over time, these partnerships can turn into agreements.

CONSEQUENCES OF NATURAL PARKS ON THE PARTICIPATING AND NEIGHBOURING SETTLEMENTS

By becoming part of the regional natural park, the cities, villages and EPCIs freely abide by the rules and limitations discussed by the parties and contribute to the implementation of the plan while exercising their powers.

The policies and guidelines of the natural park are executed by the related cities, villages and EPCIs, with particular emphasis on their town planning strategy and scheme, rules on forestation, municipal law, and approach to planning and development. In addition, the natural parks assist the communities in implementing the regulations on advertising and car traffic in natural areas through the application of the provisions of the charter (see, the Environmental Code).

In return, the cities, villages and EPCIs of the regional natural park will be in beneficial position in the following areas, besides others:

- participation in collective projects utilising local heritage and the environment
- increased participation in land use and nature conservation planning executed by the government or other public bodies operating in the territory of the park
- possibility to use the "Regional Natural Park" trademark which is acknowledged nationwide
- a multi-disciplinary team providing assistance to implement the initiatives through the enforcement of the natural park charter
- additional subsidies for developments or programmes entitled to special support from the regions, counties, government and the European Union in compliance with the natural park charter.

CHARACTERISTICS OF FINANCING THE FRENCH NATURAL PARKS

Each regional natural park has a separate budget to cover the operational and investment costs. The operational budget is financed, in the first place by the association managing the park. Additional budget support is provided by the Ministry for Environment as well as from occasional operating subsidies from various sources. The activities and facilities of the regional natural parks are funded in various proportion ratios in the first place by the local authorities, occasionally from different European programmes and/or from contributions provided by the government and public bodies.

According to the natural park charter, these subventions or funding may originate from agreements concluded as part of the "local development" element of the government or regional plans. These agreements may receive additional financial support also from the "regional development" element of the agreements on government or regional plans, in particular for the assessment and engineering tasks of the natural park. Private businesses and individuals can also help the natural parks with financial support provided for the parks' activities.

Each regional natural park has an operational budget and an investment budget which comply with the accounting principles of the local authorities. The operational budget is financed, in the first place by the association managing the park. Additional budget support is provided by the Ministry for Environment as well as from occasional operating subsidies from various sources.

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4 5

Pict 4: Landscape-level cooperation among the farmers-traders-caterers-buyers is a basic feature of the operation of French natural parks

Pict 5: The market of the settlements is not only a place to buy things but it is much more a meeting point

According to the natural park charter, these subventions may originate from agreements concluded as part of the "local development" element of the government or regional plans. These agreements may receive additional financial support also from the "regional development" element of the agreements on government or regional plans, in particular for the assessment and engineering tasks of the natural park. Private businesses and individuals can also help the natural parks with financial support provided for fulfilment of the parks' mission.

Private businesses and individuals can also support the regional natural parks by financing the activities targeting the conservation and improvement of cultural heritage, through providing information about sustainable development and raising awareness, improvement of the living environment, boosting cultural life, etc. These associations, companies and private individuals are eligible for tax exemption on their financial support through the "French Regional Natural Park" fund established in 2012. Common values guiding the relationship between the sponsors and the parks are defined in the Ethical Charter of Sponsors.

DEVELOPMENT TRENDS OF FRENCH NATURAL PARKS

Fifty years after their establishment, the French regional natural parks continue to be modern tools combining biodiversity and the challenges of development in rural regions. In the future, the most fundamental building blocks of natural parks will be sustainability of energy management, quality of life and health of the parks' communities, high-quality food produced on the land of the parks, and new development models created with the involvement of the inhabitants. With the help of all these, the natural parks can create, in accordance with their slogan "a new way of life" ("Une autre vie s'invente ici"). Nowadays they consider, more than ever before, biodiversity and preservation of waters one of the fundamental factors of their economic and social development.

Revising the charter of the individual regional natural park offers an important opportunity for development. The revision has to analyse the implementation of the charter's strategy, the extent the stakeholders – partners of public authorities and the government – met their obligations and how much the set objectives were realised. In the course of the revision, the development of the area and the effects of implementing the charter have to be taken into account. At national level, the Association of French Regional Natural Parks and the Ministry for Environment prepare the methodology on the permanent revision of the implementation of the charter and provide the necessary tools for revision (for example, software, training and publications).

At the end of 2010, the Association set up the research team dealing with the future of natural parks. This working group gathered all the parks, regions, national organisations and bodies dealing with environmental, social and economic issues, together with the French Strategic, Research and Prospect Council. The research centre defined, without questioning the five fundamental roles of the natural parks, the new objectives and goals of the natural parks responding to present and future challenges of their area:

- coordination of the different public policies in their area
- promotion of sharing innovation and best practises
- forecasting changes and adaptation
- promotion of social structure and cohesion
- participation in environmental challenges and in the transformation of energy production and use (transition)

These important initiatives, consultations and discussions made and make it possible to introduce changes in the regulations and decrees on natural parks as well.

Expectedly, the number of French natural parks will continue to increase. The annual number of applications submitted for potential regional natural park classification is a clear proof of the interest on the part of the regions and local authorities in this system. However, since regional parks, by definition are special areas their number cannot be increased without limitation. It is the responsibility of the Regional Councils to propose the areas which they consider, based on the areas' regional heritage the most representative and in which cases they acknowledge that awarding the "regional natural park" classification is a national interest. Furthermore, it is the task of the Ministry for Environment to assure the specific character of the policies and guidelines of the regional natural parks, based on the

opinion of the French Nature Conservation Council and the French Association of Regional Natural Parks.

The richness and authenticity of regional natural parks is assured by the level of requirements specified by the public authorities (during the examination of an area and the development of a project) and the Ministry for Environment (when granting and maintaining the classification).

The regional natural parks are clear and tangible examples for firm and voluntary environmental and sustainable development policies. The objective of the parks is to disclose their approaches and concrete measures (in the form of publications, seminars, meetings, resource centres, etc.) so that other areas in France and abroad gain inspiration from their experiences.

The original "French Natural Park" (Natural Park à la Française" formula:

- implements development policies which are really sustainable (focus on life and human beings) in the inhabited but sensitive areas
- guided by local initiatives and cooperation and involves the local, regional and government stakeholders
- it is based on an agreement with legal effect and ethical, moral content – the charter – and several countries are interested in its adaptation.

The individual regional nature parks and also the French Association of Regional Natural Parks are more and more frequently asked to share their experiences not only in France but abroad as well.[7] The parks can enrich their experiences also through this type of cooperation.

CLOSING IDEAS ON ADAPTATION IN HUNGARY AND THE NEXT STEPS

Regarding the adaptation in Hungary, French experiences and the possibilities to adapt them in Hungary offer a good chance for development concerning the natural park system of Hungarian landscape-level cooperation in the following areas:

- Creation of the framework for natural park organisations, with special emphasis on the development of cooperation culture among the different administrative actors and the natural parks on the one hand and within the nature park cooperation on the other hand and the regulations applicable for this cooperation.
- Adaptation in Hungary of solutions and French experiences promoting the valorisation, acknowledgement and revitalisation of rural landscapes and the heritage of communities (patrimoine).
- Examining the opportunities offered by the natural park charter and its introduction in sample/test areas, using Hungarian and EU funding, with special emphasis on the development of frameworks facilitating financial support and synergic development of rural areas and landscape-level cooperation.
- Examination of the experiences and possibilities for application of the natural park trademark and elaboration of the possibilities and solutions for its introduction.

7 In addition to the fact that some of the natural parks have been acknowledged by different international organisations (for example, UNESCO or RAMSAR), the vast majority of the parks also participate in European or international cooperation as well with about 30 countries. This type of cooperation can take different forms: cross-border activities, technical and methodological training within the framework of decentralised policies implemented by the regions, and mutual actions to support and promote the development of similar approaches in other countries (Brasilia, Chile, Uruguay, Morocco, Benin, Vietnam etc.).

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ÖSSZEFOGLALÓ

TÁJSZINTŰ EGYÜTTMŰKÖDÉSEK RENDSZERE A FRANCIA NATÚRPARKOK PÉLDÁJÁN

Több mint 50 év telt el az első francia natúrpark megalakulása óta. Hazánkban is egyre gyarapodó számban jelenlévő natúrparkok előtt az egyik legnagyobb feladat, hogy napjaink környezeti, társadalmi és gazdasági kihívásaira választ adó módon, az élet fenntartható és reziliens térségi, példái, útmutatói legyenek. A tájszintű együttműködések fogalma először „A magyarországi natúrparkok szakmai koncepciója" (2014, Vidékfejlesztési Minisztérium) című dokumentumban jelenik meg. A megfelelő megfogalmazáshoz és szabályozási keretek meghatározásához még sok munkára van szükség, amely alapját a már működő és formálódó tájszintű együttműködések példáit, tapasztalatait feldolgozó kutatások képezhetik. A fogalom meghatározásához, használatának kereteihez és a szabályozás megalapozásához kívánok hozzájárulni a francia natúrparkok egyes sajátosságainak áttekintésével.

Franciaországban a regionális natúrpark (parc naturel régional) olyan vidéki térség, amelyet országosan elismernek értékes helyi öröksége és tájképe, valamint érzékeny területi jellege és együttműködési hálózata alapján. A regionális natúrpark célja rendkívül komplex és integrált megközelítést tükrözve ① a terület természeti erőforrásainak, tájainak, emberi erőforrásainak és kulturális örökségének védelme és valorizációja (értékességének fel- és elismertetése), bemutatása,
② innovatív és környezetbarát területrendezési, gazdasági, társadalmi és kulturális fejlesztési irányelvek megvalósítása, érvényesítése.
③ a regionális natúrparkok oktatást és információt nyújtanak, és ösztönzik az újszerű és hagyományos megoldások ötvözését, fejlesztését, innovatív megoldások kidolgozását, másrészt
④ a kikapcsolódás, feltöltődés, rekreáció és vendéglátás kiemelt területei és
⑤ mindezek megvalósítása érdekében tájszintű együttműködést segítő koordinációs feladatok ellátása.

A francia regionális natúrparkok küldetése: ① a közös kulturális és természeti örökség megóvása és gyarapítása, ② hozzájárulás a helyi közösségek életének kibontakozásához, ③ az aktív gazdasági élet elősegítése a fenntarthatóság érvényesítésével, gyakorlati megvalósításával, ④ a hagyományos és a legújabb tudás ötvözése, új megoldások tesztelése és innovatív kezdeményezések megvalósítása a fenntarthatóság jegyében.

HOW CAN THE UN SUSTAINABLE DEVELOPMENT GOALS, SPECIFICALLY A CORRECT ENERGY POLICY, HELP THE SUCCESS OF A SMALL REGION?

HOGYAN SEGÍTHETIK-E AZ ENSZ FENNTARTHATÓ FEJLŐDÉSI CÉLJAI, KÜLÖNÖSEN A MEGFELELŐ ENERGIA POLITIKA EGY KISTÉRSÉG SIKERESSÉ VÁLÁSÁT?

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ABSTRACT

The biggest challenges of the 21st century in Europe in rural areas are environmental change (climate change) and social change (ageing, depopulation). In our research, the correlation between success and sustainability was examined, as well as their connection to the energy policy of a settlement. Detailed analyses were conducted in the sample area, Alsómocsolád, looking at success, sustainability, as well as energy use. It was concluded that there can be no direct connection drawn between success and sustainability, as they often require opposite attitudes from settlements. However, the correct energy policy can serve as a link, and potentially the right foundation for small settlements in the countryside.

INTRODUCTION: CHANGES IN THE RURAL POPULATION, THE SITUATION OF SETTLEMENTS

Before the World Wars, the vast majority of the Hungarian rural population lived off agriculture in extremely difficult conditions, the main reasons for which were the underdevelopment of the large estate system and industry (Andorka 1979).

The era of socialism meant a major change, with council law, collectivizing agricultural policy, and vigorous industrialization resulting in significant social change and exacerbating territorial disparities. Together, the processes induced significant social changes, population movements (commuting, migration) started in the direction of agglomerations and developed industrial areas in the northern part of the country, and aging and depopulation became more characteristic in disadvantaged settlements (Beluszky 2007).

Following the change of regime, the Local Government Act of 1990 meant a completely new legal status for many settlements, and each (municipal) local government was granted full settlement independence. With the development of the market economy, the competition of the settlements also intensified, "the villages entered the free market of the settlements" (Beluszky 2007).

As a result of the settlement network and the urbanization of society, the emigration of young people to cities has intensified, the population of rural villages has decreased, and society has aged (G. Fekete 2015). In addition to the changing role of the villages, the social demands placed on them also changed, the “urbanization” of the villages, the expansion of the range of locally available services and the improvement of their quality became basic expectations. At the same time, in the age of digitalization, the village is seen as the opposite of the accelerated urban way of life, and the calm living environment and the “rural” way of life are becoming more and more important (Henkel 2012).

SUSTAINABLE DEVELOPMENT GOALS (SDGS) AND RURAL DEVELOPMENT

The United Nations addressed environmental protection at the 1972 Stockholm Conference the very first time when 2,850 participants from 113 member countries gathered to work together (UN 1973). After decades of work, the UN adopted the Millennium Development Goals (MDGs) in 2000, which ran until 2015. The Rio + 20 Conference concluded the Sustainable Development Goals (SDGs) Agreement in 2012, followed by several years of preparatory work, leading to the completion of the Framework of SDGs with 17 goals and 169 subgoals, adopted by 193 countries in New York in September 2015. (KSH 2019).

SDGs are more ambitious than MDGs and, for the first time, recognize the prominent role of civil society organizations (Corella 2020).

It is important to emphasize that goals are interlinked and cannot be achieved in isolation as synergies and tradeoffs occur among the different targets (Lusseau-Mancini 2018).

SDGs can be of great importance for rural development, as the Framework Convention repeatedly emphasizes that the global goals can only be achieved with local results, in as small territorial units as possible, with the widest possible involvement of society. Although governments have taken responsibility for creating the tools for SDG localization, little progress has been made so far. In 2018, a research presented at the High Level Political Forum examined 51 international microregions in more than 30 countries, and less than 10% of the research participants received government assistance to adopt SDGs, while small regions began to align their strategies with SDGs as bottom-up initiatives (NRG4SD 2018).

Barabási describes success not as an individual phenomenon but as a collective one, according to which “success is never about you, but not even about your performance. Success is about us and how we see

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Fig. 1: Alsómocsolád and its surroundings. (SOURCE: HTTPS://WWW.OPENSTREETMAP.ORG)

your performance." (Barabási 2018) However, settlement and regional research treated success as a much narrower area. In the past, economic considerations dominated the most

The social aspect of settlement success must not be forgotten either, Barabási emphasizes the importance of the local leader, which also determines the success of the "settlement enterprise" (Bódi-Böhm 2000). From a social point of view, in general, population attractiveness is a success factor (Szörényiné Kukorelli 2010), while from an economic point of view, competitiveness and local economic power are.

When examining the success factors, the Hungarian literature mostly turns to Enyedi's "successful city", among the success factors defined by him, the economic factors dominate, factors related to society and living standards are less emphasized (Enyedi 1997).

However, the key to the development and success of rural areas is not only innovation, but also sustainable development, a competitive rural space, a knowledge-based rural society, and the acceptance and settlement of the need for new functions (Szörényiné Kukorelli 2015). It seems important that although sustainable development is part of the list, most success research does not discuss environmental factors. According to Kurt Lewin, certain states of functioning organizations result from a balance of two forces: some forces promote change, and there are restraining forces. To determine equilibrium, it is often easier to reduce braking forces than to search for new driving forces (Veresné Somosi 2004). In many cases, municipalities see environmental factors as a disincentive, and therefore try to minimize the resulting disincentives (e.g. in the field of economic development) instead of exploiting their potential. However, the success of settlements is unthinkable without long-term sustainability. The European Economic and Social Committee (EESC) is also highlighting this issue, which they believe is important for the revitalization of Europe's rural areas and the dissemination and promotion of good practice. (Dassis, 2018).

Success and sustainable development can be linked, but the content and meaning of concepts change dynamically, as does the reality around us. We have already recognized that sustainability can only be achieved if we address all aspects of reality at the same time and make our decisions holistically.

The SDGs are a framework that, to the best of our knowledge, may be the most comprehensive planning tool for achieving and maintaining sustainability.

Achieving the SDGs requires a change of attitude in all areas of life - economy, society and environment. As energy based any acts happen in nature or human society based in energy change (Moran et al 2018), it is a fundamental sector that we have to analys in the terms of sustainability. In this research we analys the energy mix, which refers to the combination of the various primary energy sources used to meet energy needs in a given geographic region. (https://www.planete-energies.com/en/medias/close/what-energy-mix) The world's energy demand is growing, and energy supply and security of supply are essential to maintain and increase living standards (Vajda 2009). Energy production, energy supply and transport are responsible for almost 80% of greenhouse gas emissions in the European Union. Greenhouse gas emissions have changed between different economic sectors, but the leading role of emissions related to energy production and consumption (Figure 1) has remained unchanged since 1990, so addressing this will be a priority for sustainability.

SUCCESFULL REGIONS

Our intention was to examine the potential for realizing sustainable development goals in a region, which has multiple parts that can be considered successful. However, success can be manifold. Therefore, it is necessary to consider the definitions of success in literature about settlement areas.

Success used to be considered a narrow field in earlier studies about settlements and regions, taking into account primarily economic factors. When examining the success factors, the Hungarian literature mostly turns to Enyedi's "successful city", among the success factors defined by him, the economic factors dominate, factors related to society and living standards are less emphasized (Enyedi 1997). The social aspect of settlement success must not be forgotten either, Barabási emphasizes the importance of the local leader, which also determines the success of the "settlement enterprise" (Bódi-Böhm 2000). From a social point of view, in general, population attractiveness is a success factor (Szörényiné Kukorelli 2010), while from an economic point of view, competitiveness and local economic power are.

However, the key to the development and success of rural areas is not only innovation, but also sustainable development, a competitive rural space, a knowledge-based rural society, and the acceptance and settlement of the need for new functions (Szörényiné Kukorelli 2015). According to Kurt Lewin, certain states of functioning organizations result from a balance of two forces: some forces promote change, and there are restraining forces. To determine equilibrium, it is often easier to reduce braking forces than to search for new driving forces (Veresné Somosi 2004). In many cases, municipalities see environmental factors as a disincentive, and therefore try to minimize the resulting disincentives (e.g. in the field of economic development) instead of exploiting their potential. However, the success of

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Pict. 1: View of Alsómocsolád (FORRÁS/SOURCE: ALSÓMOCSOLÁD ÖNKORMÁNYZATA)

Pict. 2.: Harmony (FORRÁS/SOURCE: ALSÓMOCSOLÁD ÖNKORMÁNYZATA)

settlements is unthinkable without long-term sustainability. The European Economic and Social Committee (EESC) is also highlighting this issue, which they believe is important for the revitalization of Europe's rural areas and the dissemination and promotion of good practice. (Dassis 2018).

Success and sustainable development can be linked, but the content and meaning of concepts change dynamically, as does the reality around us. We have already recognized that sustainability can only be achieved if we address all aspects of reality at the same time and make our decisions holistically. The SDGs are a framework that, to the best of our knowledge, may be the most comprehensive planning tool for achieving and maintaining sustainability.

Success, however is not of individual nature, neither is it an internal value, as judgement is a necessary aspect of it. Barabási describes success not as an individual phenomenon but as a collective one, according to which “success is never about you, but not even about your performance. Success is about us and how we see your performance.” (Barabási 2018) However, settlement and regional research treated success as a much narrower area. In the past, economic considerations dominated the most

SAMPLE AREA SURVEYS

Taking into consideration the advice of Albert-László Barabási, we chose Alsómocsolád in Baranya County as the sample area, as this small settlement has proved to be “successful” in several respects in recent decades:

- In 2009, Alsómocsolád won the Youth-Friendly Local Government and the Elderly-Friendly Local Government awards,
- Also in 2009, it won first place of the Hungarian Village Renewal Award,
- It won the European Village Renewal Award in 2010 for "high-quality, sustainable, complex village development in line with the motto of the call", which corresponds to the shared 2nd place in the European competition.

Alsómocsolád was also at the forefront of the cooperation established with the local governments, economic actors, institutions and non-governmental organizations of Bikal, Mágocs, Mekényes and Nagyhajmás settlements in 2014, under the name of the Northern Hegyhát Micro-Regional Union. In the past year, they have become Hungary's first "Smart Region". Behind its successes lie significant, tangible achievements.

Its mayor has not changed since 1990, its population can be considered relatively stable (10% decrease since 2013: from 300 to 273). Several successful international and domestic tenders provided financial resources for the development of the settlement, during which several investments important from the point of view of sustainability were realized, e.g. organica type wastewater treatment plant operates in the settlement. In recent years, the developments have been mainly for tourism: the village house has been built, a youth camp has been set up (Conference Center, Service House, Health House, Planetarium and Plane Simulator, Youth Information Point, Forest Gymnasium, Educational Trail and Excursion Center, Multifunctional Festival Space) and they also took part in the launch of the Hét Patak Gyöngye Nature Park Association. The civil society is quite active, there are several associations and circles in the settlement (https://www.bama.hu/pr/vagy-talalunk-ott-utat-vagy-epitunk-egy-2162475/). To stop the decline of the population, a future-weaving program was launched, during which those wishing to move to the settlement are helped with a tender (http://menu.jovo-szovoalsomocsolad.hu/).

In 2009, Alsómocsolád won the Youth-Friendly Local Government and the Elderly-Friendly Local Government awards and the Hungarian Village Renewal Award, and won the European Village Renewal Award in 2010 for "high-quality, sustainable, complex village development in line with the motto of the call", which corresponds to the shared 2nd place in the European competition. Alsómocsolád was also at the forefront of the cooperation established with the local governments, economic actors, institutions and non-governmental organizations of Bikal, Mágocs, Mekényes and Nagyhajmás settlements in 2014, under the name of the Northern Hegyhát Micro-Regional Union. In the past year, they have become Hungary's first "Smart Region".

