HOW MUCH ARE NATURE'S GIFTS WORTH?

SUMMARY STUDY OF THE MAPPING AND ASSESSMENT OF ECOSYSTEM SERVICES IN NATURA 2000 SITES OF THE NIRAJ-TÂRNAVA MICĂ REGION

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IN NATURA 2000 SITES OF THE NIRAJ-TÂRNAVA MICĂ REGION

Târgu Mureș, Romania

2017

You are holding the summary study of the "Mapping and assessing ecosystem services in Natura 2000 sites of the Niraj-Târnava Mică region" project in your hand. The project was generously supported by the EEA Grants 2009-2014 with the contribution of the Romanian Ministry of Environment. The implementation is led by Milvus Group Association, with contribution from the partner organizations Centre for Ecological Research of the Hungarian Academy of Sciences (MTA ÖK) and CEEweb for Biodiversity, the Hungarian representative of the network of European nature conservation NGOs.
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DEAR READER!

Nature gives us gifts. These gifts, including trees of the forests, the self-purification of our waters, pollination of our plants, or the beauty of the landscape that is our natural habitat are all indispensable for the healthy functioning of society and the economy and, within that, local communities. In spite of this, we are losing them at an alarming rate. To prevent this we need to open our eyes to these non-ostentatious gifts that are 'taken for granted' and raise people's awareness of them. Short-sighted decisions damage "Nature's free goods", as concluded by a Transylvanian decision-maker worried about the fate of future generations in Sfântu Gheorghe as early as 1786.[1] Amid the enormous environmental challenges of the 21st century, this appeal is more relevant today than it ever was.

This publication describes the mapping and assessment of 'the gifts of nature', or, in more modern terms, ecosystem services along the rivers Niraj and Târnava Mică, close to the place, which was one of the cradles of this concept 230 years ago. The goals of our work were similar, too: through a comprehensive assessment of ecosystem services, to be able to better preserve these gifts for today and tomorrow. International experience shows that involvement of local communities in the research greatly increases efficiency, which is why we performed this research with the inclusion of the locals from the planning of the very first steps to the final conclusions. During our research one of our key principles was to create practical results that can be utilized locally. All that we, researchers did was to provide a few flexible frames, which were later filled with content through the active participation of the local community. It is our hope that the countless in-depth conversations and all those hours of collective thinking have resulted in a deeper, jointly experienced understanding of the challenges we face today and that the answers we have obtained also point to real solutions and shared goals.