EXAMINATION OF SUCCESS INDICATORS IN ALSÓMOCSOLÁD

The results (successes) of Alsómocsolád are known nationally, the name and results of the village can be found at

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Pict. 3.: Welcome to Alsómocsolád (FORRÁS/SOURCE: ALSÓMOCSOLÁD ÖNKORMÁNYZATA)

Pict. 4: Spring in Alsómocsolád (FORRÁS/SOURCE: ALSÓMOCSOLÁD ÖNKORMÁNYZATA)

professional conferences and in the press. In addition to the titles and awards won, the success of the village is also shown by its position in the region,

Alsómocsolád and its neighbouring settlements ar elocated in one of the one of the most disadvantaged parts of Hungary, which is characterized by an ageing population and high unamployment. The majority of settlements have small population sizes and poor demographic indicators. The majority of their population works in agriculture. With assistance from the University of Pécs, the „Energy trail" („Energia ösvény") concept was realized in the Seven Creeks Nature Park, located in this region. This demonstrates the commitment of Alsómocsolád to sustainable energy. The state of villages within this region is not equal, the indicators of Alsómocsolád are significantly better compared to its similar neighbours. The comparison is based on the classification of beneficiary settlements and the system of conditions of Decree 105/2015 (IV.23.)[1] and the data of the local government cluster analysis prepared by the Ministry of the Interior in 2019 (Illésy-T. Nagy-Számadó 2019).

Examining the individual data, it can be stated that Alsómocsolád really stands out among the villages with similar endowments, its situation is more favourable from the economic, social and demographic point of view:

– The migration difference of Alsómocsolád is positive – 18.99 per thousand inhabitants – it has an order of magnitude better than the other settlements. (Moreover, in the case of Bikal, Mágocs and Szalatnak we speak of a migration loss).
– The proportion of buildings built in the last 5 years compared to the total housing stock in Alsómocsolád is 2.82%, which is a higher proportion than in other settlements, moreover, no new flats were built in other settlements during this period, except for Bikal and Mágocs.
– The number of registered jobseekers is the second lowest (6.02%) compared to the working-age population, with only fewer registered unemployed in Bikal.
– In Alsómocsolád, the proportion of dwellings connected to the public sewerage network is almost 60%, which is worse than the indicator of Mágocs and Szalatnak, but in the other three villages the sewerage network has not yet been built, so the value of the indicator is 0.

1 Pursuant to the provisions of Section 2 (1) of the Government Decree, a complex indicator formed from social and demographic, housing and living conditions, local economy and labour market, as well as infrastructure and environmental indicators (four groups of indicators) must be taken into account when classifying settlements on the basis of territorial development. The scope of the data and the calculation methodology are defined in Annex 1 of the Government Decree. (The data were provided by the KSH.)

– The income per capita of the PIT base is slightly higher in the case of Bikal and Mágocs than in Alsómocsolád, however, the indicators of the other settlements with almost the same population are much lower. (Ág', Gerényes' average income is less than half that of Alsómocsolád.)
– The number of operating enterprises per thousand inhabitants is 40, which is slightly less than the Bikali and Mágocsi indicators, but two to four times the indicators of the other villages.
– The ratio of the local tax revenue of the local government to the total revenue is remarkably high in the case of Alsómocsolád (36.59%), which is much higher than the ratio of Bikal or Mágocs, and by orders of magnitude higher than in other villages. (In the case of Ág and Gerényes, this ratio does not reach 3%).
– The proportion of people with at least a high school diploma among the population over the age of 18 is 24.2%, which is again only orders of magnitude higher than that of Ág, Gerényes or Szalatnak. (Bikal and Mágocs have a ratio of over 30%).
– The number of non-profit and non-governmental organizations per thousand inhabitants in Alsómocsolád is 54.31, which is orders of magnitude more than the number of non-governmental organizations in other settlements - the value between 10 and 20 is typical, and in the case of Szalatnak the number of non-governmental organizations is 0.

ALSÓMOCSOLÁD AND THE SDGS

We have received a completed questionnaire on SDG awareness from Alsómocsolád. Based on the answers and the activities of the settlement, it can be said that almost all SDGs were already dealt with in Alsómocsolád, even before the UN SDG framework was created.

We highlight some activities through the lenses of SDGs. The Our Bread and the Social Land Programs (Dicső, 2015), contribute to SDG2: Zero Hunger. The local Forest School with rich equipment and local educational modules contribute to SDG4: Quality Education. The installed living machine ecological wastewater treatment plant contributes to SDG6: Clean water and sanitation. There are several large companies and 26 microenterprises in the administrative area of Alsómocsolád, providing a total of

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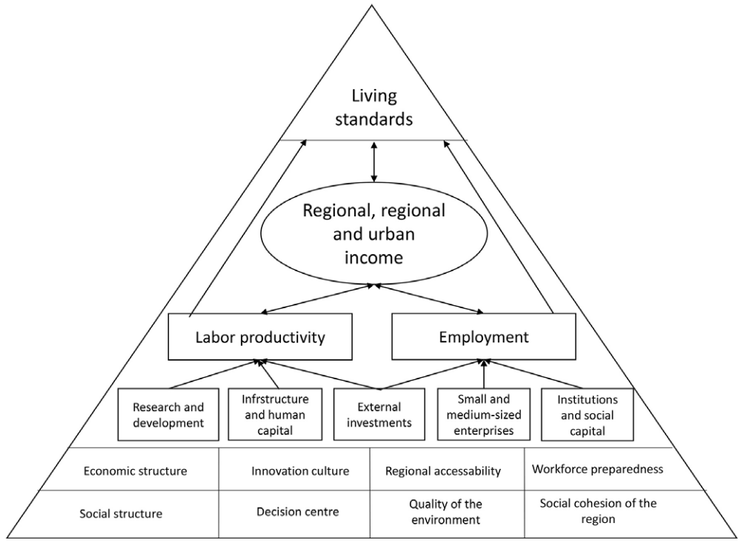
Fig. 2: Rokström-Shudev: Pyramid of SDGs (2014) (SOURCE: HTTPS://ECOACSA.COM/EN/SDG/)

Fig. 3: The Pyramid Model of Regional Competitiveness (Lukovics, 2008)



450 jobs (HEP, 2018), which contributes to SDG8: Decent work and economic growth, and SDG9: Industry, innovation and infrastructure. Rigac, the local money launched in 2013 (Szemerédi, 2019), contributes to SDG10: Reduced inequalities. The strong cooperation between the municipality, local NGOs, residents and the business sector, as well as the regular community planning processes and the creation of a new type of municipal model (Dicső 2015) contributes to SDG17: Partnerships for the goals

Regarding this paper SDG7, Affordable and Clean energy, is the most relevant goal to discuss. Alsómocsolád contributes to this goal with the biomass-heated boilers, which are operating in the settlement. In 2015 Alsómocsolád installed solar systems on public buildings to reduce the maintenance costs of Alsómocsolád five municipality buildings. The installed solar systems increase the renewable electricity generation and usage, and at the same time reduce the greenhouse gas emissions by 28.016 tons/year (https://alsomocsolad.hu/?oldal=367&menu=486), and so the same project significantly contributes to SDG13: Climate action.

There is still a lot that can be done, and some suggestions are mentioned in the Energy management of Alsómocsolád section of this paper.

Considering all of the above, it can be concluded that Alsómocsolád made significant advancements in both success and sustainability. However, these two factors can only be measured in very different ways: Despite their efforts in the field of sustainability, it is apparent in the case of Alsómocsolád that the metrics used to measure success and those used to measure sustainable development goals are based on different principles. This difference is illustrated by figures 2 and 3, which both show pyramid models of social needs, but the different methodologies result in different models.

ENERGY MANAGEMENT OF ALSÓMOCSOLÁD

To make the most efficient use of renewable energy, the natural endowments of the area must be examined, and it is also important to look at the state and development opportunities of industry, innovation and infrastructure. In the case of the micro-region, we examined the renewable energy potential, the environmental impacts of each resource and the production opportunities.

Developments related to energy management contribute not only to environmental sustainability goals but also to the development of industry and technology. In Baranya county, the potential of wind energy is not significant, it cannot be utilized economically with the current technological development. The potential of geothermal energy and biomass is of outstanding importance (Regional Development Concept of Baranya County 2013). The combustion utilization of biomass only for the production of electricity without heat recovery is uneconomical, the efficiency of the Szakoly power plant is 33% (Popp-Potori 2011). In energy insutry both herbaceous (eg. Helianthus annuus L., Miscanthus sinensis, Agropyron sp.) and woody plants (eg. Salix sp., Popolus sp., Robinia pseudoacacia) are used. (Gyuricza 2014) There are serious conservation concerns about energy grass (Agropyron sp.), as it is questionable whether they become invasive species, interbreed with related species, and the extent to which pollen pollution may occur (Gyulai 2006). The issue cannot be neglected in terms of air pollution either, as one of the sources of particulate matter emissions is biomass combustion (Sárváry 2011). As a member of the Mecsek Energy Circle, the heating of municipal institutions with biomass boilers has also been implemented or is planned in Alsómocsolád (Csanaky-Fülöp-Irmalós 2014), which will reduce greenhouse gas emissions in the short term. At the same time, geothermal energy utilization is worthwhile in the long run, the solar energy potential is significant (Figure 5), and by 2020 the municipality can supply several municipal buildings with solar electricity, which is the initial step in the transition to renewable energy sources (Csanaky-Fülöp-Irmalós 2014). Especially considering that the largest consumers in the settlement are the municipal institutions.

To demonstrate sustainability, we examined the renewable energy potential of residential energy consumption, so it becomes visible to what extent a small town can become energy independent. This could even mean an economic recovery in the long run, as the use of renewable energy sources is constantly becoming more efficient. As the residential energy consumption is also significant in the settlement, it is worth examining the extent to which the construction of solar systems can be implemented in the case of residential buildings, as an environmental load of this energy source

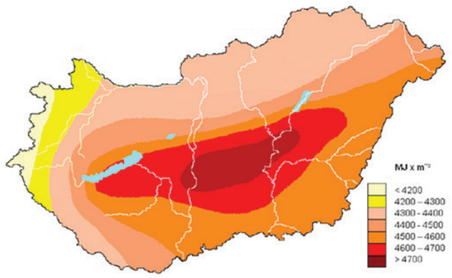


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Fig. 4: The average annual amount of global radiation in Hungary (Horváth 2011)

during operation is extremely low. For the calculation, we took into account the local building regulations of Alsómocsolád, the average consumption per household determined by national utilities (https://www.nkmenergia.hu/aram/pages/aloldal.jsp?id=550565) and the performance and dimensions of solar panels (http: //www.ingyennapelem.hu/blogok/mennyi-napelem-kell-egy-hazhoz). For electric car consumption, we used a low-consumption car (https://villanyautosok.hu/2019/12/26/ezek-a-legkisebb-fogyasztasu-elektromos-autok). We used estimation in our calculations.

According to the local building regulations of Alsómocsolád, the minimum plot size of the residential areas is 800 and 900 m², respectively, and the build ability is 30%. Each plot contains the residential building and outbuilings, such as summer kitchen and farm buildings. (Település Arculati Kézikönyv, Alómocsolád 2017) The built-in area of the 900 m² plot was estimated at 15% and solar cells were placed in our model at 25% of the surface, from which 33 m² solar cell coverage came out. A 1 kW solar cell produces an average of 1,150 kWh of electricity in Baranya County (Csanaky-Fülöp-Irmalós, 2014). To produce 1 kW of electricity, we need 4 solar cells with a size of approx. 7 m². Thus, approximately 5405 kWh of electricity can be generated in the 33 m² area per year. According to the calculations of the National Utilities, the annual consumption of a consumption site is 2168 kWh / year. This means that a household in Alsómocsolád can fully switch to a renewable energy source in terms of electricity, and is likely to be able to achieve additional production. According to our calculations, approx. 3237 kWh hours of extra production can be realized in a household, so it is worth examining whether the solar cell can provide consumption when using an electric car. We considered the consumption of a mid-range, Hyundai Kona Electric, which is 15 kW / 100km. Taking into account the daily 50 km commute when using the car, this means an annual consumption of 3600 kW 20 days a month, which is close to the remaining extra consumption. Based on our calculations, the transition to a fully renewable energy source in terms of electricity and transport available in residential energy consumption in Alsómocsolád.

Based on our calculations, it is clear that the use of residential electricity can result in economic growth in addition to self-sufficiency, even in the short term, without further construction and the use of grasslands. Economic growth in this case is compatible with the principles of sustainability. To estimate the investment we choose a 3 kW system (https://pentelesolar.hu/napelem-rendszer-arak.html) which cost around 1,4 million HUF with the installation. As a part of the new energy strategy of Hungary (Új Nemzeti Energyiastratégia 2020) the government support the installation of solar system for households. We can count on 40% support, that means the cost of the solar system is 840000 HUF. The 3 W system produces 3450 kW electricity yearly. According to the average consumption, which is 2168 kW yearly, the households save 67440 HUF yearly. The overproduction is 1282 kW and we count with 85% of the price of electricity that the provider pays for the production, that is 31700 HUF yearly. The overall save and income is 99140 HUF. This means that the investment needs around 8 and a half year to return.

We have examined the potential of solar energy in more detail, but it is important to note that the inclusion of more energy sources in electricity supply is necessary due to the network characteristics. As the sun is not a controllable, flexible resource, weather-independent energy sources must also be involved in the production to maintain the system effectively. At the regional level, it is worth mentioning the planned biogas plant (Csanaky, Fülöp, Irmalós, 2014), whose environmental load is also low (Tamás, Blaskó 2008), and uses the waste generated at the livestock farms and the Alsómocsoládi Pick plant in the region. Using solar, biomass, geothermal energy and biogas, a multi-legged energy production strategy can be developed. The 20 kV medium-voltage line connecting Alsómocsolád to the network also ensures the security of energy supply.

CONCLUSIONS

Based on our research, the majority of success indicators quantify economic and social success. Data on environmental well-being is limited, so they are weightless for policymakers.

In many cases, sound principles are not or not consciously applied, despite the fact that our studies have shown that their application can be very effective in improving the state of both society and the environment in the medium term, which is essential for long-term development.

The five years that have passed since the adoption of the SDGs have yielded few tangible results, with most progress being in theoretical terms. Decision-makers and the public (including communities) in most cases do not consciously apply the SDG framework.

Thinking in complex systems can help to avoid developments that promise good results only in the short term. What we mean by sustainability or success today, is changing dynamically, as is our external reality. SDGs will provide a supportive framework until 2030, but after 2030, we will likely need to rethink what goals can contribute to sustainable development.

Sustainable development goals and sustainable energy policy can contribute to the prosperity of a small region, as well as to its long-term competitiveness. Therefore, while environmental and social considerations are viewed as limitations on economic development, they can also contribute to it.

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ÖSSZEFOGLALÓ

HOGYAN SEGÍTHETIK-E AZ ENSZ FENNTARTHATÓ FEJLŐDÉSI CÉLJAI, KÜLÖNÖSEN A MEGFELELŐ ENERGIA POLITIKA EGY KISTÉRSÉG SIKERESSÉ VÁLÁSÁT?

A XXI. század legnagyobb kihívásai Európában a vidéki térségekben a környezet megváltozása (klímaváltozás) és a társadalmi változások (elöregedés, elnéptelenedés). A kutatás során áttekintettük a sikeresség és a fenntarthatóság összefüggéseit, valamint azok kapcsolatát a települési energia gazdálkodással. Mint területünkön, Alsómocsoládon részletes elemzéseket végeztünk, mind a sikeresség, mind a fenntarthatóság és az energiagazdálkodás tekintetében. Megállapítottuk, hogy a sikeresség és a fenntarthatóság között nem lehet egyértelmű ok-okozati kapcsolatot vonni, mivel a kettő gyakran ellentétes hozzáállást kíván a településektől. A megfelelő energia politika viszont jó összekötő kapocs és akár kiugrási pont is lehet vidéki kis települések számára.

RÁBA ÉS SEBES-KÖRÖS MENTI BELVÍZJÁRTA TERÜLETEK SZEREPE A VÉDETT TERÜLETEK RENDSZERÉBEN

THE ROLE OF AREAS EXPOSED TO EXCESS WATER NEAR RÁBA AND SEBES-KÖRÖS RIVERS IN THE PROTECTED AREAS' SYSTEM

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HTTPS://DOI.ORG/10.36249/57.5

BEVEZETÉS

A belvízi elöntés Magyarország síkvidéki területeinek jelentős hányadát, mintegy 73,52%-át érinti valamilyen mértékben. A 2015-ben elkészült komplex belvíz-veszélyeztetettségi térképezés[1] eredményeként megállapítható, hogy a fenti adat az 1%-nál nagyobb valószínűséggel történő elöntést mutatja. A gyakrabban visszatérő belvízi elöntések aránya (jelen esetben 10%-nál nagyobb valószínűséggel bekövetkező elöntési valószínűség) az alföldi területeken mintegy 24,42% (OVF adatszolgáltatás 2020). A belvíz[2] kialakulásához a folyószabályozásokon kívül számos tényező járult hozzá – különösen az antropogén beavatkozások, mint például a beépítések, burkolt felületek arányának növekedése, az intenzív, nagyüzemi mezőgazdálkodási tevékenység –, de a természeti adottságoknak is van szerepük benne. Számos kutatás készül(t) a belvízi elöntés gazdasági szempontú következményeinek feltárására, az ökológiai potenciáljával ezzel szemben viszonylag kevés kutatás foglalkozik, pedig ezen időszakosan vízborította területek hozzájárulnak a biodiverzitás növeléséhez, a változatosabb fajösszetételhez. Élőhelyként, elsősorban időszakos táplálkozóhelyként szolgálnak a vizenyős helyeket kedvelő állatok (pl. madarak, szitakötők) számára. A belvízlevezető csatornákban, a belvizes gyepeken és a jellegzetes iszapnövényzetű belvizes szántókon számos ritka és veszélyeztetett növényfaj előfordulását igazolták kutatások (Molnár

1 *Komplex belvíz-veszélyeztetettségi térkép: Az Árvízi kockázati térképezés és stratégiai kockázatkezelési terv készítése (KEOP 2.5.0/B/09-12-2013-0001) című pályázat keretein belül a Belvízi veszélytérképezés feladatrészeként megvalósult projekt eredménye. (http1)*
2 *Belvíz: "a rendes körülmények között vízzel nem borított földterületnek a talajvízből származó vagy a csapadékvízből összegyülekező víz alá kerülése" (178/2010. (V. 13.) Korm rend. 1.§ (2,c)). "a sík vidékek időszakos, de meglehetősen tartós és viszonylag nagy területre kiterjedő jelensége, sajátos vízfajtája" (Pálfai 2004)*

INTRODUCTION

Excess water inundation endangers a significant proportion of Hungary's flatlands. As a result of the complex excess water risk mapping[1] completed in 2015, this statement shows the extent of flooding occurs with a probability of more than 1%. The proportion of more frequent excess water inundation (in this particular case the chance of flooding occurs with a probability of more than 10%) in the Great Plain is about 24.42% (General Directorate of Water Management – data supplying, 2020). Besides river regulations, numerous factors have contributed to the formation of excess water,[2] especially anthropogenic interventions, such as the increasing proportion of constructions, paved areas, the intensive agricultural activity, but natural conditions also play an important role. Several studies have been made and are in progress to reveal the economic consequences of excess water, while its ecological potential is relatively slightly explored, although these periodically flooded areas contribute to biodiversity increasing and to create a diversification among species. These areas function as habitats primarily as feeding grounds for animals (for example birds, dragonflies), which prefer wetlands. Research works have confirmed the presence of numerous rare and endangered plant species in drainage canals, on grasslands exposed to excess water and on special agricultural fields with mud vegetation (Molnár – Lukács 2014). Nowadays, in order to mitigate the effects of climate change, the role of wetlands and water retention become appreciated, more and more international and national strategies and programs give priority to the role of water (for example the so-called European Green Deal 2019). Therefore, areas exposed to excess water are ecologically more valuable than areas with similar characteristics but not exposed to excess water. These areas create a specific, coherent, periodic network of blue and green infrastructure. The quantified indicators of their natural and landscape values besides the presence of protected species and the naturalness of habitats, the various nature protections – the aim of our article is to reveal this.

METHODS

We analyzed the following regional designations in the sample areas in order to reveal the correlations between areas exposed to excess water[3] and areas under nature protection. We analyzed among natural areas protected by special legislation the existence of national park (NP), protected landscape area (PLA), nature conservation area (NCA), in the case of European nature protection categories, the presence of Natura 2000 Special Protection Area (Natura 2000 SPA), Natura 2000 Special Areas of Conservation (Natura 2000 SAC). In addition to the mentioned types, National Ecological Network (NEN) and its three parts: core zone, buffer zone and ecological corridor were also taken into account. During the research, we analyzed the correlations by comparing the characteristics and protections of two drainage districts[4] (01.08. drainage district near Rába river with an area around 13.370 hectare and 12.04 drainage district near Sebes–Körös river with an area around

1 *Complex excess water risk map: Within Project 'Flood risk mapping and preparing strategic risk management plan' (Programme KEOP, ID No. 2.5.0/B/09-12-2013-0001) the excess water risk mapping activity has been implemented separately as a sub-task of the flood risk management planning. (http1)*
2 *Excess water: "the getting of a land under water (water from groundwater or accumulating from rainwater), which is normally not covered by water" – own translation (178/2010. (V. 13.) Government decree. 1.§ (2,c)). "a phenomenon, a specific water-type of flatlands that occurs periodically but quite permanently and relatively on large areas" – own translation (Pálfai 2004)*
3 *Area exposed to excess water: Area often covered by excess water, due to its topographical and soil characteristics, the appearance of excess water can be expected generally even in the case of relatively low rainfall. – own translation (Szlávik 2013). Area regularly exposed to excess water: it is also defined in the National Spatial Planning of Hungary (areas regularly exposed to excess water include the deeper parts of lowlands or moderately sloping areas, where some of the local precipitation accumulates in the form of temporary surplus water in greater quantities and more frequently – own translation) (Act CXXXIX of 2018.)*
4 *Drainage district: A well-defined part of drainage system that is suitable for the appropriate control and implementation of protection. Its area, boundaries are defined by law. (Szlávik 2013) (10/1997. (VII.17.) KHVM rend.)*

– Lukács 2014). Napjainkban a klímaváltozás hatásainak enyhítése érdekében a vizes élőhelyek és a vízvisszatartás szerepe felértékelődik, egyre több nemzetközi és hazai stratégia, program kezeli kiemelten a víz szerepét (pl. az ún. Európai Zöld Megállapodás 2019). A belvízjárta területek mindezek miatt ökológiai szempontból értékesebbek, mint a hasonló adottságú, de nem belvizes területek. Ezek a területek sajátos, összefüggő, időszakos kék- és zöldinfrastruktúra hálózatot képeznek, melyek természeti, táji értékeinek számszerűsíthető mutatói a védett fajok előfordulása és az élőhelyek természetessége mellett a különféle természetvédelmi oltalmak, védettségek – cikkünk ennek feltárását tűzi ki célul.

MÓDSZER

A belvízjárta[3] és a természetvédelmi oltalom alatt álló területek közötti összefüggések vizsgálatához a következő területi kijelöléseket elemeztük a mintaterületeken. Az egyedi jogszabállyal védett természeti területek közül nemzeti park, tájvédelmi körzet, természetvédelmi terület meglétét, az európai természetvédelmi kategóriák esetében a Natura 2000 különleges madárvédelmi területek (Natura 2000 SPA), Natura 2000 különleges természetmegőrzési területek (Natura 2000 SAC) jelenlétét vizsgáltuk. A felsoroltakon kívül az Országos Ökológiai Hálózatot (OÖH) és ennek három részelemét (magterület, pufferterület és ökológiai folyosó) is számításba vettük. A kutatás során az összefüggéseket két belvízvédelmi (a 13 370 hektár kiterjedésű Rába menti 01.08-as és a 34 000 hektáros Sebes-Körös menti 12.04-es) szakasz[4] jellemzőinek, védettségeinek összevetésével, térinformatikai eszközök alkalmazásával elemeztük; valamint az eredményeket összehasonlítottuk az országos adatokkal is. Síkvidéki területként a hazai nagytájak közül a Kisalföldet és az Alföldet vettük számításba. A kutatásban az Országos Vízügyi Főigazgatóság, az Észak-dunántúli Vízügyi Igazgatóság és a Körös-vidéki Vízügyi Igazgatóság belvízjárta területekre, illetve a vizsgált belvízvédelmi szakaszokra rendelkezésre bocsátott adatait, a természetvédelmi információs rendszer (http2), valamint a vízügyi atlaszok online adatbázisát (http3) használtuk fel. A mintaterületi térképek készítése során (3. és 5. ábra) a belvízjárta területek lehatárolásához a belvízelöntési gyakoriság térkép 1., 2., 3., 4. osztályokba sorolt területeinek összesített kiterjedését vettük alapul.

Ebben a cikkben nem térünk ki az országos védettség alatt álló, törvény erejénél fogva végett (ex lege) lápokra és szikes tavakra, a Ramsari területekre, bioszféra rezervátumokra, érzékeny természeti területekre, valamint a mintaterületeken jelenlévő vízhez kötődő egyedi tájértékek szerepére sem, ezek feldolgozása későbbi kutatásaink tárgya lesz.

3 *Belvízjárta terület: "a belvízzel gyakran elborított terület, amelynek domborzati és talajadottságai miatt belvíz megjelenésére általában, még viszonylag kisebb csapadék esetén is számítani lehet." (Szlávik 2013) Rendszeresen belvízjárta terület: A fogalmat definiálja kijelölt övezetként az Országos Területrendezési Terv is (síkvidéki vagy enyhe lejtésviszonyokkal rendelkező területek azon mélyebb részei tartoznak közéjük, ahol a helyi csapadék egy része átmeneti vízfelesleg formájában, nagyobb mennyiségben és gyakorisággal összegyűlik) (2018. Évi CXXXIX. Tv.)*

4 *Belvízvédelmi szakasz: A belvízrendszernek a védekezés célszerű irányításához és végrehajtásához alkalmasan meghatározott része. Területét, határait jogszabály állapítja meg. (Szlávik 2013) (10/1997. (VII.17.) KHVM rend.)*

1

1. Táblázat/ Table 1: Védett és kiemelt oltalom alatt álló belvízjárta területek területi megoszlásának összevetése az országos adatokkal védettségi kategóriánként / *Comparison of protected areas exposed to excess water and national data by protection categories*

1	2	3	4	5	6	7	8
Védett, illetve kijelölt oltalom alatt álló terület típusa / *Protection category*	**Védett területek országos területi megoszlása (%) / *Distribution of protected areas in national scale* (%)**	**Védett területek megoszlása síkvidéki területeken (%) / *Distribution of protected areas in flatlands* (%)**		**Védett területek megoszlása a mintaterületek egészén (%) / *Distribution of protected areas in sample areas* (%)**		**Belvízjárta területek védettségének területi megoszlása a mintaterületeken (%) / *Distribution of protected areas exposed to excess water in sample areas* (%)**	
	Országos / *National scale*	**Kisalföld**	**Alföld**	**I. mintaterület / *I. sample area***	**II. mintaterület / *II. sample area***	**I. mintaterület / *I. sample area***	**II. mintaterület / *II. sample area***
Nemzeti Park / *National park*	5,26	4,00	4,27	0,00	15,88	0,00	9,48
Tájvédelmi Körzet / *Protected Landscape Area*	3,41	2,38	2,78	0,00	0,00	0,00	0,00
Természetvédelmi Terület / *Nature Conservation Area*	0,33	0,08	0,37	0,00	0,00	0,00	0,00
Natura 2000 SPA	14,77	10,30	13,99	1,64	14,53	2,51	6,75
Natura 2000 SAC	13,89	6,09	12,89	10,80	12,77	11,00	11,66
OÖH – magterület / *NEN – core zone*	19,49	12,61	14,13	2,56	15,76	4,08	9,25
OÖH – pufferterület / *NEN – buffer zone*	7,77	7,95	9,43	3,01	8,90	3,17	9,45
OÖH - ökológiai folyosó / *NEN – ecological corridor*	9,18	7,31	8,55	15,72	12,61	17,40	13,24
Egyes védettségek %-os arányainak összege / *Total distribution of protected areas*	74,10	50,72	66,41	33,73	80,45	38,16	59,83
Védett és kiemelt oltalom alatt álló területek összterületének %-os aránya / *Distribution of protected areas' total area*	44,71	30,5	40,71	22,73	43,36	18,26	22,31

34.000 hectare) using GIS methods; the results were also compared with national data. As flatlands, the Little Plain and the Great Plain, delimitated as the major Hungarian landscape categories, were taken into account. In this research we used the data provided by the General Directorate of Water Management, North-Transdanubian Water Directorate, Körös Valley District Water Directorate for the areas exposed to excess water and drainage districts, the nature conservation system (http2) and the online database of water atlases (http3). During the mapping of sample areas (Figure 3, Figure 5.), we took as a basis the total extent of excess water inundation frequency map's classes 1., 2., 3., 4. to delimit the areas exposed to excess water.

In this article, we don't analyze ex lege (protected due to one single law) bogs and salt-marshes, Ramsar sites, biosphere reserves, vulnerable natural areas or the role of the so-called unique landscape features, which relate to waters on the sample areas; the processing of these will be the subject of our future research work.

RESULTS

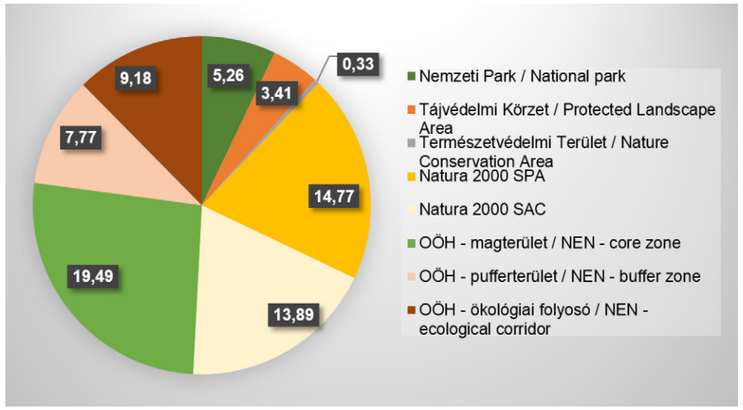
The results of the analysis are summarized in Table 1 by protection categories in terms of percental proportion calculated on the basis of the areas' extent. We compared the protected areas' extent to the country's area in the second column, to the Little Plain in the third column,

1 1 2

1. ábra/Fig. 1: Védett és kiemelt oltalom alatt álló területek országos területi megoszlása (%) / *Distribution of protected areas in national scale (%)* (SAJÁT SZERKESZTÉS / *OWN EDITING*)

1. kép/Pict. 1: Körös-Maros Nemzeti Park területe Szeghalom és Vésztő között / *Area of Körös-Maros National Park between Szeghalom and Vésztő* (FOTÓ/PHOTO: VARGA DALMA, 2020.)

2. kép/Pict. 2: A Kutas-főcsatornát szegélyező nádasok Szeghalom térségében / *Reedy area among the Kutas main channel near Szeghalom* (FOTÓ/PHOTO: VARGA DALMA, 2020.)



EREDMÉNYEK

Az elemzés adatait az 1. táblázatban védettségi kategóriánként foglaltuk össze a területi kiterjedés alapján számított százalékos arányban megadva. A 2. oszlopnál az ország, a 3. oszlopnál a Kisalföld, a 4. oszlopnál az Alföld, az 5-6. oszlopoknál a mintaterületek összterületéhez, a 7-8. oszlopoknál a mintaterületek belvízjárta területéhez (100%) viszonyítottuk a védelem alatt álló területrészek kiterjedését. Az országos védettségi adatok a rendelkezésre álló térinformatikai adatbázisokból származó, területméréssel előállított összesítő adatok. A táblázat utolsó előtti sorában összegeztük a védett és a kiemelt oltalom alatt álló területek területi százalékos megoszlásának értékeit. A táblázat utolsó sora az összes elemzett védettségi kategóriába tartozó területek (NP, TK, TvT, Natura2000, OÖH) összemásolását, egymásravetítését követően létrejövő védett összterületének %-os arányát mutatja.

Védettségek országos, alföldi és kisalföldi referenciaértékeinek elemzése (táblázat 2-4. oszlopai)

A táblázatban a védettségeket országos területi megoszlásban, illetve a síkvidéki területek (Kisalföld, Alföld) tekintetében is elemeztük. A különböző védettségek országos megoszlását az 1. ábra mutatja be. A két tájegység összevetéséből kirajzolódik, hogy az egyes védettségek területi részaránya hasonló, viszont a Natura 2000 különleges természetmegőrzési területek és a természetvédelmi területek aránya a Kisalföldön jóval alacsonyabb. A védett területek összterületének aránya alapján a Kisalföld 30,5%-a, míg az Alföld 40,71%-a áll oltalom alatt az elemzett kategóriák alapján. A különbség oka vélhetően a jelenlegi tájhasználatokban és a tájváltozási tendenciákban keresendő: az Alföldön a nagytáblás szántóföldek dominálnak, ugyanakkor viszonylag kisebb az összefüggő erdőségek, illetve gyepek aránya. A Kisalföldön is jelentős változások mentek végbe a tájban az évszázadok során, de több foltban megmaradtak, vagy éppen rehabilitálásra kerültek olyan területek (gyepek, erdők), amelyek magasabb természetvédelmi értékkel bírnak napjainkban.

Védettségek megoszlásának elemzése a mintaterületek teljes területe tekintetében (táblázat 5-6. oszlopai)

Az *I. mintaterület (Rába menti 01.08. belvízvédelmi szakasz)* 22,73%-a érintett az elemzett kategóriák valamelyikével, így

to the Great Plain in the fourth column, to the total extent of sample areas in the fifth, sixth columns and to the areas exposed to excess water of sample areas in the seventh, eighth columns.

The national data are calculated on the basis of the available GIS databases calculated by area measurement. In the penultimate row of the table, we summarized the values of the protected areas' areal percental proportion. The last row of the table shows the percental proportion of the protected areas' total extent calculated by layering all analyzed protection categories (NP, PLA, NCA, Natura 2000 areas, NEN areas).

Analysis of reference values of protection areas in national scale and on the Little Plain and Great Plain (columns 2-4 of the table)

In the table, we analyzed the distribution of protected areas in national scale and in the flatlands (Little Plain, Great Plain). Figure 1 shows the national distribution of different protection categories. The comparison of these landscape areas shows that the proportion of protected areas is similar, but the ratio of Natura 2000 SAC and nature conservation areas is much lower in the Little Plain. Based on the proportion of the total area of protected areas, 30.5% of the Little Plain and 40.71% of the Great Plain are protected by the analyzed categories. The difference's reason can be presumably found in the current landuses and landscape changing trends: the Great Plain is dominated by large, coherent agricultural lands, at the same time the proportion of contiguous forests and grasslands is relatively smaller. In the Little Plain, significant changes also have proceeded in the landscape during centuries, however areas (grasslands, forests), that have higher nature conservation value, have been preserved in several patches or have been rehabilitated.

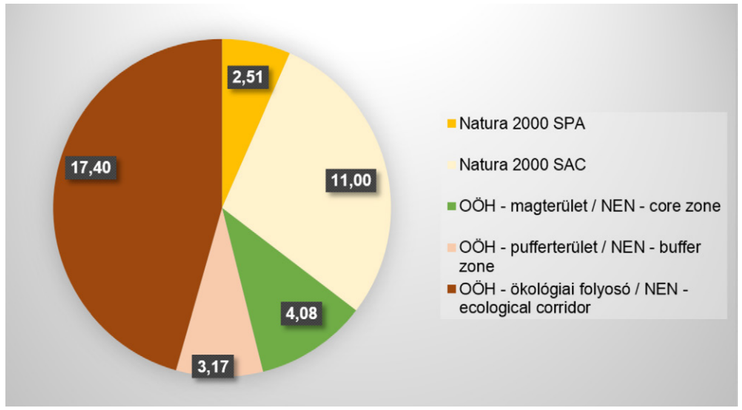
Analysis of distribution of protected areas in sample areas' total extent (columns 5-6 of the table)

22.73% of the *I. sample area (01.08. drainage district near Rába river)* is covered by any of the analyzed categories, so totally 3038.42 hectare is protected. The total distribution of protected areas is 33.73%. There is not any national parks, protected landscape areas, nature conservation areas in this sample site, but most of the gallery forests along Rába and Rábca rivers and the streams are parts of Natura

2 3

2. ábra/Fig 2: Védett és kiemelt oltalom alatt álló területek területi megoszlása (%) az I. mintaterület belvízjárta részein / *Distribution of protected areas in areas exposed to excess water in I. sample site (%)* (SAJÁT SZERKESZTÉS / *OWN EDITING*)

3. ábra/Fig. 3: I. mintaterület belvízi elöntéssel veszélyeztetett területei és védett természeti területei / *Areas exposed to excess water and protected areas in I. sample site* (SAJÁT SZERKESZTÉS / *OWN EDITING*)

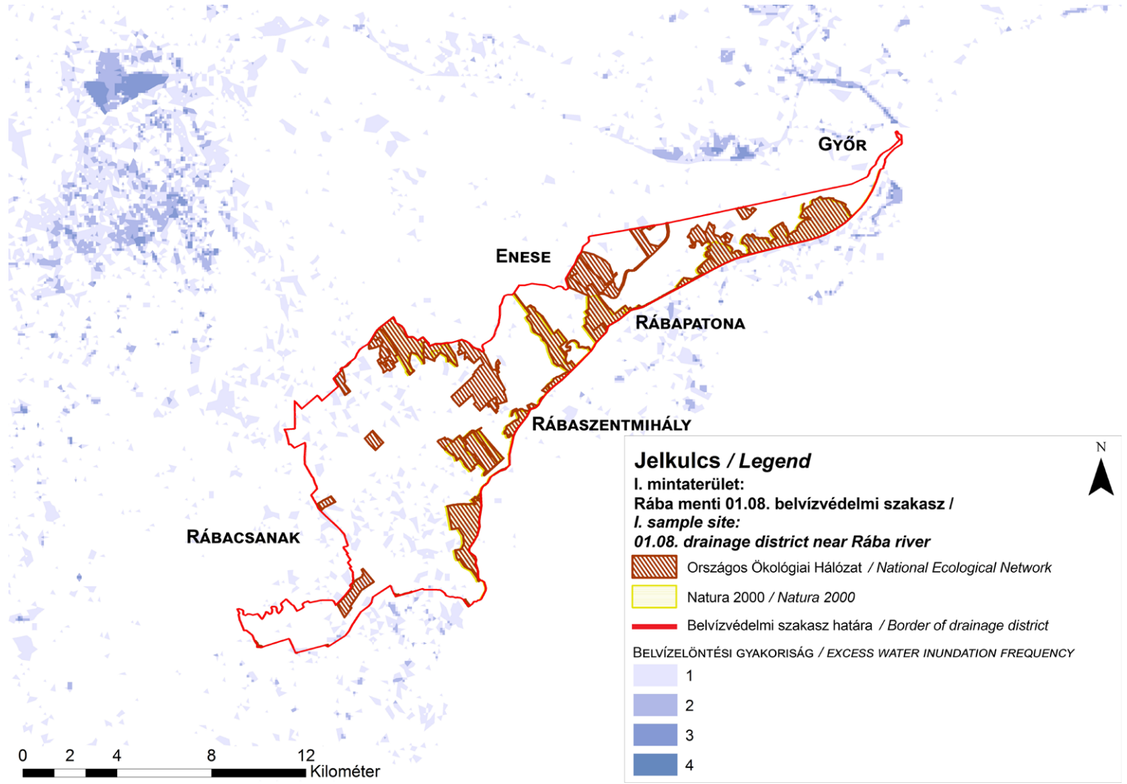


összesen 3038,42 ha védett. A védettség alatt álló területek területi arányainak összegzett értéke 33,73%. Nemzeti park, tájvédelmi körzet és természetvédelmi terület nem található itt, viszont Natura 2000 terület, illetve az Országos Ökológiai Hálózat része a kis patakok, valamint a Rába és Rábca mentén húzódó galériaerdők zöme. Különleges természetmegőrzési területként (HUFH30005 Hanság, HUFH20011 Rába) kijelölt a mintaterület 10,8%-a, azaz 1443,92 ha; az ökológiai folyosó aránya 15,72%, vagyis 2101,7 ha.

A *II. mintaterület (Sebes-Körös menti 12.04. belvízvédelmi szakasz)* 43,36%-a érintett az elemzett kategóriák valamelyikével, így összesen 15600,74 ha védett. Nagyon magas, 80,45%-os a védettségek területi arányainak összegzett értéke, melynek oka az, hogy sok helyen többféle védettség is érinti ugyanazt a területrészt. A védett területek közül ki kell emelni a Körös–Maros Nemzeti Parkot, amely 15,88%-ban fedi le több, kisebb-nagyobb foltban a területet – köztük például Szeghalom és Vésztő környékét (1. fotó). Tájvédelmi körzet és természetvédelmi terület nem található a vizsgált belvízvédelmi szakaszon. Országos átlagnak (14,77%) megfelelő a Natura 2000 különleges madárvédelmi területek aránya (HUKM10002 Kis-Sárrét) (14,53%), ami azt mutatja, hogy a II. mintaterületi belvízvédelmi szakaszon magas ezen európai jelentőségű oltalom aránya. Kiemelt szerepét támasztja alá az is, hogy a Kis-Sárrét különleges madárvédelmi terület jelentős része a Sebes-Körös menti belvízvédelmi szakaszon húzódik, számos ritka ragadózómadár, köztük a barna rétihéja, kék vércse élőhelyéül szolgálva. (http4)

Védettségek megoszlásának elemzése a mintaterületek belvízjárta részein (táblázat 7-8. oszlopai)

Az *I. (Rába menti) mintaterület* 35,07%-a érintett közvetlenül belvízi elöntéssel. E belvízjárta terület 18,26%-a védett, az egyes védettségek területi arányainak összesített értéke 38,16%. Az országos átlaghoz, illetve a teljes Kisalföldhöz képest jóval kisebb a Natura 2000 különleges madárvédelmi területek, illetve az Országos Ökológiai Hálózat mag– és pufferterületeinek területi aránya. A Natura 2000 különleges természetmegőrzési területeinek aránya az országos átlagtól jelentősen nem tér el, de a kisalföldihez képest magasabb részarányú. Kiemelkedő viszont az ökológiai folyosók aránya; az I. mintaterület belvízjárta területeinek 17,40%-a tartozik ebbe a kategóriába. (2-3. ábra)



2000 areas and the National Ecological Network (NEN). 10.8% (that is 1443.92 hectare) of the sample area has been designated as Natura 2000 SAC (ID No. HUFH30005 Hanság, HUFH20011 Rába); the proportion of the ecological corridor is 15.72% that is 2101.7 hectare.

43.36% of the *II. sample area (12.04 drainage district near Sebes-Körös river)* is covered by any of the analyzed categories, so totally 15600.74 hectare is protected. Total distribution of protected areas is very high, 80.45%, which is due to the fact that in many patches more protected areas cover the same part of the sample area. Among the protected areas, the Körös-Maros National Park should be highlighted, which covers 15.88% of the area in more smaller and larger patches – including for example the area near Szeghalom and Vésztő (Picture 1.) There is not any protected landscape areas, nature conservation areas in this drainage district. The distribution of the Natura 2000 SPA (ID No. HUKM10002 Kis-Sárrét) (14.53%) corresponds to the national average (14.77%), which shows that the proportion of this European nature protection category is high in this sample area. Its special role is also confirmed by the fact, that a significant part of Kis-Sárrét Special Protection Area locates in the drainage district near Sebes-Körös river serving as a habitat for many rare raptors, including western marsh harrier, red-footed falcon. (http4)

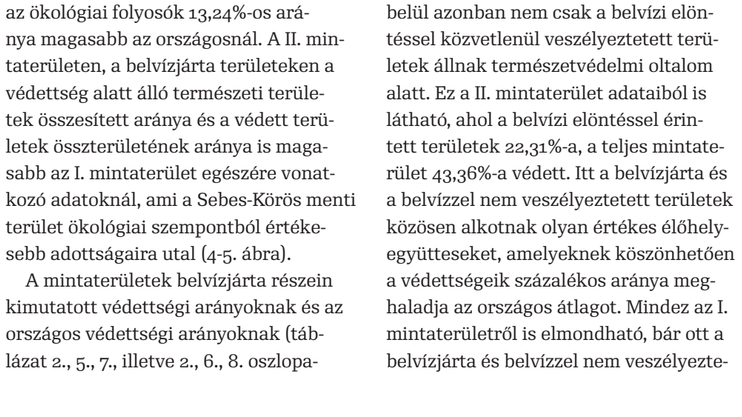
Analysis of distribution of protected areas in areas exposed to excess water in sample sites (columns 7-8 of the table)

35.07% of the *I. sample area* is directly exposed to excess water. 18.26% of these areas are under protection, the total distribution of protected areas is 38.16%. Compared to the national average and the whole Little Plain, the ratio of Natura 2000 SPA and the core zone, buffer zone of the National Ecological Network is much smaller. The distribution of Natura 2000 SAC does not differ significantly

4 5

4. ábra/Fig 4: Védett és kiemelt oltalom alatt álló területek területi megoszlása (%) a II. mintaterület belvízjárta részein / *Distribution of protected areas in areas exposed to excess water in II. sample site (%)* (SAJÁT SZERKESZTÉS / *OWN EDITING*)

5. ábra/Fig. 5: II. mintaterület belvízi elöntéssel veszélyeztetett területei és védett természeti területei / *Areas exposed to excess water and protected areas in II. sample site* (SAJÁT SZERKESZTÉS / *OWN EDITING*)

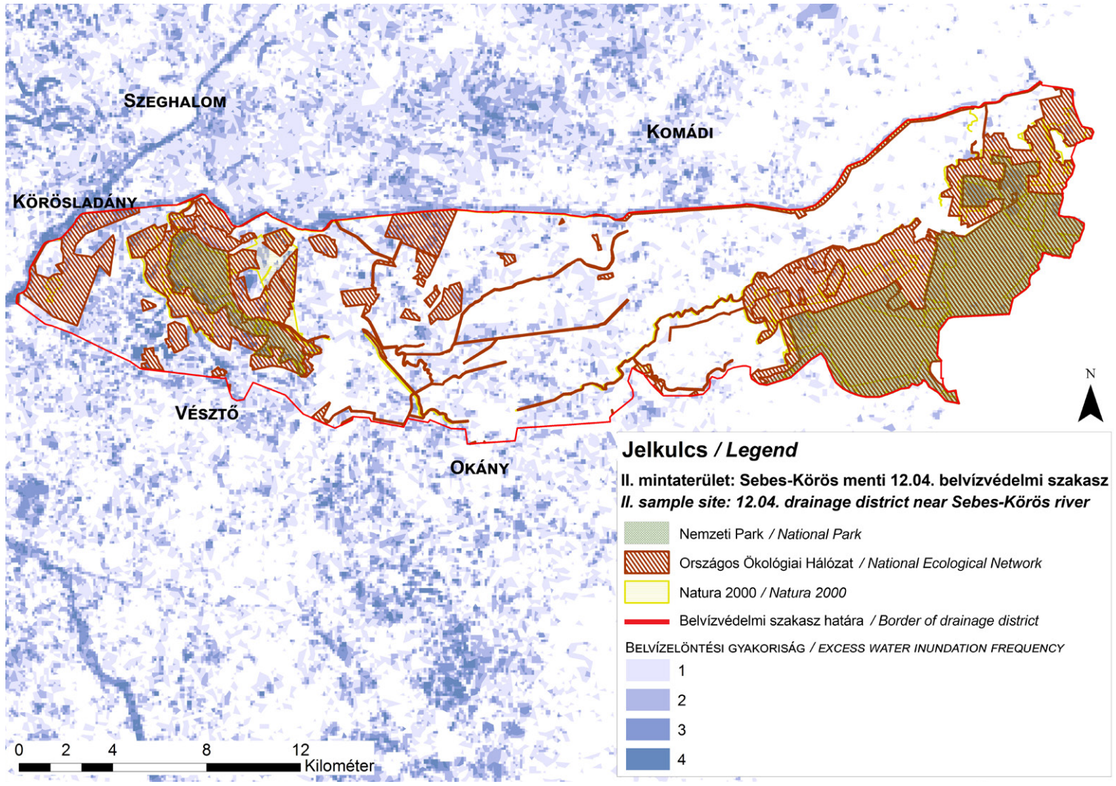


A *II. (Sebes-Körös menti) mintaterület* esetében 38,85%-os a belvízi elöntés által veszélyeztetett területek aránya. E belvízjárta területek mintegy 22,31%-a védett, a védettségek területi arányainak összesített értéke pedig 59,83%, ami annak köszönhető, hogy sok helyen több védettség is egymásra halmozódik. A terület 9,48%-a a Körös–Maros Nemzeti Park része. A gazdag madárvilág következtében magas a Natura 2000 különleges madárvédelmi területek aránya, különösen a nádasok madárvilága kiemelkedő (2. fotó), ez a 6,75%-os részarány viszont az országos, illetve az alföldi értékeknél alacsonyabb. Az Országos Ökológiai Hálózat elemei közül mind a pufferterületek 9,45%-os, mind az ökológiai folyosók 13,24%-os aránya magasabb az országosnál. A II. mintaterületen, a belvízjárta területeken a védettség alatt álló természeti területek összesített aránya és a védett területek összterületének aránya is magasabb az I. mintaterület egészére vonatkozó adatoknál, ami a Sebes-Körös menti terület ökológiai szempontból értékesebb adottságaira utal (4-5. ábra).

A mintaterületek belvízjárta részein kimutatott védettségi arányoknak és az országos védettségi arányoknak (táblázat 2., 5., 7., illetve 2., 6., 8. oszlopainak) az összevetését a 6. és 7. ábrán látható diagramok szemléltetik.

Az 1. táblázatban összefoglalt eredmények tehát igazolják, hogy az elemzett két mintaterületen a belvízjárta táj-részletek fontos szerepet töltenek be a védett természeti területek rendszerében (az elemzett kategóriákban), elsősorban a nemzeti parkok, Natura 2000 különleges természetmegőrzési területek, valamint az Országos Ökológiai Hálózat elemeinek esetében. Az eredményeket feltételezésünk szerint tovább erősíti majd a bioszféra rezervátumok, az ex lege védett szikes tavak, lápok és a Ramsari területek integrálása a későbbi elemzésekbe.

A vizsgált belvízvédelmi szakaszokon belül azonban nem csak a belvízi elöntéssel közvetlenül veszélyeztetett területek állnak természetvédelmi oltalom alatt. Ez a II. mintaterület adataiból is látható, ahol a belvízi elöntéssel érintett területek 22,31%-a, a teljes mintaterület 43,36%-a védett. Itt a belvízjárta és a belvízzel nem veszélyeztetett területek közösen alkotnak olyan értékes élőhely-együtteseket, amelyeknek köszönhetően a védettségeik százalékos aránya meghaladja az országos átlagot. Mindez az I. mintaterületről is elmondható, bár ott a belvízjárta és belvízzel nem veszélyezte-



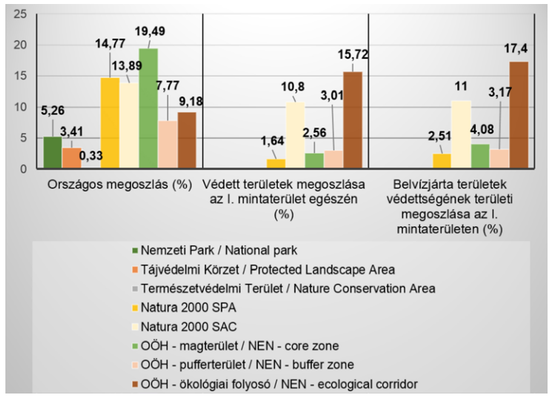
from the national average, but it is higher than in the Little Plain. However, the proportion of ecological corridors is prominent; 17.40% of the areas exposed to excess water in the I. sample site falls under this category. (Figure 2-3.)

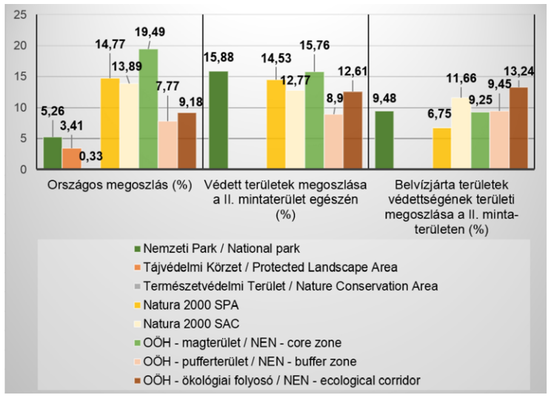
38.85% of the *II. sample area* is directly exposed to excess water. About 22.31% of these areas are protected, the total distribution of protected areas is 59.83%, which is due to the fact that in many patches more protected areas cover the same part of the sample area. 9.48% of the area exposed to excess water is part of the Körös-Maros National Park. As a consequence of the rich bird population, the proportion of Natura 2000 SPA is significant (Picture 2.), but this share (6.75%) is lower than the national and the Great Plain's values. Among the elements of the National Ecological Network, the proportion of buffer areas (9.45%) and ecological corridors (13.24%) is higher than the national one. In the II. sample site, in the areas exposed to excess water the total distribution of protected areas and the distribution of protected areas' total area is also higher than in the I. sample site, which indicates that the area among Sebes-Körös river is ecologically more valuable. (Figure 4-5.).

The comparison of the proportions of protection in sample sites' areas exposed to excess water and in national scale (columns 2, 5, 7 and 2, 6, 8 of the table) is illustrated in Figure 6. and 7.

The summarized results in Table 1. confirm that those areas which exposed relatively often to excess water in the two sample sites, play an important role in the system of protected areas (in the analyzed categories), mainly in the case of national parks, Natura 2000 SAC and the elements of the National Ecological Network. According to our assumption, the results will be enhanced by the integration of biosphere reserves, ex lege protected bogs, salt-marshes and Ramsar sites into the next analyses.

As the results show, within the analyzed drainage districts not only





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6. ábra/Fig. 6: Védett és kiemelt oltalom alatt álló területek megoszlása országos szinten, az I. mintaterület egészén, illetve az I. mintaterület belvízjárta területein (%) / *Distribution of protected areas in national scale (1. group), in the I. sample site (2. group) and in the areas exposed to excess water in I. sample site (%) (3. group)* (SAJÁT SZERKESZTÉS / *OWN EDITING*)

7. ábra/Fig. 7: Védett és kiemelt oltalom alatt álló területek megoszlása országos szinten, a II. mintaterület egészén, illetve a II. mintaterület belvízjárta területein (%) / *Distribution of protected areas in national scale (1. group), in the II. sample site (2. group) and in the areas exposed to excess water in II. sample site (%) (3. group)* (SAJÁT SZERKESZTÉS / *OWN EDITING*)

tett területek védettségének százalékos megoszlása között nem jelenik meg a II. mintaterülethez hasonló szignifikáns különbség. Míg a belvízjárta területek 18,26%-a, a teljes mintaterület 22,73%-a védett. A vizsgált belvízvédelmi szakaszok között – természetvédelmi szempontból – megfigyelhető különbségek is alátámasztják az országos szintű elemzés létjogosultságát és szükségességét.

ÖSSZEGZÉS

A természetvédelmi szempontból kiemelt területek és a belvízjárta területek összefüggéseinek feltárása rámutatott, hogy a vízjárta, időszakos vízborítású területek növelik egy adott térség diverzitását, emelik az esztétikai értékét, tájgazdagító szerepűek. Napjainkban egyre inkább felértékelődik a víz szerepe a tájban a klímaváltozás és más globális változások miatt. A többnyire nagy csapadékmennyiséggel járó, heves esőzések után kialakuló belvizek időszakosan jelentkező víztöbblete és vízfelülete sajátos élőhelyeket biztosít, amelyek sok esetben igazi ritkaságokat is magukban rejtenek. A jelenlegi belvízjárta területek legnagyobb része az egykori – folyószabályozások előtti – vizenyős, mocsaras területeken alakult ki. Az országban számos kisebb–nagyobb foltban, mint például a Hortobágyi Nemzeti Parkban vagy a kutatásban is vizsgált Körösök mentén is léteznek belvízjárta ősgyepek, illetve olyan belvizes szántóterületek, melyeket fajgazdag, valamint különleges flórájuk és faunájuk érdemessé tett a védelemre. Meg kell említeni továbbá a belvízlevezető csatornákat is, melyek értékes élőhelyek lehetnek, ezáltal pedig változatos szerepet töltenek be a zöldinfrastruktúra hálózatban. Az elemzett mintaterületek bemutatott adataiból is jól látható, hogy a belvízjárta területek jelentős hányada magas ökológiai értékkel rendelkezik, és ennek köszönhetően, természetvédelmi oltalom alatt áll. A belvizes területek ökológiai jelentőségének további alátámasztásához a belvízi elöntéssel veszélyeztetett területek és a védett természeti területek összefüggéseinek országos léptékű térinformatikai elemzése is indokolt a mintaterületre kidolgozott módszertan alkalmazásával. Erre a kutatás következő fázisában kerül sor.

A kutatás a Kék Bolygó Klímavédelmi Alapítvány támogatásával készült.

those areas that are exposed to excess water are under protection. This can be seen from the data of the II. sample site, where 22.31% of the areas exposed to excess water is under protection, but at the same time 43.36% of the total sample area is protected. Here, areas exposed to excess water and areas not endangered by excess water form together valuable habitats; as a result of this, the percentage of their protected areas exceeds the national average. All this can be said also for the I. sample site, although there's not so significant difference between the percental proportion of areas exposed to excess water and areas not exposed to excess water. In the I. sample site the distribution is 18.26% and 22.73% in favor of areas not exposed to excess water. The observable differences – from nature protection aspect – between the analyzed sample sites confirm the existence and necessity of the analysis at national level.

CONCLUSION

The analysis of correlation of protected areas and areas exposed to excess water has confirmed that periodically water-covered areas exposed to excess water increase the diversity of a given area, increase its aesthetic value and play role in enriching the landscape. Nowadays, the role of water in the landscape is increasing due to climate change and other global changes. The periodically appearing excess waters that are created mostly after heavy rainfalls, provide specific habitats, which in many cases also contain real singularities. Most of the current areas exposed to excess water have developed on former wetlands, which could be found before river regulations. In Hungary, in many smaller or larger patches, such as in the Hortobágy National Park or along the Körös river, which has been analyzed in this study, there are also ancient grasslands and other areas exposed to excess water, that have a special flora and fauna; therefore they are worthy for protection. Drainage canals should also be mentioned, which can be a valuable habitat, thus play a diverse role in green infrastructure network. It can be seen from the presented data of the analyzed sample areas, that a significant proportion of areas exposed to excess water have a high ecological value and as a result of this, they are under protection. On behalf of proving the ecological significance of these areas, a nationwide GIS analysis, used in this study, is needed to reveal the correlations between areas exposed to excess water and protected areas. This process will be carried out in the next phase of the research.

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ECOLOGICAL ASPECTS OF TRADITIONAL CHINESE WATERSCAPE

A VÍZ ALKALMAZÁSÁNAK HAGYOMÁNYOS FORMÁI A KÍNAI TÁJÉPÍTÉSZETBEN. ÖKOLÓGIAI VONATKOZÁSOK

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HTTPS://DOI.ORG/10.36249/57.6

ABSTRACT

Water is a basic element of Chinese traditional landscape and the management of water resources had played an important role in the development of China's ancient civilization (Pengfei, Di, 2011)

This paper presents four case studies in four specific geographical and climatic regions of China with the intention to provide a closer and detailed view of the water resources management in each locations, trying also to discover the ecological benefits and the common characteristics of the projects. The four case studies are: Jing-Hang Grand Canal (South Eastern China), Ganzhou City (Lower Yangtze Plain), Turpan City (North Western China) and Chengdu City (South Western China).

The paper discusses and analyses the most important and representative water management projects of these areas, including: (1) the canal and moat system and its flood control project in Chengdu, (2) the water supply system in Turpan, (3) the water system combined with artificial canals and ponds in the city of Ganzhou and (4) the artificial river and multifunctional water system of Jing-Hang Grand Canal. In addition, the paper also sums up some drawbacks and lessons of the water resources management of ancient China.

Keywords: Landscape ecology, Landscape heritage, Water management, Flood control, Sustainable landscape

1. INTRODUCTION

China's complex topography and diverse climate has created a large number of unique water landscapes under the joint action of nature and humans. Water not only shapes the landscape, but also shapes the behavior and logic of harmony between man and nature. (Qiao et al., 2020) (Figures 1-2)

The ancient Chinese understanding of the world is that mountains and water constitute the main body of nature. Moreover, old representations and descriptions show that water has complex functions: drinking, irrigation, food production, cleaning, transportation, defense, energy production, leisure, artistic role. The ancient Chinese people transformed the natural environment and accumulated the experience about how to live in harmony with nature (Jie, 2003). Exploration of the historical Chinese relationship with water is of great value for tackling today's climate anomalies. These experiences offer a good opportunity to understand the important ecological role that water plays in long-term social development. (Li, 2018)

In retrospect, scholars' research on climate anomalies are carried out mostly from the perspective of reducing carbon emissions and fossil energy. But also from the perspective of ecology, focusing on minimizing negative environmental impacts through integration with living processes (Walther, 2002; Blair & Pachauri, 2006). Compared to ancient or traditional water resources management, it has the same logic.

The western water management already started to move from technical approach to a true integration of the human dimension (Pahl-Wostl, 2007). This means that we have to look at water resource management solutions from the comprehensive dimension of time and space. Ancient Greece and Rome considered the geographical characteristics, introducing advanced urban water supply and drainage systems (Crouch, 1993). The rainwater management, the irrigation system and the rainwater storage system in antique Egypt and in the Middle East are all worthy of reference for today's water landscape (Mays, 2010).

Water management technologies and facilities in China are also changing with the changes of the natural and social environment. Up to now, there are still well-functioning traditionally rooted water management facilities. This is of great significance for contemporary urban and landscape planning and the development of water conservancy facilities. From a relatively continuous historical perspective, it is possible to study the origin and the evolution of traditional water landscapes, to predict the future applications for the current situation and to facilitate ecological solutions to combat global warming and urban heat island effects. (Li & Xu, 2006)

2. GOALS

The main aim of the paper is to find out the traditional ecologic wisdom from water-related heritage. In order to achieve this, the article illustrates and highlights the essence of traditional Chinese waterscapes, analyzes the water landscape heritage and old hydrological maps in order to obtain the essence of the ancient Chinese water management from the Qin Dynasty to the Qing Dynasty during 2400 years. The paper intends to show how vernacular water management solutions can be applied in specific design situations and locations in contemporary landscape architecture in order to increase the ecological impact and benefit, and how tradition can be used as a source of inspiration for shaping and developing today's waterscapes.

Regarding the designated aims and research questions, a harmonious water management model was hypothesized. Based on this, the ecological model of water management in traditional Chinese water landscapes can be derived:

- Circulation
- Adaption to the environment
- Harmony of man and nature

This ecological logic can provide empirical support for water resources management and water landscape planning in the context of today's climate change.

3. MATERIALS AND METHODS

Through literature review and case analysis, this study provides heritage utilization framework from the perspective of ecology, according to different climate zones and historical periods, which provides a comprehensive approach to the climate crisis. The survey methodology was based on the principle that the sites concerned must be interpreted in context with the relevant periods and landscapes, as the only way to understand their historical importance and current value.

The paper is built on the topic of traditional waterscapes and water management methods in China, as the basis of ecological landscape management.

For a systematic survey of the most important waterscapes, we have established the following theoretical framework:

- Identification of all potential regions with unique and traditional waterscape and water management
- Selection of the highlited locations in each region for detailed studies
- Historic overview of the selected areas
- General landscape and ecological assessment of the present conditions of the selected areas
- Conclusions related to possible applications of the analyzed waterscapes and water management solutions

4. WATERSCAPES IN DIFFERENT PERIODS AND CLIMATIC REGIONS IN CHINA: A SHORT HISTORIC OVERVIEW

We have done a bibliography research to identify and compile the potential regions with typical and traditional water manegement regimes in different climatic zones of China. Significant architectural, landscape architectural, ecological and historical works, essays, descriptions and depictations have been studied (Figures 3-8 and list of references from 17 to 27).

1 2

Fig. 1-2: Ancient waterscape maps of China. The water resource representations suggests the importance of water resources in the life of China in 14th century (Ming Dynasty, Southeast of China) (SOURCE: THE METROPOLITAN MUSEUM OF ART, NEW YORK, https://tuchong.com/15985243/61967785?utm_source=weixin&utm_medium=android_share)

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Fig. 3: "Hua yi tu" - a stone carved map from Fuchang, China, 1136 (SOURCE: LIBRARY OF CONGRESS, GEOGRAPHY AND MAP DIVISION WASHINGTON, D.C. 20540-4650 USA DCU, HTTPS://WWW.LOC.GOV/ITEM/GM71005081/)

Fig. 4: "Yu ji tu" - a stone carved map from Fuchang, China, 1136 (SOURCE: LIBRARY OF CONGRESS, GEOGRAPHY AND MAP DIVISION WASHINGTON, D.C. 20540-4650 USA DCU, HTTPS://WWW.LOC.GOV/RESOURCE/G7821C.CT001493/)

One of the most interesting and unique sources of water landscapes from China are the stone carved maps. One of the first stone carved Chinese maps is presented in Figure 3. It was engraved in Fuchang in 1136, and covers China in the Nan Song Dynasty, from the sea at the east to, including Korea, to the Pamier area at the west, and from the Great Wall at the northeast and Heilongjiang region at the northeast, to Hainan Island at the south. The representation shows mountains, rivers, lakes, and more than 400 administrative place names of China.

The map from Figure 4, engraved also in Fuchang at the same time, shows coastlines, the Yellow River and its branches, Tai Lake, Dongting Lake, and Fanyang Lake.

The ancient Chinese experienced primitive worship, religious deification, imagination, miniaturization of landscapes, and reproduction of waterscapes for the natural element of water. (Li, 2011)

From Chinese ancient times, 2500 BC, {Dayu's water control} when people were suffering from floods, up to now, many myths and stories related to floods have been handed down, about water gods, river gods and other primitive worship images. Until Dayu, according to the topography of high west and low east, dredge river course, connect water system, dig canal and build dike.

The systematic water management in the Yellow River Basin has reduced the threat of flood to human settlements, and laid an important physical and environmental foundation for the development of agriculture in China in the next period. (Wu et al., 2016; Qing, 1999) In the Qin Dynasty (221-206 BC), Li Bing and his sons built Dujiangyan in Shudi (today's Sichuan Province), which enabled people to control floods and droughts, so that the kingdom of abundance came, and agriculture flourished (Li, K., & Xu, Z. 2006). (Figure 5)

In addition to water conservancy facilities, emergency strategies for sudden floods were also applied (Figure 6). This pictorial map shows the location of forts on the Yangtze River from Jiujiang-Yangzhou to the borders of the Nanjing district. The red stickers with different lengths are used to mark the hydrological information of different river sections for flood control reference. At the same time, there were special personnel responsible for hydrological monitoring of rivers, who were also responsible for monitoring and organizing people for flood control operations during the flood season.

In the early Han Dynasty, the theory of Geomantic omen emerged, that is, the doctrine of choosing residence according to the environment, and it has continued to this day. It has a profound impact on the location of the city, on the architecture, and the traditional Chinese environmental aesthetics (Ge & Hu, 2014) (Figure 7). The importance of the water and waterscape and its preservation as a natural scenery and artistic image has been surveyed by several researchers. No classical Chinese garden would be complete without mountains and water. In the creation of rock landscapes (landscape penjing), miniature scenes arranged on a tray, both elements are equally vital. *"The superior qualities of water are to be emulated by man: It follows its own course and always fills the bottom level, equivalent to the wise man being true to himself and maintaining a low profile. Water is the emblem of the unassertive. Taking the path of least resistance, always yielding, its effectiveness is unsurpassed… Yang and Yin*

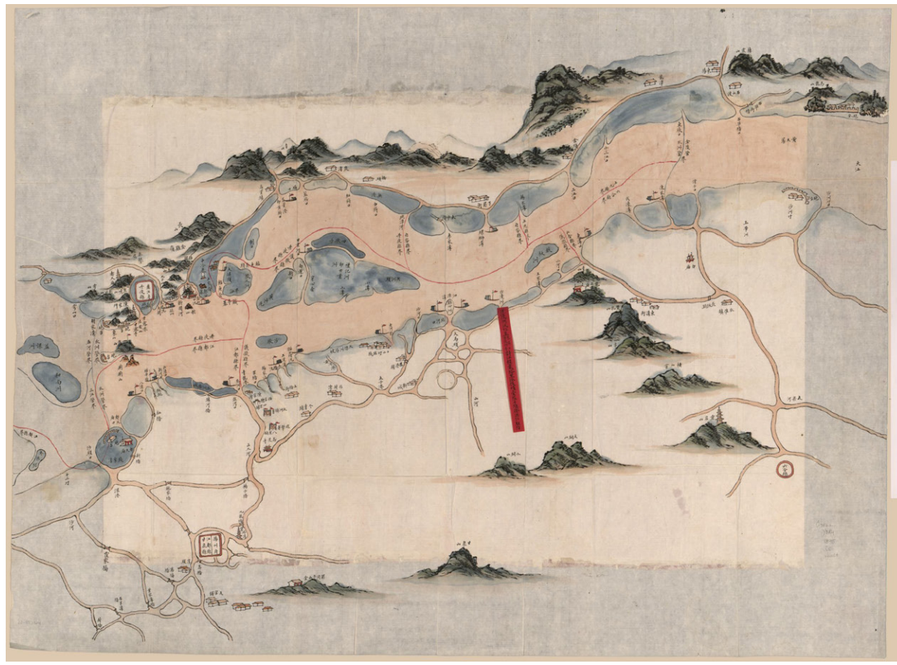


Fig. 5: Map of the waterways and main points of interest of Min and Yangtze Rivers from Songpan, Sichuan to Jingzhou, Hubei. One of the 14'th river section published on the website (SOURCE: LIBRARY OF CONGRESS, GEOGRAPHY AND MAP DIVISION WASHINGTON, D.C. 20540-4650 USA DCU, HTTP://HDL.LOC.GOV/LOC.GMD/G7822YM.GCT00273)

Fig. 6: Complete flood control map of the Yangtze Naval Brigade. 1864 (SOURCE: LIBRARY OF CONGRESS, GEOGRAPHY AND MAP DIVISION WASHINGTON, D.C. 20540-4650 USA DCU, HTTP://HDL.LOC.GOV/LOC.GMD/G7822Y.CT003300)

are associated, among other elements, with heaven and earth, the masculine and the feminine, the light and the dark, the solid and the liquid, the firm and the yielding. Mountains and water form such an ideal yang-yin pair." (Albert, 1988)

The best principle for locating cities is: living by the water, backing the mountains and facing the water, sitting north facing south. (Figure 8.) During the Tang and Song Dynasties, foreign trade gradually developed and the Silk Road emerged. The foundation of this Silk Road is the water source of the oasis in the arid area of the northwest (Li, Qian & Zhou, 2017), which is like a string of pearls, connecting all the oases in series. The water was not only connected with trade, but also linked to the economic cultures and civilizations of Eurasia.

During the Ming and Qing Dynasties, the construction of flood control facilities and the diversion of the Beijing-Hangzhou Grand Canal was further improved, which not only prevented floods, but also embodied the concept of today's South-to-North Water Diversion, and at the same time exploited the shipping value of connecting the North and the South. (Qiao-yi, 2005).

Looking back on the history of Chinese water landscapes, it is mainly divided into four historical periods, namely, the pre-Qin period, the Qin and Han periods, the Tang and Song Dynasties, and the Ming and Qing dynasties. The ideas related to water landscapes have shown the progress of primitive worship – simulation of fairyland – combination of man-made landscapes and nature – simulation of nature, and their functions can be divided into visual amenity, drinking, irrigation, boat traffic. In different climatic regions, the functionality of water landscapes has also different emphasis. The examples selected in this study are taken from different climatic regions, having a water landscape heritage with different functions still in operation, and the ecological component presented in each case (Figures 9a-b).

The study examples cover water storage in arid regions in the northwest, adjacent water settlements in the southeast monsoon region, and irrigation facilities in the mountainous regions in the southwest to include various climatic conditions and water resource functionality.

5. DISCUSSION

Our framework shows, that a division into four climatic zones, according to Figures 10a-b, and a presentation of a case study from each area (related to different historic periods) can offer a comprehensive overview about the most traditional waterscapes and water management methodologies used in China during the centuries.

5.1. Case study no. 1: The southeast of China

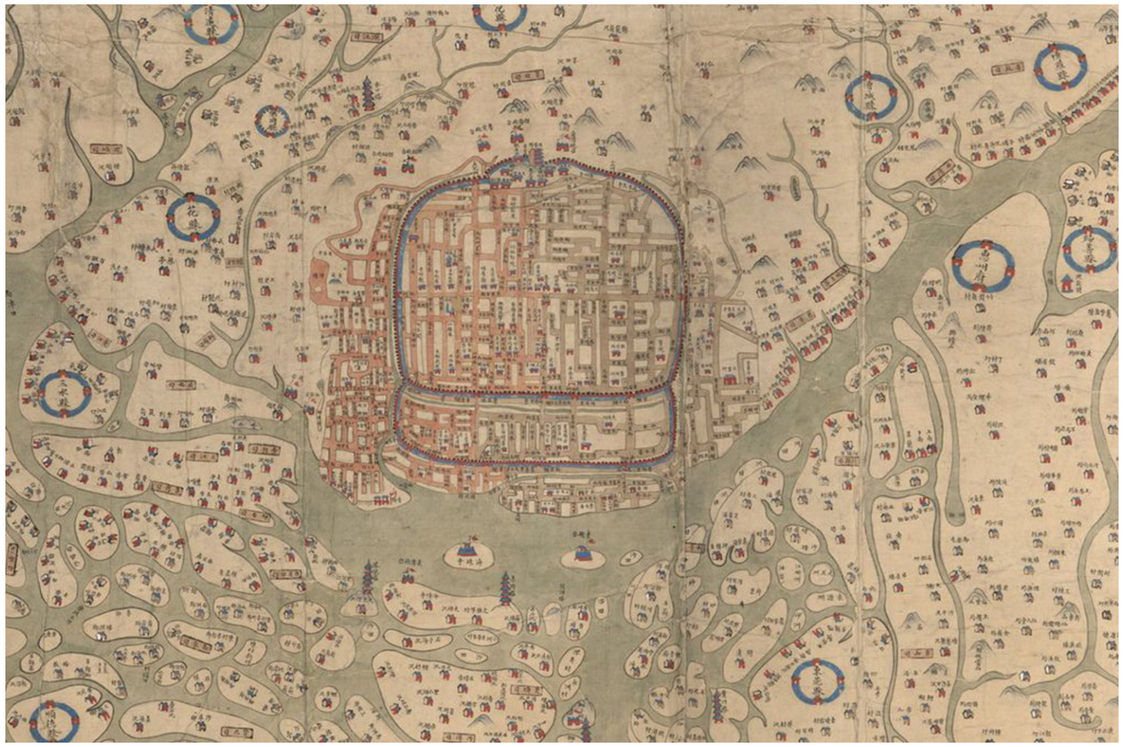
This is a monsoon region, with an average precipitation between 1600 mm – 800 mm. The northwest region is a dry region because of the low inland precipitation. The precipitation has decreased from southeast to northwest since

7

8

Fig. 7: Mountain and river – traditional Chinese painting (SOURCE: HTTPS://WWW.ARTISOO.COM/MOUNTAIN-RIVER-CHINESE-PAINTING-P-4683.HTML)

Fig. 8: Map of the waterways in Guangdong city (1815). The map shows a very rich water system represented by rivers, channels, lakes, shores, islands, drainage system and the spatial relationship between water and the water related human features (towns, villages, roads, passes) in Guangdong Province, including the Leizhou Peninsula and the Hainan Island (SOURCE: LIBRARY OF CONGRESS, GEOGRAPHY AND MAP DIVISION WASHINGTON, D.C. 20540-4650 USA DCU, HTTP://HDL.LOC.GOV/LOC.GMD/G7823G.CT003406)



ancient times (Figures 10a-b). Thus, the spatial distribution of the precipitation is uneven, and due to the monsoon, the climatic characteristics of high temperature and rain in summer and cold and dry winter result in uneven distribution of water resources. Accordingly, the water landscape in China's humid regions is dominated by the surface water of rivers and lakes, and groundwater in the northwestern region.

The water and soil provides subsistance for people, and the uneven distribution of water resources in time and space has also resulted in large differences in water resources management strategies in the northwest and southeast.

Looking at the local conditions, it is not difficult to see from the water landscape heritage that it has preserved time-tested wisdom of ancient people in water management.

The Beijing-Hangzhou Grand Canal was built in the Tang Dynasty and had it golden ages in the Ming and Qing Dynasties (Qiao-yi, 2005). The map from 1884 (Figures 11a-c) shows waterways combined with points of interest and dikes of the Grand Canal and the Yangtze River from Beijing via Yangzhou to Dongting Lake in Hunan.

Since China's terrain is high in the west and low in the east, most of the rivers in China flow from west to east. The Beijing-Hangzhou Canal spans from the 800 mm to other precipitation zones, running through multiple rivers transversally, and connecting the north and south of China through waterways. It has an important impact on the natural environment and the economic and cultural development of the eastern coastal areas.

Since eastern China is located in the monsoon region, the precipitation of the north temperate monsoon of the Huaihe River in the Qinling Mountains and that of the south subtropical monsoon of the Qinling Mountains show significant difference. Due to the influence of the subtropical high pressure zone each year, the rain belt is narrow and long from the east to the west, so that rainfalls often cover the entire basin. This is easy to result in floods, across multiple watersheds from north to south, and the Beijing-Hangzhou Grand Canal can disperse the flow of different watersheds and reduce flood peaks. In the dry season, the rivers in the south are abundant in water and can supply water for agricultural production in the north through the canals. Today, the Beijing-Hangzhou Grand Canal has become a part of the South-to-North Water Diversion Project.

5.2 Case study no. 2: The southwest of China

The study area no. 2 is located in the southwest of China, on the Chengdu Plain in Sichuan Province. It was established in the Qin Dynasty and was completed by Li Bing and his sons for several generations. Its main part is composed of fish mouth, aquarium mouth, and Feisha weir, which can control the flow rate of the canal through intervention into the riverbed. Therefore,

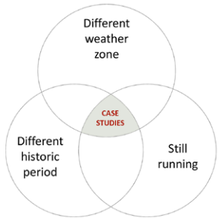
Fig. 9a-b: Timeline of the history of Chinese water landscapes and the scheme of principles for the case studies selection (SOURCE: PREPARED BY THE AUTHORS)

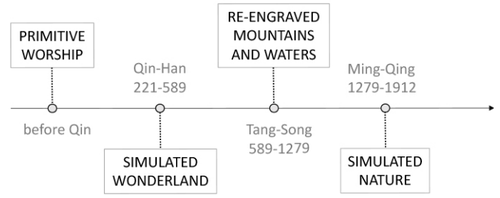
Fig. 10a-b: Location of research areas (case studies) and the map of the dynamic change of the monsoon in East China (SOURCE: PREPARED BY THE AUTHORS BASED ON HTTPS://GEOLOGY.COM/WORLD/CHINA-SATELLITE-IMAGE.SHTML)

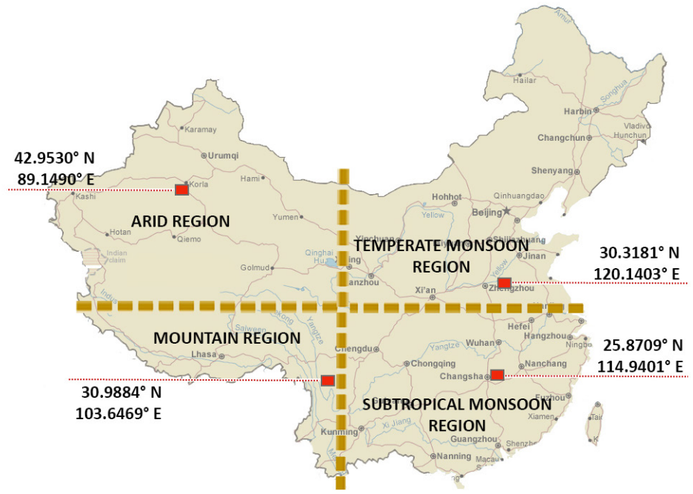
whether it is in the dry season or the rainy season, the Chengdu Plain can receive sufficient water for irrigation. In addition, it has strong ecological significance. Unlike modern dams, Dujiangyan uses Kuanglou and other facilities to build temporary dams. The semi-open structure can allow some aquatic creatures to pass smoothly, which is of great significance for migratory aquatic animals in the basin. It is a model of harmony between man and nature.

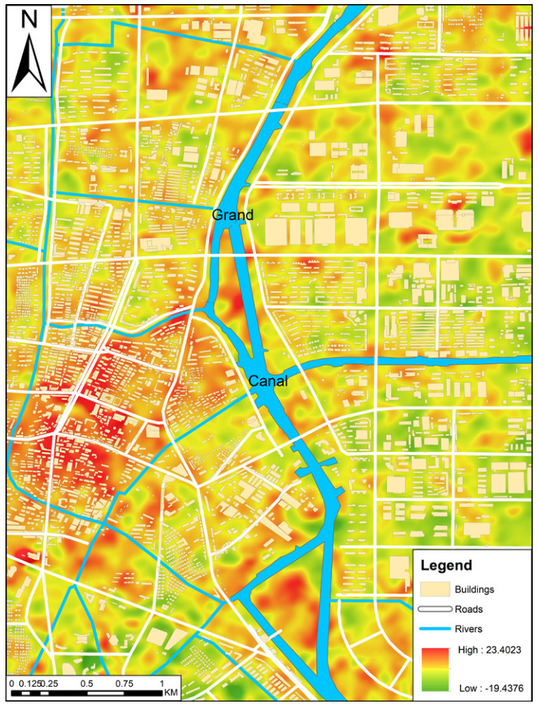
The construction of Dujiangyan also has its peculiarities. The river is curved, slowed down, and interspersed with mountains and minor rivers, which played a basic role in the formation of the weir. However, the fact that Li Bing and his sons were able to choose this place for construction from many areas shows that the ancients already knew well about the importance of topography (Figures 12a-d).

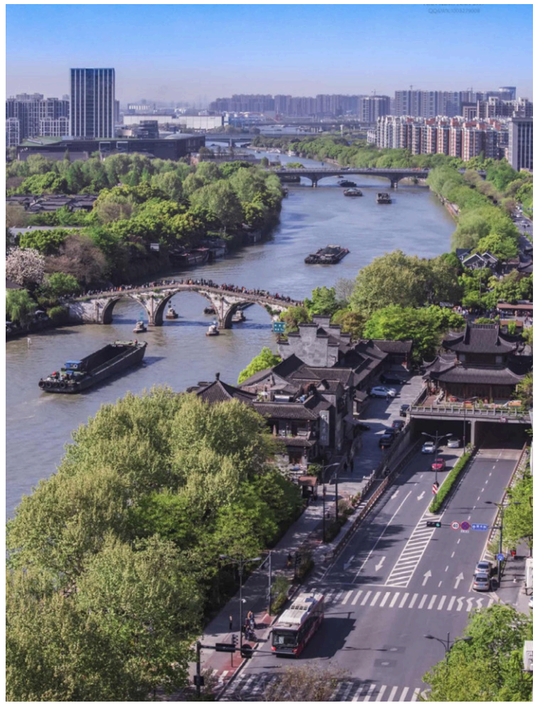
The main structure of Dujiangyan is a river division system composed of three artificial dams and a buffer zone. This system splits the Minjiang River three times. As shown in the figure, the first division is located at Yuzui, splitting the river into external and internal branches. The location and construction of the dam conform to the principle of concave bank erosion and convex bank accumulation in hydrology, and the difference in flow velocity between the inner river and the outer river is taken into account. It will lead to an altered sedimentation of the Neijiang River, so that the riverbed of the Neijiang River will be deepened to prevent the sedimentation of the riverbed and ensure the stability of the water resource. The second division is located in Feishayan, from Neijiang to the second division. As the river is narrow and the flow rate slows down, sediment will be deposited here to form a buffer zone. As a result, the river bed rises in the buffer zone, which prevents the river from flowing into the external branch during the dry season, while during the flood period, the rise of the water level will sweep the sediment away in the buffer zone and deepen the riverbed to accelerate drainage. The lower third division is located at the mouth of the Aquarius, where it took eight years to manually excavate the rock to form a relatively solid waterway. Due to the first two divisions, the amount of water entering the mouth of the Aquarius will remain relatively stable, thus providing sufficient water for irrigation and the households throughout the year.





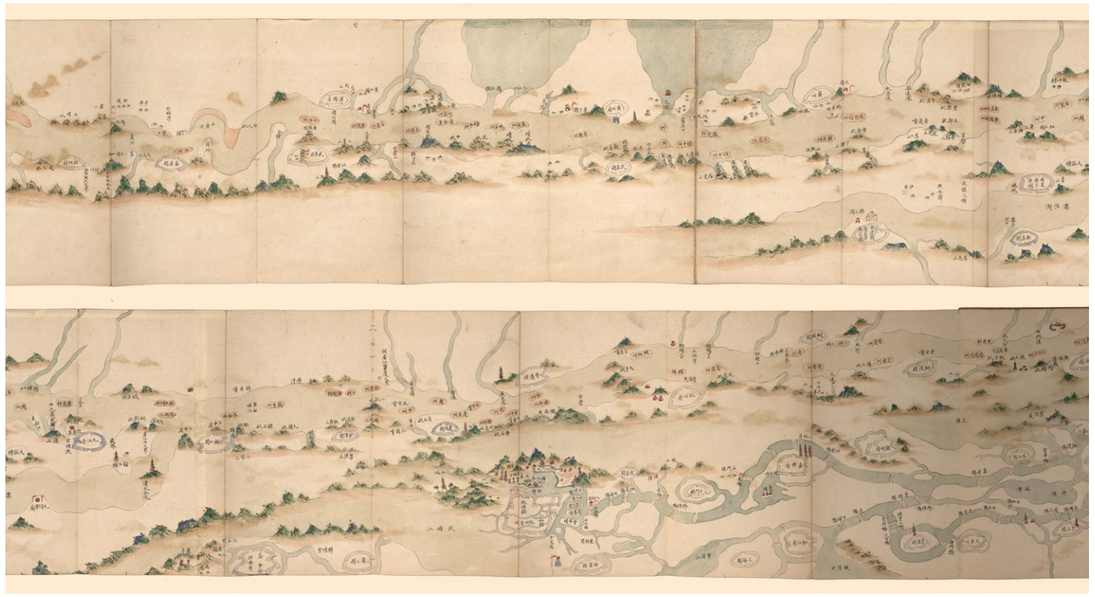






11a 11b 11c

Fig. 11a-c: The Beijing-Hangzhou Grand Canal (Tang period) nowadays and in a map representation (Map of the Grand Canal water course) from 1884 (SOURCE: PHOTO BY AUTHORS AND THE LIBRARY OF CONGRESS, GEOGRAPHY AND MAP DIVISION WASHINGTON, D.C. 20540-4650 USA DCU, HTTP://HDL.LOC.GOV/LOC.GMD/G7822GM.GCT00252)



5.3 Case study no. 3: The northwest of China

Xinjiang has a temperate continental climate, with aridity and less rainfall throughout the year, and with a total precipitation of 170 mm. The main water supply is glacier melt water. Kanerjing has been popular in Xinjiang since the Han Dynasty and it is still used today. It is very similar to some water facilities from Iran, namely Qanat. (Haidari & Fekete, 2015). The principle of Kanerjing is to establish underground tunnels to protect precious water resources from being quickly evaporated through soil layers. Usually, the search for borehole sites starts at the foothills. The vertical wells are drilled first, and then the horizontal wells are drilled down below the diving level. The vertical wells are connected to form underground water tunnels from the foot of the mountain to the oasis. The oasis around the Tarim Basin in Xinjiang is nourished by these Kanerjing. (Figures 13a-c)

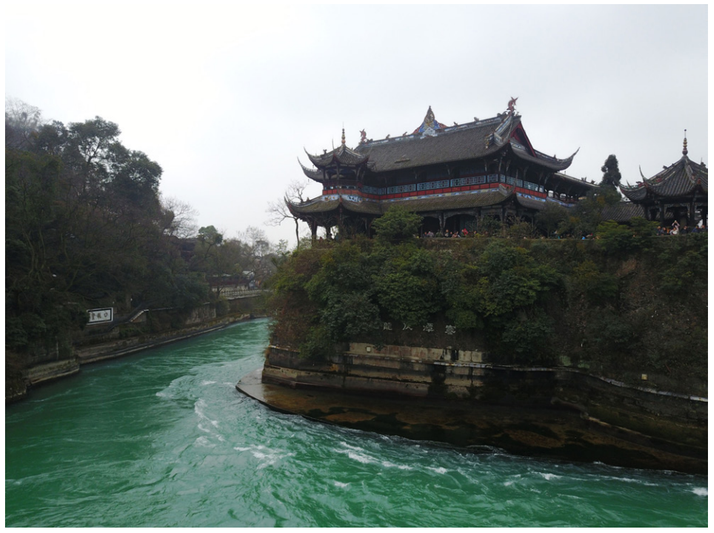
The most important function of the Kanerjing is to provide a reliable and clean water resource for agriculture in Xinjiang through underground canals. The construction of underground canals utilizes the difference in terrain and expands the living space and time of Xinjiang people by reducing evaporation. In ancient Chinese society, it was built and used by manpower, and its development concept of conforming to the natural environment is worth learning and applying in today's water landscape construction.

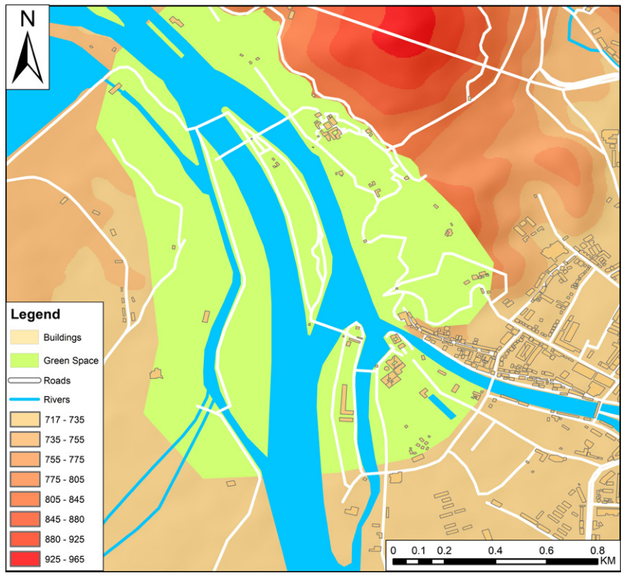
5.4. Case study no. 4: The southeast of China

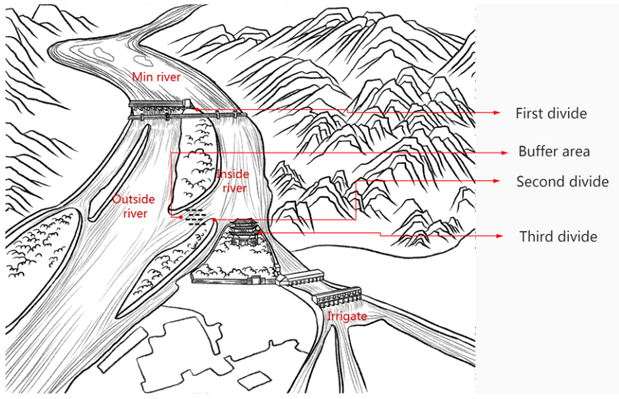
Song Dynasty ancient city, Ganzhou, Jiangxi Province is located at the middle and lower reaches of the Yangtze River. It has been a flood-prone place since ancient times. Its drainage system is still in operation. It has been protecting the ancient city from floods from 975 years ago to the present day. (Ge & Hu, 2014)

The flood prevention system of the ancient city of Ganzhou is divided into three parts, from the inside to the outside: the reservoir, the water window, and the city wall. There are 6 pools connected to each other in the city, which can collect precipitation and provide water for domestic and other uses. When the rainwater collected in the pool in the city is too much, it will be discharged outside the city through the water window by the water channel. The water window design uses only water pressure to achieve drainage. Establishing a buffer zone for floods can ensure that even if the river water level is higher than the level of the ancient city when the flood peak arrives, there will be no backflow. Moreover, the city wall adopts a bionic design. The entire wall is elliptical and streamlined like a tortoise, so that it can withstand the impact of floods. (Figure 14a-f)

The most important flood control measure of Ganzhou ancient city is the water window in the city wall. It has two important functions: to drain the water in the city and to prevent the flood from flowing back. The functionality of water windows is achieved by







12a 12b 12c 12d

Fig. 12a-d:
Irrigation canal 'Du Jiang Yan', Sichuan province, Qin period (SOURCE: PHOTO AND SKETCH BY AUTHORS)

the interaction of walls, buffers, and drainage pipes. As shown in the figure, in normal years, the water level of the river is low. As the terrain of the inner city is higher than the riverbed, the accumulated water in the city will be discharged into the buffer zone along the pipeline through the water window, and a certain amount of water will continue to be discharged into the river through the drainage pipeline in the city wall.

When the water level of the river rises and exceeds the ground level of the city, the river water will flow back into the buffer zone along the drainage pipeline. Since the water window has a special structure similar to the vein valve in the blood vessel, when the water level in the buffer zone exceeds the height of the water window, it will be automatically closed under pressure to prevent the flood from flowing back to the inner city, so as to ensure the urban drainage and prevent the flood from flowing back.

6. CONCLUSIONS

The ancient Chinese water resource utilization model is a logic of harmony based on the ecological approach of the water use and management. Summarizing the above examples of water landscapes in China, although the climate has an impact on the use of the water, the logic of creating various water landscapes by Chinese ancestors is indeed the same, and besides the direct use of the water – such as drinking, irrigation, transport etc – one of the most important indirect and secondary advantages of the water management system is the ecological benefit represented by different kinds of water uses.

a. Harmonious water-space relationship

Cleverly using the original topography to make the most benefit of the situation. Making full use of the principle of hydrodynamics that water flows towards lower places, especially in diversion, establishment of canals, flood discharge and prevention of disasters, which can accurately reflect.

b. Harmonious dynamic and static relationship: Circulation and adaption.

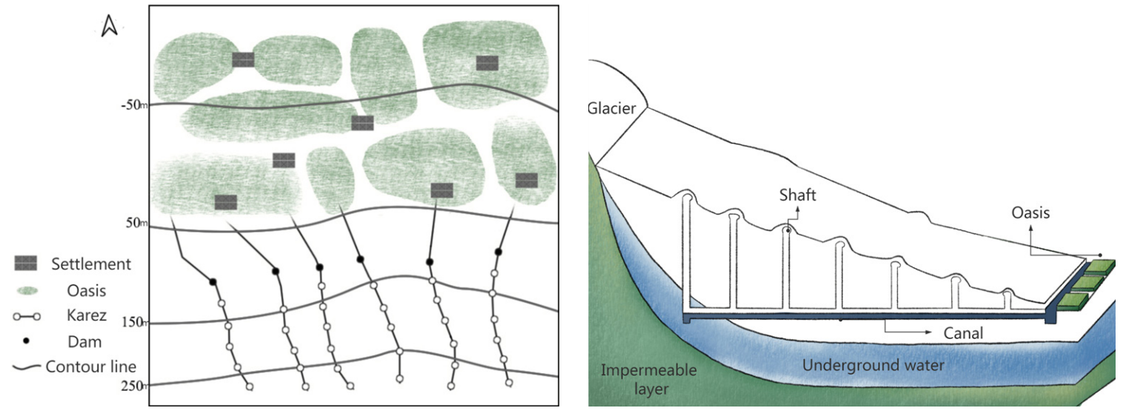
The ancient Chinese realized that water is an integral part of nature, in the process of constant movement, change and circulation, conforming to the natural characteristics, making a good use of the beneficial parts of each element of the water cycle, applying the water cycle processes, but not destroying or blocking them. The process of water cycle is a symbiotic relationship.

c. The Harmony of man and nature: Cohesion

The attitude of the ancient Chinese towards the natural environment is awe. The dualism of the ancient Chinese classified everything in the world into two parts, yin and yang, and yin and yang are in a symbiotic cycle. For example, in nature, mountains can be classified as yang and water is classified as yin. Men are

13a 13b

13c



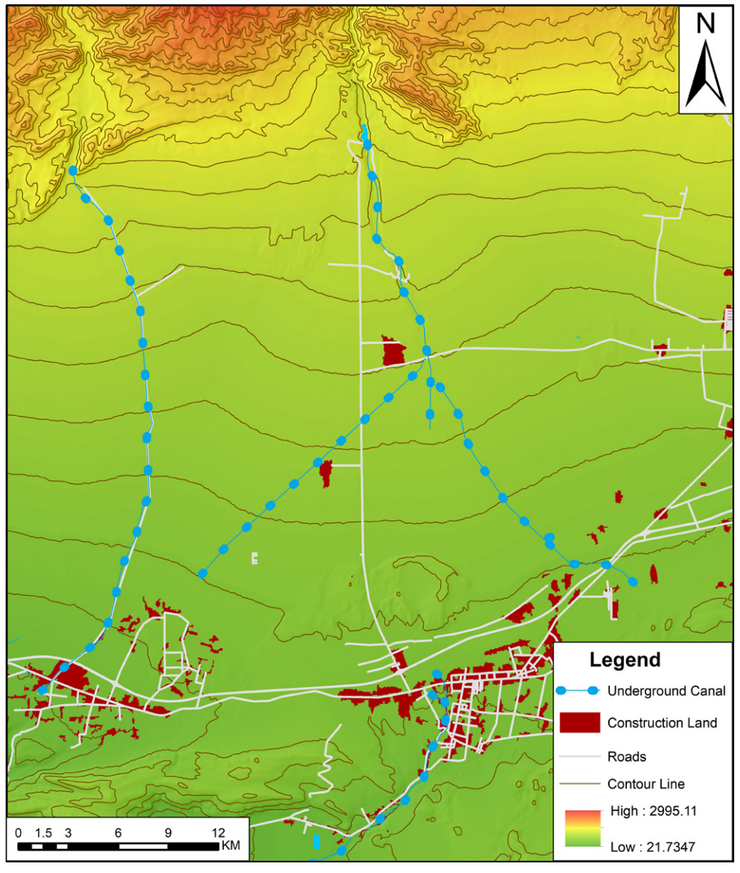


Fig. 13a-c: Kaner Jing (Karez), Xinjiang province, Han period. Map and sketches of the Karez Well System. The karez located around the city of Turpan in China's western region of Xinjiang, is an incredible example of an ancient irrigation system and the Uyghur ingenuity that developed it. The karez well system is considered the greatest Uyghur engineering accomplishment (nicknamed "The Underground Great Wall"), and even today is a marvel to visit and see (SOURCE: HTTPS://WWW.FARWESTCHINA.COM/TRAVEL/TURPAN/UYGHUR-KAREZ-WELLS/)

classified as yang, and women are classified as yin, so everything in the world is mutually opposed and interdependent to some extent. Humans must find a way to live in harmony with nature.

d. Harmony of time and space: Achieving balance in both space and time.

Two thousand years ago, Confucius said that he was not worried about want but only about imbalances. With regard to the temporal and spatial distribution of China's water resources, what nature gives us happens to be unbalanced. Therefore, the Chinese have been thinking about the role of time and space in the course of the construction of water landscapes.

At present, China is experiencing a flood breaking the historical records, and a large number of cities suffer from water logging and flooding.

For example, in the past 10 years, Wuhan city which is located in central China has experienced waterlogging after heavy rains. And in 2016, there have been 3 times of extremely large and continuous precipitation weather with accumulated precipitation exceeding 500mm in one week. (Chen, 2016) Excessive urban area and unreasonable drainage design caused severe urban waterlogging and economic losses.

What is worth exploring is that the ancient cities with normal drainage systems were free from flood disasters. The Three Gorges Dam in China opened its floodgate to discharge flood beyond the critical water level, which aggravated the water level rise in the middle and lower reaches of the Yangtze River Basin. With the background of an abnormal climate, the modern engineering has not achieved the expected ability to reduce flood risk to once in 100 years, while Dujiangyan has continued its function of flood control and irrigation for thousands of years. These realities tell us that we need to learn from traditional wisdom.

Comparing the traditional construction methods of water conservancy facilities to the methods of nowadays, the most significant difference is that the traditional water landscape construction uses the original natural environment as much as possible, but with some intervention, flood control and irrigation, the natural process of river movement can be imitated, and the coexistence of

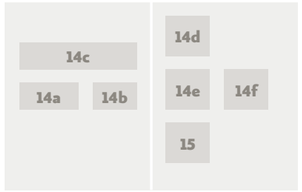
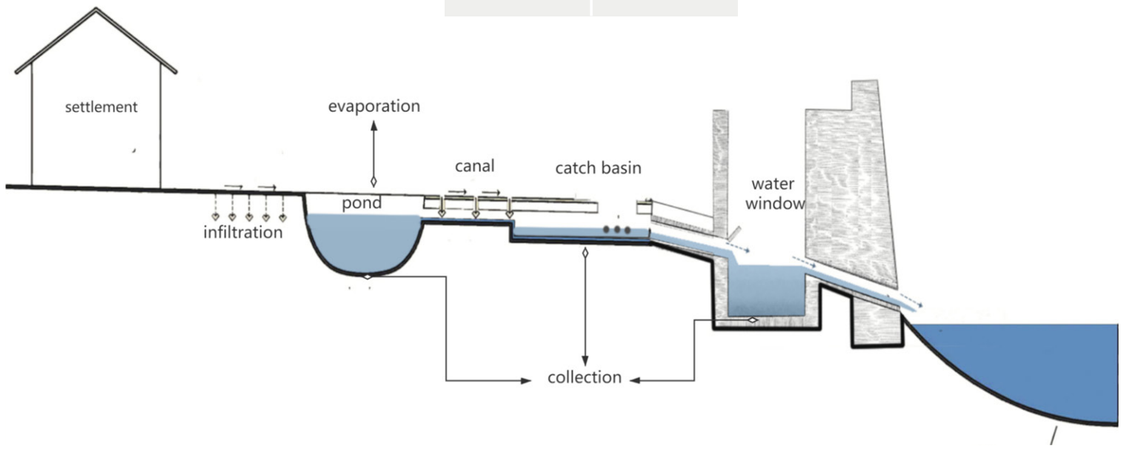


Fig. 14a-f: 'GanZhou', JiangXi province, Song period (SOURCE: PHOTOS AND SKETCHES BY THE AUTHORS)



humans and nature can be achieved. The concept of modern water conservancy facilities is mostly based on interception, blocking and utilization. When blocking a river by dam, the original environmental balance is destroyed. But the advantage is that power generation provides clean energy. Therefore, under the guidance of the traditional harmonious thinking between man and landscape, the water landscape construction is inspired from the perspective of landscape ecology. Taking natural water as the main element, water diversion and saving can realize the water conservancy function of irrigation, flood regulation, power generation and the ecological effect of water landscapes. (Figure 15)

The Harmony logic of ancient Chinese water landscapes is of great significance to urban construction, storm water management, and construction of water conservancy facilities, with regard to today's abnormal climate.

Before landscape planning and construction take place, a baseline surface analysis must be carried out. The urban drainage system must have storage and decentralized units. The riverside settlements must be designed to prevent floods and water logging. At the same time, the existing surface runoff should not be directly intercepted and built. Use the riverbed to leave a biological channel.

Water landscape design in arid areas can focus on the use of groundwater, and make targeted designs based on the specific context.

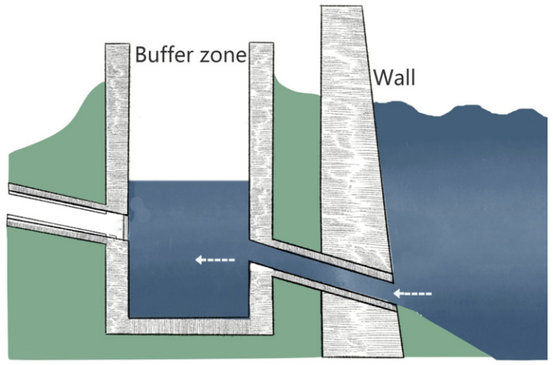
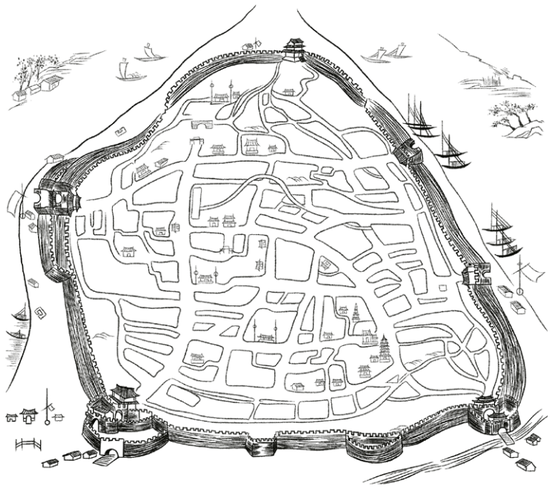
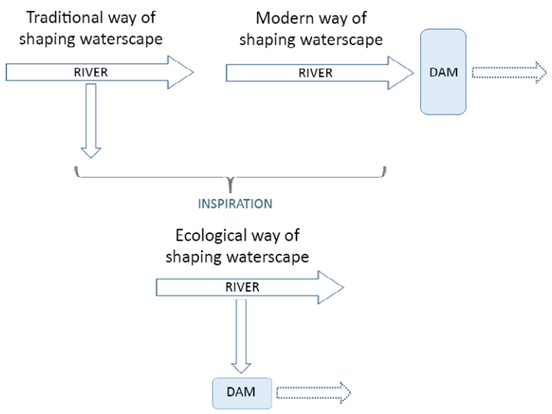


Fig. 15: Inspirational sketch of traditional Chinese waterscapes (SOURCE: SKETCH BY THE AUTHORS)





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ÖSSZEFOGLALÓ

A VÍZ ALKALMAZÁSÁNAK HAGYOMÁNYOS FORMÁI A KÍNAI TÁJÉPÍTÉSZETBEN. ÖKOLÓGIAI VONATKOZÁSOK

A hagyományos kínai táj és filozófia alapvető alkotóeleme a víz. A vízgazdálkodás és hasznosítás, a víz megjelenési formái és látványa kiemelt szerepet játszott az ősi kínai civilizáció kialakulásában és fejlődésében, mezőgazdasági, áru- és személyszállítási, művészeti, és ökológiai szempontból egyaránt.

A tanulmány a víz Kína tájainak alakításában betöltött szerepének általános bemutatásával kezdődik, majd ezt követően négy esettanulmányon keresztül ismerteti részletesebben a kínai vízgazdálkodás egyes történeti aspektusait. A négy esettanulmány Kína különböző, földrajzilag és klimatológiailag eltérő régiójában helyezkedik el, a következők szerint: Jing-Hang Nagycsatorna (délkelet Kína), Ganzhou városa (Kínai-alföld, Yangtze alsó folyása), Turpan városa (északnyugat Kína) és Chengdu városa (délnyugat Kína). Az esettanulmányok szétszórt elhelyezkedése segít áttekinteni a különböző kínai régiókban alkalmazott hagyományos és részben eltérő vízgazdálkodási módszereket, és értékelni azok ökológiai előnyeit.

A tanulmány olyan hagyományos kínai vízgazdálkodási és használati módszereket mutat be, amelyek széles körben jellemzőek az illető régiókban, és hosszú századokon át - egészen napjainkig - használatban voltak/vannak és hatékonyan működnek. Ennek megfelelően a cikk áttekintést ad, illetve elemzi a Chengdu-i csatorna- és árvízvédelmi rendszert, a Turpan-i vízutánpótlás módszereit (amelyek nem csak Kína bizonyos régióiban, hanem szerte a világ száraz égövi, hegyvidéki, sivatagos övezetiben megtalálhatók), a Ganzhou-i mesterséges csatorna és tórendszert, illetve a Jin-Hang Nagycsatorna kapcsán kialakított nagyszabású folyóvíz-szabályozás egyes elemeit. A következtetések a hagyományos kínai vízalaklamazás és vízgazdálkodás ökológia előnyeire illetve kortárs alkalmazhatóságára vonatkoznak.

A METHOD FOR REDEFINING THE AGGLOMERATION OF BUDAPEST

NEW INDICATORS, NEW RESULTS?

EGY MÓDSZER A BUDAPESTI AGGLOMERÁCIÓ LEHATÁROLÁSÁRA

ÚJ INDIKÁTOROK, ÚJ EREDMÉNYEK?

SZERZŐ/*BY:*
ÁKOS KESZTHELYI

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INTRODUCTION

The Agglomeration of Budapest consists of the capital of Hungary and 80 surrounding settlements, each of these are located in Pest county. This delimitation has been in force since 1996 and, as a result, it no longer appropriately reflects the current and real spatial relations and processes of Budapest and its surroundings (Schuchmann & Tóth 2010; Schuchmann 2019). In 2007 the Development Council of the Agglomeration of Budapest – which has been disbanded by today – formulated the necessity of redefining the agglomeration (DCAB 2007). As a result in 2010 and 2014, a statistically-based method has been published, however, the results couldn't be put into practice (Schuchmann & Tóth 2010; Tóth 2014). In 2019, "Strengthening the cooperation between Budapest and its region" came forward, as the Budapest 2030 program set it as a goal. It was formulated as a criticism that the Act CXXXIX of 2018 was drafted without redefining the Budapest agglomeration, so no substantial progress has been made in this matter since the adoption of the National Development and Spatial Development concept in 2014 (Schuchmann 2019). Even though the National Development and Spatial Development defines "the reinterpretation of the delimitation of the Agglomeration of Budapest" as a development policy task, and that the Long-Term Urban Development Concept of Budapest formulates „defining the new boundaries of the Agglomeration of Budapest by taking into account spatial processes and the results of the 2011 census" as one of the means of implementing the thematic task "Strengthening territorial cooperation". With these in mind, this study aims to find a delimitation methodology that follows the spatial processes with sufficient sensitivity and fits into the development documents.

1

Source	Definition
Kovács, Tóth (2003)	„A settlement structure, where population growth and significant housing activity can be observed. The processes that took place in the 1990s indicate that a growing population and housing construction activity. The processes that took place in the 1990s indicate that the growing population and housing activity is not typical in the centers, but in the surroundings: for various reasons, the population moves from the centers to the surroundings as immigration from other areas is directed to those areas, and they build a house there. Jobs for the active population (the vast majority) are located in the centers. Multifaceted functional relationships are established between the center and the settlements in its immediate vicinity (workplace-residence, business-economy, trade-market, education, culture, health, culture, various types of services). As a result of the intensive agglomeration process, continuous, physically integrated build-up areas are formed and the settlements are merged. The infrastructure systems cover and unite the entire territory of the agglomeration (transport, energy supply, public water supply). The settlement structure of the center and its co-centers, the morphological features, the natural-geographical conditions of the affected area (topographic features, hydrographic situation) and the territorial-geographical location of the linear infrastructure play a decisive role in the formation of the settlement structure of the agglomeration. The area of the agglomeration is characterized by intensive land use and the relative density of the build-up area. An increase in installation height can be observed."
Nemes Nagy (2005)	„A complex of settlements created as a result of the processes of concentration and centralization of productive forces, in which the developed city stands out from its surroundings and the surrounding settlements are connected by intensive economic and social life to the central city, and where population densification can be observed around the central city."

Table 1: The most detailed definitions for the agglomeration in Hungary

1. THE CONCEPT AND INTERPRETATION OF AGGLOMERATION IN HUNGARY

First of all, it is necessary to interpret, understand, and formulate the concept and scope of an agglomeration, which sheds light on its basic elements, processes and shows how an agglomeration works. There are several definitions for agglomeration, which have come to light since professionals and scholars have dealt with this phenomenon in Hungary. The relevant and the most detailed definitions are given in Table 1.

Based on the definitions, it can be stated that agglomeration is characterized by very close relations. The intensive increase of the build-up areas, thereby the merge of the build-up areas plays a main role in the agglomeration, and as a result of these, the densification of the population and the increase of daily commute can be observed. Based on these, it can be concluded that the agglomeration is a set of settlements with the closest demographic and urban relations organized around the central core(s), in which the intensive physical growth of the build-up area and the merge of settlements are characteristic.

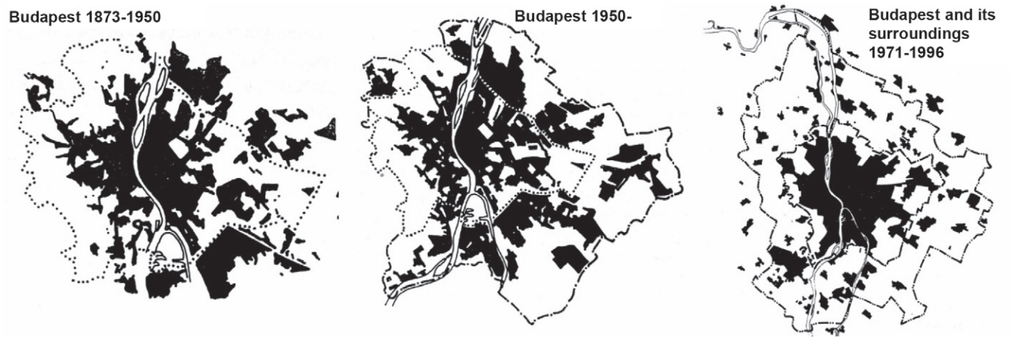

Fig. 1.: The forming of Budapest and its surroundings 1873-1996

Table 2: The statistical indicators of the 2010 and 2014 methodologies

The indicators of the 2010 methodology	The indicators of the 2014 methodology
Budapest city center public road accessibility 2009 (min)	Change in resident population 2001-2011 (%)
Budapest city center public transport accessibility 2009 (min)	Proportion of dwellings built between 2001 and 2012 as a percentage of the 2012 housing stock
Proportion of dwellings built between 2000 and 2008 as a percentage of the 2008 housing stock	Population density 2011 (person/km^2)
Number of cars per 1000 inhabitants 2008 (pcs)	PIT-based income per permanent residents 2012 (HUF)
Proportion of employees 2001	Number of cars per 1000 inhabitants 2012 (pcs)
Proportion of employees in industry, construction, and services 2001	Proportion of daily commuters compared to resident population 2011
Proportion of daily commuters to Budapest 2001	Proportion of active working population 2011
Proportion of daily commuters from Budapest compared to local employees	Proportion of employees in industry, construction, and services 2011
Number of active enterprises per 1000 inhabitants 2007	Proportion of daily commuters to central settlements 2011
Change in resident population 2000-2008 (%)	Difference in migration 2001-2011 (%)
Migration diferrence per 1000 inhabitants 2000-2008	
Population density 2009 (person/ km^2)	
PIT-based income per 1000 permanent residents 2008 (HUF)	

2. THE BRIEF HISTORY OF THE AGGLOMERATION OF BUDAPEST

The area of Budapest is one of the oldest inhabited areas in Europe, the historical significance of which is indisputable due to its strategic position and endowments. The remains of the Roman Empire, its significant role in the Middle Ages made this area one of the cultural centers of the Carpathian Basin and Europe. In its current name, but not in its current form, Budapest was established in 1873 by merging Buda, Pest, and Óbuda (Perényi 1976) (Figure 1).

After World War II, as a result of industrialization, Budapest, as the only city suitable for the establishment of a major industrial center, started to grow strongly (Bernát, Bora & Fodor 1973). In 1950, with the administrative unification of the then Budapest and its suburbs, the administrative border of the capital – which is still known today – was created (Figure 1). In 1960 the government approved the first General Settlement Plan by resolution 1027/1960/X.4., which managed Budapest and its surroundings together for the first time. At that time the surroundings of Budapest consisted of 64 settlements located in the capitals 15-kilometer ring.

In 1969 a new delimitation was created by a comprehensive methodology and detailed examination, which defined an active spatial processes based spatial category and consisted of the capital and 45 settlements in its immediate vicinity (Figure 1). This methodology has already taken into account the distribution of occupations, commuting, the supply levels, the pace of development, and the transport connections of the settlements too, thus the 1971 General Settlement Plan already included an agglomeration zone, which based on these indicators (SPAB 1999). The first plan which named as Spatial Plan of the Agglomeration of Budapest made in 1975 and revised in 1985. In 1996 the Agglomeration of Budapest was redefined by the Act XXI of 1996, which described and defined the extent of the agglomeration still in force today. This delimitation consisted of the capital and 78 surrounding settlements. Through the years the number of the surrounding settlement has numerically increased to 80 by the separation of two settlements. In 2005 the Spatial Plan of the Agglomeration of Budapest has risen to legal force as a priority area by the Act LXIV of 2005. During its review in 2011, the spatial regulations of the area were tightened, but by then it was very late (Schuchmann 2015). In 2018 the Spatial Plan of the Agglomeration of Budapest has brought under the scope of Act CXXXIX of 2018 together with the National Spatial Plan and the Spatial Plan of the priority resort area of Lake Balaton. However, the agglomeration has not been redefined in any law since 1996.

On the other hand, if we look at some demographic and economic data – based on the Central Statistical Office data - we can see why so important and actual to redefine the Agglomeration of Budapest. For the examination, a study area was delineated which consists of Budapest and 301 surrounding settlements in an average 50-70-kilometer ring based on the functional urban area of Budapest (KSH 2018, UA 2018).

Between 1990 and 2018 the resident population of Budapest decreased by more than 250.000 and the surroundings increased by more than 300.000, thus the distribution of the resident population between Budapest and its surroundings changed from 60%-40% to 52%-48%. The migration difference indicator shows the process well because the value of this indicator in 2018 in Budapest was –1,78 ‰, and +11,90‰ in the surroundings. The number of employees decreased by 140,000 in Budapest and increased by 70,000 in the surroundings between 1990 and 2011.[1] The housing stock increased by 115,000 in Budapest and by 175,000 in its surroundings, thus the resident population per dwelling indicator decreased from 2,52 to 1,91 in Budapest and from 2,81 to 2,53 in its surroundings between 1990 and 2017. Meanwhile, the number of cars is significantly increased in the whole area. In this period the number of cars in Budapest increased by more than 140,000 and by more than 400,000 in the surroundings, which is a very big change. Connected to this, the proportion of commuting employees is 29,75% from the surroundings to Budapest in 2011, which means nearly one from every three employee commute to Budapest from the surroundings.

***1** This data based on the census databases. The last census was in 2011 in Hungary*

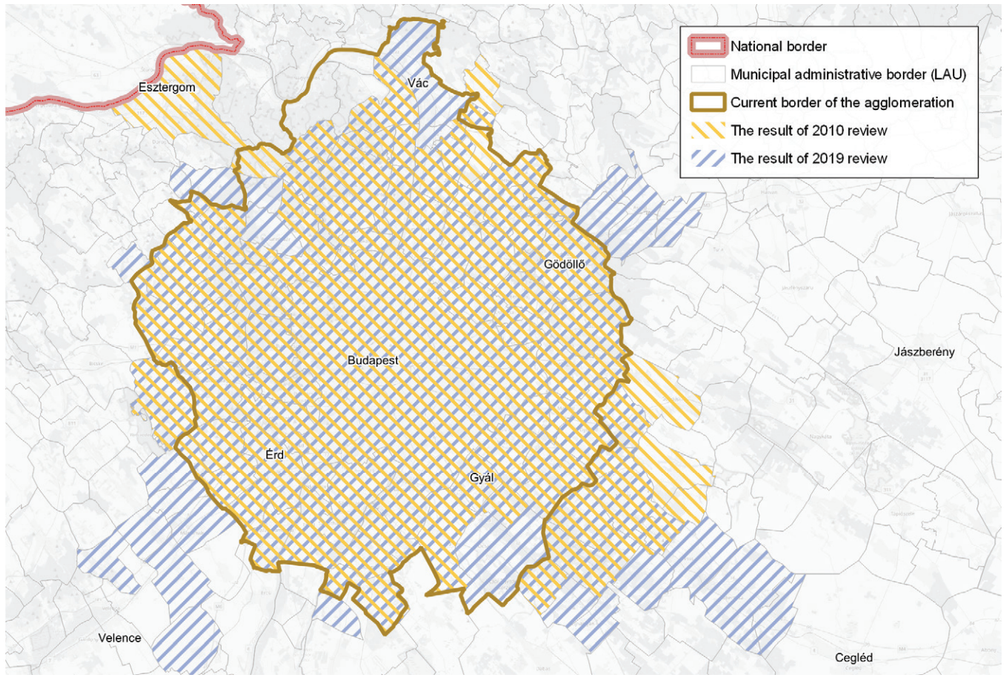

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Fig. 2: The results of the reviews (2010, 2019)

Based on these data we can see how the base demographic and economic processes changed from the delineation of the agglomeration and why is it so important to redefine the agglomeration zone around Budapest these days.

3. ATTEMPTS TO REDEFINE THE AGGLOMERATION OF BUDAPEST

In 2010 a statistical methodology to redefine the Agglomeration of Budapest has created by Géza Tóth and Péter Schuchmann, which included 13 indicators (Tóth & Schuchmann 2010) (Table 2.). It was revised in 2014 and the indicators were modified, which are already based on the data of the 2011 census too (Tóth 2014) (Table 2.). These indicators were derived from Kovács-Tóth's definition.

Based on the 2010 methodology, those settlements could form the agglomeration, which indicators were better than the average of the study area, their population increased, the proportion of new dwellings as a percentage of the housing stock in 2008 reached or exceeded the national average and the capital was accessible within 25 minutes. As a result, the redefined agglomeration consisted of the capital and 85 surrounding settlements (Tóth & Schuchmann 2010) (Figure 2.).

In 2014 the methodology changed a bit. Those settlements could form the agglomeration, which complex indicators were higher than the rural average, due to the general population loss, the criteria were not to be characterized by emigration in the given settlement and the proportion of daily commuters in the resident population should be at least 10%. If a settlement did not meet the criteria but wedged into the area as an enclave, it had to be part of the agglomeration. Thus the Agglomeration of Budapest consisted of the capital and 117 surrounding settlements (Tóth 2014).

The 2014 methodology was revised in 2019 but has not been published officially. The indicators did not change but were updated if new data were available. The method has changed a bit, those settlements could form the agglomeration, which complex indicators were higher than the rural average, the number of housing construction was higher than rural average, the capital was accessible within 35 minutes, the decrease of the population was lower than the rural average and the minimum of 8% of the resident population were daily commuter. Thus the Agglomeration of Budapest consisted of the capital and 107 surrounding settlements (Tóth 2019) (Figure 2.).

4. THE LACK OF STATISTICAL INDICATORS

The purely statistical indicators may show complex statistical differences and processes, but they can not show the spatial effects of the processes with sufficient sensitivity. Although statistical changes have often be linked to some spatial change, thus these indicators also have a significant spatial dimension. In the following, the lack of statistical indicators are highlighted one by one.

The change of the resident population an appropriate indicator, as urban agglomeration is accompanied by an increase in the population, however in Hungary the population is decreasing nationwide, so in this case, this indicator can not show a clear picture of the real processes by itself.

The proportion of dwellings built is theoretically correct, but it does not reflect the size of the dwellings and the land occupied by the associated property, so it is not sensitive to the dimensional properties of the urban sprawl.

The population density shows the distribution of the resident population compared to the total administrative area of the given settlement. Although administrative areas are very diverse in size and may contain many non-built-up areas, which may distort this indicator, while densification occurs in urban areas, so in this form, this indicator does not provide an appropriate picture of spatial processes.

The PIT-based income per permanent residents and *the number of cars per 1000 inhabitants* are a quality indicator, which is more suitable for exploring individual better or less better sectors rather than determining the extent of the agglomeration zone.

A high level of commuting is the basis of an agglomeration, so the *proportion of daily commuters compared to resident population* indicators is essential. Although, it is not necessarily to be examined in the proportion to the resident population. There is a large proportion of people who are locally employed or who are not even working and commuting within the resident population, thus this fact may distort the values of the indicator.

The proportion of the active workers is an appropriate indicator, as the central city attracts and concentrates those who want to work in its area, but this cannot give a suitable picture alone, because it does not show the actual location of the workplace.

The proportion of employees in industry, construction, and services is not a necessary indicator. No further segregation within employees is required. People choose a job based on their motivations and opportunities, wherever they want or can. Compared to the country, Budapest also concentrates a large proportion of jobs, including jobs in industry, construction, and services, but a separate analysis of these is not necessary in terms of the extent of the agglomeration.

The proportion of daily commuters compared to the resident population is reflects the difference between the workplace and the residence location, which expresses an attachment to a center, so the examination of this indicator is necessary, because it may show relations between the central and the given surrounding settlement.

The difference in migration can be an appropriate indicator, in addition to the decreasing population, but its mistake is that it does not take into account the changes in the urban or built-up area and is not sensitive to urbanization and densification processes.

The time factor, and analyzing availability within a given time is an inappropriate indicator. In several cycles a day, the distance that can be covered in a given time varies often depending on the

The most affected relief categories by urban areas
A*:0-100 S**:0-5; A:0-100 S:5-12
A:100-150 S:0-5; A:100-150 S:5-12; A:100-150 S:12-17; A:100-150 S:17-25
A:150-200 S:0-5; A:150-200 S:12-17; A:150-200 S:17-25
A:200-250 S:0-5; A:200-250 S:5-12; A:200-250 S:12-17
A:250-300 S:0-5; A:250-300 S:5-12
A:300-350 S:0-5; A:350-400 S:0-5
*A = Altitude (m)
** S = Slope (%)

Table 3: The most affected topographical categories by urban areas

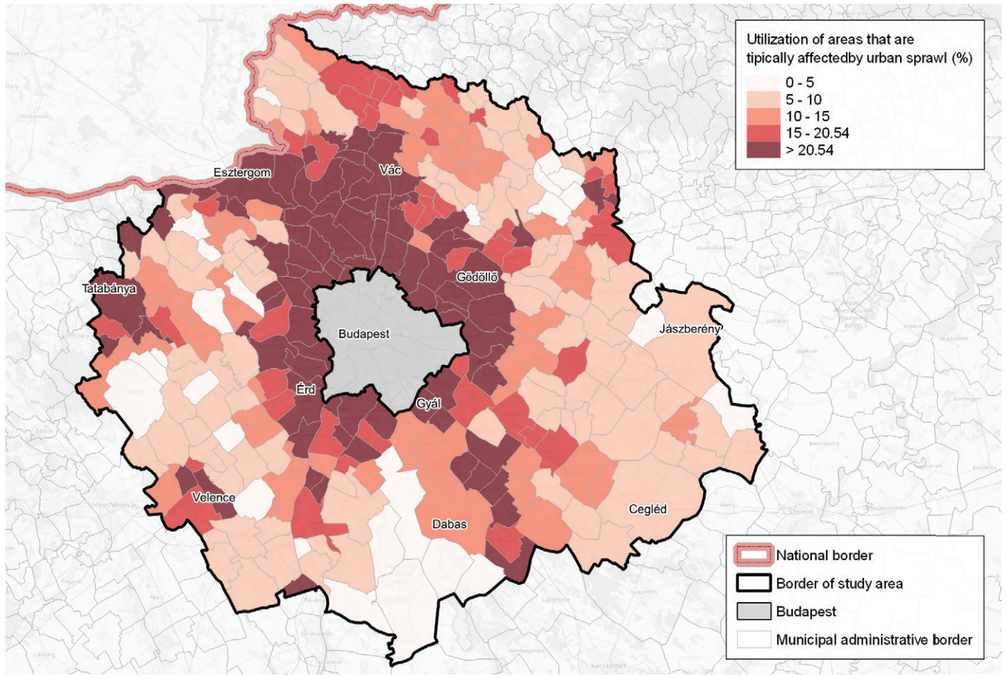

Fig. 3: The utilization of the areas that are tipically affected by urban sprawl

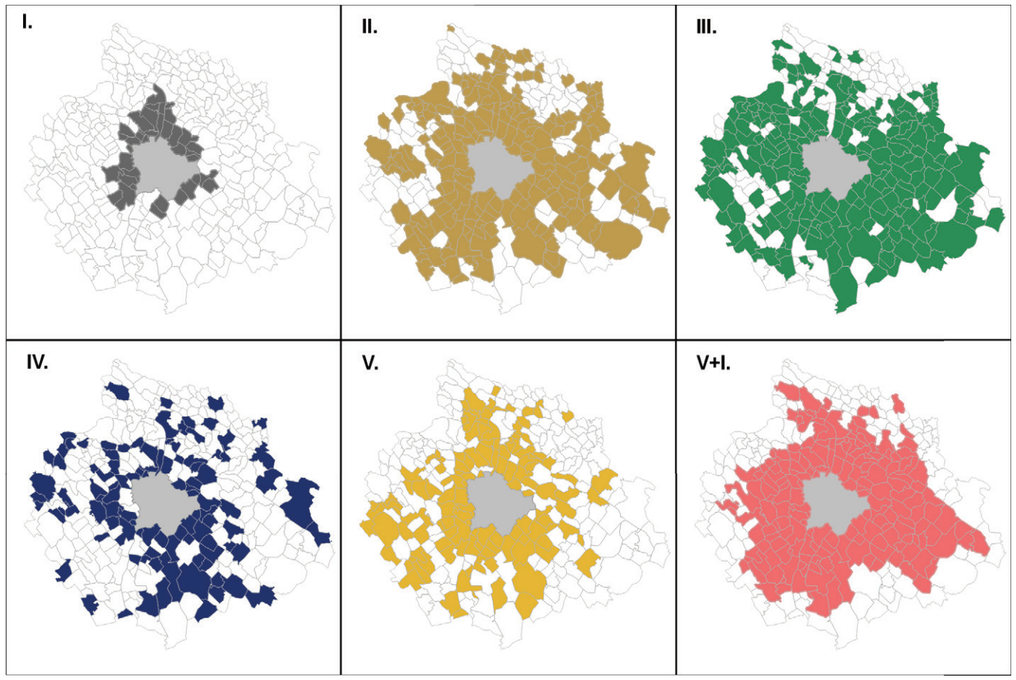

Fig. 4: The results of the new indicators

traffic, so the indicator is too diverse and it envisions a too ideal case and does not take into account the longer commuting time taken from the constraint.

5. THE NATURAL-GEOGRAPHICAL CONDITIONS

The biggest lack of statistical method is that they can not reflect appropriately to the natural-geographical conditions, thus their enumeration was not even part of the agglomeration delimitation methodologies in Hungary. Even though the most detailed definition underlying the natural-geographical conditions ability to influence the spatial structure.

Four main features were analyzed, that have a major influence on new build-up areas: the forests, the water surfaces and wetlands, the altitude and the slope in the study area which consists of Budapest and 301 surrounding settlements. This study interprets forest, water surfaces, and wetlands as non-buildable areas. For the analysis of relief conditions, 10 categories were created based on the altitude and six categories based on the slope, so 60 different relief categories were formed based on their summation. After the summation, the forests, water surfaces, and wetland areas had been cut out from the database, and the remaining areas were further analyzed. The categories which most affected by urban areas were selected (Table 3.). These categories have been named as the area that typically affected by urban sprawl.

After the identification of the areas that are typically affected by urban sprawl, the proportion of these areas by settlement had been identified, and after that, the proportion of already built-up areas has been identified in those areas by settlement. In the case of the whole analyzed area, this value was on average 20.54% per settlement (Figure 3). The existing spatial regulations may further reduce the extent of buildable areas, thus this proportion may increase taking them into account.

6. NEW INDICATORS

Based on available data six new indicators have been developed, five new „urbanization indicators" and one modified statistical indicator. The analysis of the extension of land uses and urban or built-up areas are based on the CORINE land cover database.

I. Contiguous urban area
This indicator enumerates those settlements in which urban areas are physically connected to Budapest or are so close to each other that the 200-meter buffer zone of their urban areas meet, so their relative proximity to each other is very high. Thus, their urban areas could be said to be connected to the capital.

II. Proportion of urban area
Those settlements are located in the agglomeration, which has a prominently large urban area, thus more land is lost from other land uses than

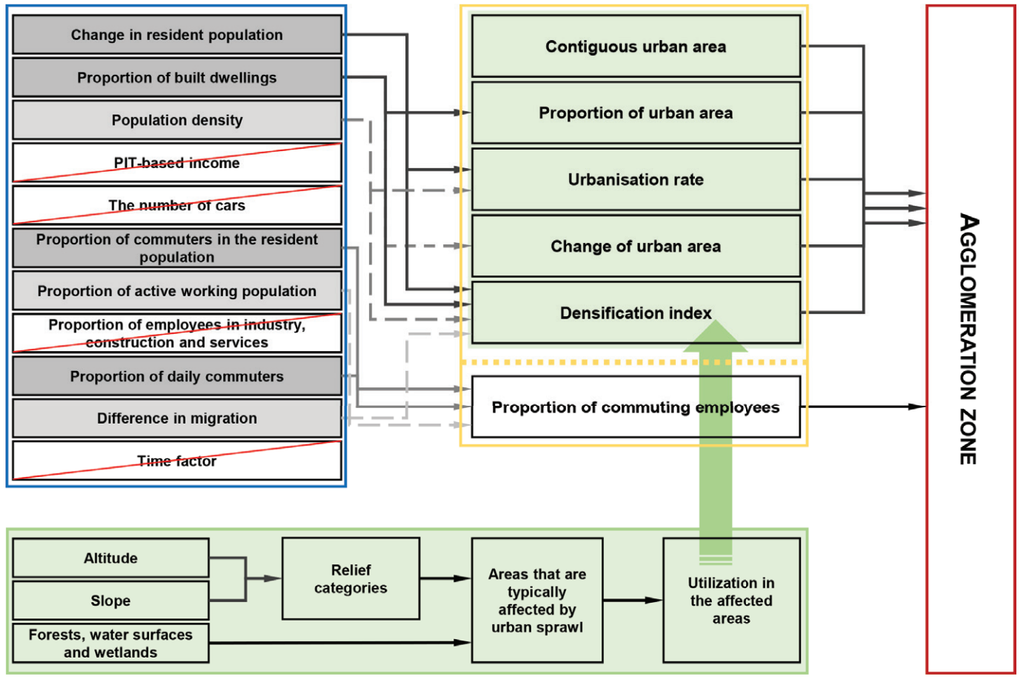

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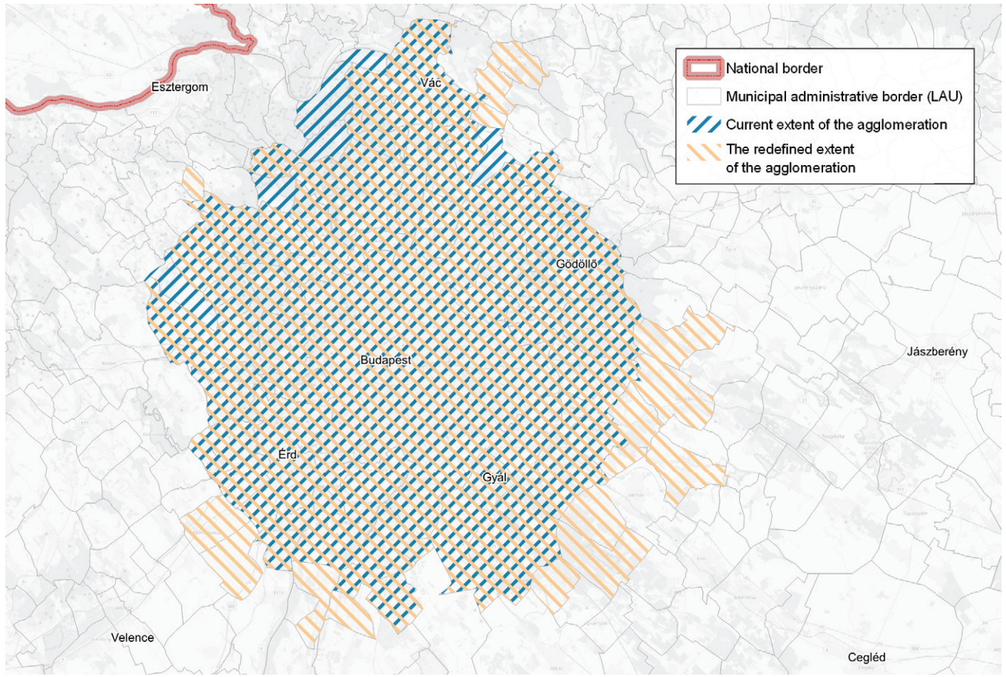
Fig. 5: The process of the new methodology
Fig. 6: The result of the new methodology



average, so its presence is more significant. Accordingly, those settlements are included in this indicator in which the proportion of the urban area is higher than the national average.

III. Urbanization rate
This indicator based on the OECD's report named *Redefining „Urban" – A New Way to Measure Metropolitan Areas (2012)*. It highlights the relations between the resident population and the extent of the inhabited land. Essentially, it shows the population density concerning inhabited areas, thus getting rid of the error of the general population density indicator, which manages the entire administrative area. The indicator includes those settlements in which the urbanization rate exceeds the national average.

IV. Change of urban area
Indicators of changes have also been developed to appropriately illustrate the spatial processes. This indicator expresses the extent of the change in urban areas between 2006 and 2018. This indicator includes those settlements which values exceed the national average.

V. Densification index
To express the relations between population concentration and change in inhabited areas, the so-called densification index has developed based on the OECD's report named *Redefining „Urban" – A New Way to Measure Metropolitan Areas (2012)*. This indicator shows the extent of the change in the urbanization rate in a given period, expressed as a percentage. In this case, the national average was negative due to the decrease in the resident population, so this indicator includes those settlements which have a positive densification index.

V+I. Proportion of commuting employees
Examining the proportion of commuters is essential because it expresses well the basic labor market relations and the attachment to the center. The ratio within the employees is more appropriate than the ratio to the resident population because the driving force of the agglomeration and the basis for its formation is the increase in the distance between the place of residence and the place of work, not necessarily the mobility of the entire population. In line with Eurostat's functional urban area delimitation methodology, the threshold is set at 15%.

7. RESULTS

In the lights of the examined and analyzed data, it could be visible, that the new indicators include the necessary statistical data and they can add a spatial dimension to the delimitation method.

According to the results, the five new indicators can be divided into two subcategories. The so-called static indicators, which express a state at a given time, as the contiguous urban area, the proportion of urban area, and the urbanization rate. Furthermore, the so-called dynamic indicators, which express processes of change, as the change of urban area and the densification rate.

Until the compliance with at least three indicators in a given settlement, dynamic indicators typically play a key role and the contiguous urban area indicator can be found on those settlements which comply with at least three indicators from five urbanization indicators. In settlements that reach the threshold of only two or fewer urbanization indicators, dynamic indicators play an increasingly small role and no settlement is affected by the contiguous urban area indicator.

The comparison of the natural-geographical condition analysis and the dynamic indicators shows that the settlements that have already used the

largest extent of their areas that are typically affected by urban sprawl are also the settlements those affected by densification and/or an above-average urban area change. This leads to the conclusion that there is a direct relation between changes in dynamic indicators and natural-geographical conditions. Settlements are either barely able to expand further within their territory or they have grown to such an extent that not able to expand because of the natural barriers.

Furthermore, it can be seen that the settlements affected by contiguous urban areas are characterized by the fact that the utilization of their areas that are typically affected by urban sprawl is above average and the densification index is also positive.

8. CONCLUSION

In conclusion, those settlements could be considered as part of the agglomeration, in which at least three of the five urbanization indicators reach the threshold and the proportion of commuting employees is at least 15%.

There are settlements in the study area in which urbanization rate or proportion of urban area does not reach the national average, however, the change of urban area is above average, and also the densification is positive. Comparing the results of the natural-geographical analysis and the dynamic indicators, it can be seen that they overlap each other largely. Accordingly, those settlements in which the proportion of urban area and urbanization rate are not above the national average are not necessarily formed because the urbanization processes would not have taken place or would not be present now and the expansion or densification of the settlement area not be problematic. Simply, their natural-geographical conditions are such that they prevent a larger proportion of expansion, so a significant densification of the existing urban areas has started, which is a catalyst for the settlement to be treated as part of the agglomeration.

To sum up, it is necessary to meet only three of the five indicators, because it is not expected that only the settlement affected by contiguous urban areas will be delimited and just very few settlements can meet the other four urbanization indicator at the same time. According to this, a settlement is included in the delimitation in such a way that its existing values are already above the national average or their changes are of such magnitude and direction that it is essential to treat them in an agglomeration zone. Therefore, due to the influence caused by natural-geographical conditions, non-compliance with one indicator alone cannot exclude belonging to the agglomeration zone in this respect, so due to the different processes, it is necessary to allow some room for maneuver within the urbanization indicators. Finally, the last and mandatory criterion, which connects the settlement to Budapest is the proportion of commuting employees with a threshold of 15%. In this way, the settlements that are connected to the capital, are closely related to it, and have significant urbanization processes can be delimited (Figure 5).

As a final result the Agglomeration of Budapest consist of the capital and 91 surrounding settlements, which is 11 settlement larger than the current agglomeration in force. Six settlements were excluded: Kisoroszi, Pilisszántó, Pilisszentlászló, Tök, Vácrátót and Visegrád; and 17 new settlements were added to the agglomeration zone: Vácduka, Rád, Penc, Leányvár, Martonvásár, Ráckeresztúr, Szigetcsép, Szigetszentmárton, Áporka, Inárcs, Vasad, Csévharaszt, Péteri, Mende, Gomba, Sülysáp and Dány (Figure 6.).

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ÖSSZEFOGLALÓ

EGY MÓDSZER A BUDAPESTI AGGLOMERÁCIÓ LEHATÁROLÁSÁRA – ÚJ INDIKÁTOROK, ÚJ EREDMÉNYEK?

Budapest és környékének kezelése több évtizedes téma Magyarország térstruktúrájával foglalkozó szakemberek között. Jelenleg a Budapestet és a hozzá csatlakozó térséget Budapesti Agglomerációnak nevezzük, mely 80 települést és a fővárost foglalja magába. Ez lehatárolás 1996 óta hatályos, azonban már 2007-ben felmerült a szakmai igény az agglomeráció új határainak definiálására. Ennek nyomán 2010-ben készült egy statisztikai alapú módszertan e célból, mely 2014-ben és 2019-ben is felülviszgálatra került, azonban a gyakorlatba nem került átültetésre.

A Budapesti Agglomeráció kezelése és szabályozása a 2005. évi LXIV. törvény hatályba lépésével törvényi erőre emelkedett és elkészült a Budapesti Agglomeráció Területrendezési Terve is. E tervnek a felülviszgálata 2011-ben történt meg, melybe az előbb említett statisztikai módszertan átültetése kudarcba fulladt. 2018-ban a Magyarország és egyes kiemelt térségeinek területrendezési tervéről szóló 2018. évi CXXXIX. törvény hatálya alá került a Budapesti Agglomeráció és a területrendezési terv ismét felülviszgálatra került, de az agglomeráció újradefiniálása ekkor sem történt meg, így ez a 2007 óta megfogalmazott igény megvalósítása mindmáig várat magára, annak ellenére is, hogy a főváros és Pest megye fejlesztési dokumentumaiban mind fejlesztési célként jelenik meg az agglomeráció új határainak meghatározása.

E tanulmány célja egy olyan lehatárolás módszertan lehetőségének felvázolása, mely kellő érzékenységgel leköveti a területi folyamatokat és a fejlesztési dokumentumokban foglalt célkitűzéseknek is megfelel, illetve túllépve a mindösszesze statisztikai mutatókon, új módszereket és eszközöket alkalmaz a területi folyamatok térbeli vetületének megértéséhez és kezeléséhez.

A célok elérése érdekében mindenekelőtt tisztázni szükséges, mit is tekintünk agglomerációnak, így a részletes és kevésebé részletes meghatározások áttekintése után két definíció került kiválasztásra, melyek érdemi indikátorokat írnak le a lehatárolás módszertanához Magyrország és Budapest tekintetében. Ezt követően a Budapest és térségének története került áttekintésre, hogy érthetők legyenk a lezajlódó folyamatok és kirajzolódjanak a tendenciák. Majd az elkészült statisztikai módszertan és azok felülvizsgálatainak áttekintése következett, hogy a pusztán statisztikai indikátorok hiányosságai és erényei felszínre kerüljenek, így megértve és megmutatva miért is van szükség új módszerek és eszközök alkalmazására is egy 21. századi agglomeráció lehatárolás módszertanba.

Ezek után készült el az előzöekben feltárt elemekre való hatást figyelembe véve a természeti adottságok (domborzat, lejtőmeredekség, erdők, vízrajz) elemzése. Az elvi beépíthetőség és a beépítéssel jellemző érintett területek ezek alapján körvonalazódtak és látható vált, hogy e területeken milyen és mennyi lehetőség van a további beépített területi terjeszkedésre.

Végül 5+1 új indikátor került leírásra, melyek a ötvözik a térinformatika és a statisztikai adatok összehangolásában rejlő lehetőségeket. Az egyetlen pusztán statisztikai indikátor – „az ingázók aránya a foglalkoztatottakon belül" – mellett öt urbanizációs indikátor került megállapításra, melyek a következők:

1. Összefüggő településtest
2. Települési terület aránya
3. Urbanizációs ráta
4. Települési terület változása
5. Sűrüsödési index

Az indikátorok eredményeinek összevetéséből látható, hogy az urbanizációs indikátorok között további két alkategória határozható meg: a statikus- (1.,2.,3.) és a dinamikus (4.,5.) mutatók, melyek eltérő folyamatokat mutatnak meg a területi rendszerben.

Kimutataható, hogy a dinamikus mutatók azokon a településeken játszanak kulcsszerepet, melyek legalább három indikátor küszöbértékét haladják meg. A temrészeti adottságokkal való összvetés azt mutatja, hogy a dinamikus mutatókkal leginkább érintett települések használták fel legnagyobb arányba települési terjeszkedéssel leginkább érintett területeiket, mely megmutatja a dinamikus mutatók és természeti adottságok közötti összefüggést. Továbbá látható, hogy azok a települések, melyek összefüggő településtesttel érintettek a leginkább sűrüsödő települések és terjeszkedési területük kihasználtsága is átlag feletti.

Összegezve az e tanulmányban felvázolt indikátorok segítségével, akkor nevezhető egy település az agglomerációs övezet részének, ha az öt urbanizációs indikátorból legalább hárommal érintett és a Budapestre ingázó foglalkoztatottjainak aránya is meghaldja a 15%-ot. Így végső eredményként egy 91 települést és a fővárost tartalmazó agglomeráció került lehatárolásra.

KÖNYVISMERTETÉS

CSIMA PÉTER: MIKOVINY SÁMUEL AZ ÉPÍTÉSZ ÉS TÁJALAKÍTÓ

BOOK REVIEW

PÉTER CSIMA: SÁMUEL MIKOVINY, THE ARCHITECT AND LANDSCAPE-FORMER

SZERZŐ/*BY:*
MÓDOSNÉ BUGYI ILDIKÓ

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A 2020. elején megjelent könyv a hazai tájépítészet szakmatörténetének legkorábbi időszakát és legelső képviselőjét mutatja be. Hiánypótlónak mondható, mert bár a szakmában évtizedek óta mondjuk és tanítjuk, hogy Mikoviny Sámuel kiemelkedő szerepet játszott a Kárpát-medence tudatos tájalakításában, a tatai munkáján kívül nagyon kevesen és nagyon keveset tudtunk arról, hogy miket is alkotott. A könyvben az eddig nem publikált – tájépítészethez, építészethez köthető – tervei, alkotásai közül is feltárt és bemutat néhányat a szerző.

Több társszakma – így legfőképpen a térképészet, a bányászat és a vízépítés – tekinti kiemelkedő képviselőjének Mikoviny Sámuelt. Az életéről beszámoló eddigi magyar és szlovák kiadványok és folyóiratcikkek egyikének sem volt célja azonban **építészeti és tájépítészeti terveinek** a bemutatása. Csima Péter professzor könyve Mikoviny ilyen témájú terveit és megvalósult alkotásait tekinti át – azok szakmai elemzésével. 40 kéziratos tervlapot mutat be – közöttük eddig ismeretlen, korábban nem közölt rajzokat is – továbbá néhány látképet a településeket táji környezetükkel együtt ábrázoló rajzok közül.

A tervrajzok és a tervleírások megértését segíti, hogy a szerző beazonosította Mikoviny által tervezett létesítmények helyét, felkereste és fotókkal dokumentálta a megvalósultak mai állapotát. A könyv bemutatja, hogy Mikovinyi (mai értelmezés szerint) tájépítészeti tervei alapján, többségében az irányításával kivitelezett létesítmények közül több ma is a tájszerkezet jelentős eleme. A *selmecbányai Kálvária* építészeti-táji együttese ma kiemelten védett kultúrtörténeti emlék, egyben népszerű turisztikai célpont. A *Karkóc és Lipótvár közti út* ma is a Mikoviny terve alapján helyreállított nyomvonalon és töltésen vezet. Megépült a Dudvág és a Vág folyók között létesített patakon az általa tervezett öt oldalág, amelyek közül kettő ma is létezik. A *selmecbányai úthálózat terve* és a *komáromi cölöphíd* nyomvonalterve a mai napig hatóan meghatározó volt a két város településszerkezetének alakulásában. A tervei alapján megvalósult *tározótavak, vízvezetők és a selmeci Kálvária* ma *Világörökségi helyszínként* az UNESCO által védetté nyilvánított egyetemes értékek.

Mikoviny Sámuel tervei a táji adottságokat felismerő és azokat hasznosító kiváló tervezői képességét igazolják, a kárpát-medencei tájalakítás történetének nagyszerű dokumentumai. Munkásságának szakmatörténeti jelentőségét az építészet és a tájépítészet területén, tervezési módszereinek bemutatásával is alátámasztja a könyv. Tájépítészeti terveinek részletezettsége, grafikai kidolgozottsága, színezése, jelmagyarázatainak felépítése és érthetősége korának általános színvonalát lényegesen meghaladta. A tervezéshez az alaptérképeket a saját műszeres felmérései alapján készítette, így egyesítve hasznosította földmérői-térképészi és építészeti szakmai tudását. A műszaki megoldásokat a domborzati és a vízrajzi adottságokra alapozva dolgozta ki. Tökéletes

This book, published at the beginning of 2020, describes the earliest period and the first representative of Hungary's landscape architecture. The book can be considered as suppletory research because although we have been saying and teaching in landscape architecture for decades that Sámuel Mikoviny played a prominent role in the conscious landscape-forming of the Carpathian Basin, apart from his work in Tata, we knew very little about what he has created. In this book, the author has also revealed and presents some of Mikoviny's previously unpublished plans and works, which can be connected to landscape architecture and architecture.

Several associate professions, above all cartography, mining, and hydraulic engineering, consider Sámuel Mikoviny to their excellent representative. None of the Hungarian and Slovakian publications and journal articles about his life was meant to present his **architectural and landscape architectural plans** so far. Professor Péter Csima's book reviews Mikoviny's completed plans and works – with their professional analysis. The author presents 40 manuscripts – *including previously unknown, formerly unpublished drawings* – as well as some vistas about settlements with their landscape environment surroundings.

The understanding of plans and plan descriptions is helped thereby the author identified the location of installations designed by Mikoviny, visited the completed ones, and documented with photographs about their current state. The book shows that based on Mikoviny's (according to recent interpretation) landscape architecture plans, most of the installations, facilities constructed under his direction, are still significant elements of the landscape structure. The architectural and landscape combination of *Calvary in Selmecbánya (Banská Štiavnica)* is a specially protected monument with historical importance and at the same time, it is also a popular tourist destination. *The road between Karkóc (Trakovice) and Lipótvár (Leopoldov)* still leads on the path and dam restored according to Mikoviny's plan. The five stream beds, that he designed on the streams between Dudvág and Vág rivers have been constructed; two of them still exist nowadays. *The plan of the road network in Selmecbánya (Banská Štiavnica)* and the *path plan of the stakes bridge in Komárom* have been determinate in the formation of these two towns' settlement structure. Based on his plans, *wet basins, aquifers and the Calvary in Selmecbánya* are universal values declared by UNESCO as World Heritage Sites.

The plans of Sámuel Mikoviny prove his excellent designer ability in recognizing and utilizing the landscape qualities; these are brilliant documents of the Carpathian Basin's landscape-forming history. The book also confirms the historical significance of his works in the field of architecture and landscape architecture by presenting his design methods. The level of detail, graphic elaboration, coloring, structure, and clarity of legends significantly exceeded the general standard of his era. For his plans, he made the basic maps based on his own instrumental surveys, thus combining his knowledge of geometer, cartographer, and architect. He developed technical solutions based on the topographic and hydrographic conditions. There is a perfect harmony between his plans and plan descriptions and the budgets made for them, these parts of work complement and support each other well.

According to the author's research, it turned out, that based on our knowledge, Mikoviny has created the first *local development plan* in the Kingdom of Hungary. He was the first, who applied the two-scale method of architectural analysis – for a region and facility, as well as for the settlement and facility – and the two-scale method of landscape analysis and planning. As a part of his landscape surveys, he also made archeological analyses, and presented their results on plans, and created reports to describe them.

The results of professor Péter Csima prove that the planning and construction work of Sámuel Mikoviny in the Tata-Almás region between 1746-1747 is an eminent performance of the *conscious landscape-formation in the 18th century.* According to the planning documents presented in the book, Mikoviny can be considered as the planner of the *first landscape plan* for the area of current Hungary. Its plan and implementation served as a model in many aspects of forming the landscape of the Carpathian Basin in the following decades. In the second half of the century, similar works were implemented in other parts of the country to increase the agriculturally usable lands and to make possible the multifaceted usage of the landscape.

The book was published by the Construction / Building Information Center.

1 2 3
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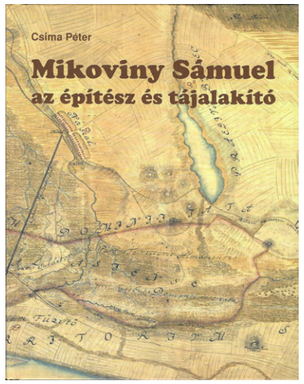
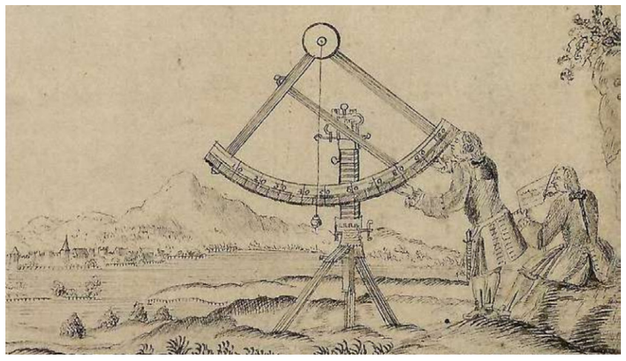
Könyvborító /
Book cover
2. kép/pict. 2:
Mikoviny Sámuel /
Sámuel Mikoviny
3. kép/pict. 3:
Mikoviny által
tervezett és épített
tározótó / *Reservoir*
designed/planned and
built by Mikoviny
4. kép/pict. 4:
Térkép mellékrajz
a műszeres mérésről /
side-plan of
Instrumental survey





összhang van a tervrajzai illetve az azokhoz készített tervleírások és költségvetések között, ezek a munkarészek egymást jól kiegészítik és alátámasztják.

A szerző kutatásai nyomán kiderült, hogy ismereteink szerint Mikoviny készítette a Magyar Királyságban az *első településrendezési tervet.* Elsőként alkalmazta a kétléptékű – térségre és építményre, illetve településre és épületre vonatkozó – építészeti vizsgálat valamint a kétléptékű tájvizsgálat és tervezés módszerét. Tájvizsgálatai keretében régészeti terepi vizsgálatokat is folytatott, azok eredményeit tervlapokon bemutatta és azokról írásos jelentéseket készített.

Csima Péter professzor eredményei bizonyítják, hogy Mikoviny Sámuel Tata-Almás térségében 1746-1747-ben végzett tervezői és kivitelezési tevékenysége a *18. századi tudatos tájalakítás* kimagasló hazai teljesítménye. A könyvben bemutatott tervdokumentumok alapján Mikovinyt a Magyarország mai területére készített *első tájterv* készítőjének tekinthetjük. Terve és annak megvalósítása sok tekintetben mintaként szolgált és hatással volt a következő évtizedekben a kárpát-medencei tájak alakítására. A század második felében hamarosan követték az országban máshol is a hasznosítható termőföldek növelését és a táj sokoldalú hasznosítását lehetővé tevő hasonló munkálatok.

A könyv az Építésügyi Tájékoztatási Központ kiadásában készült.

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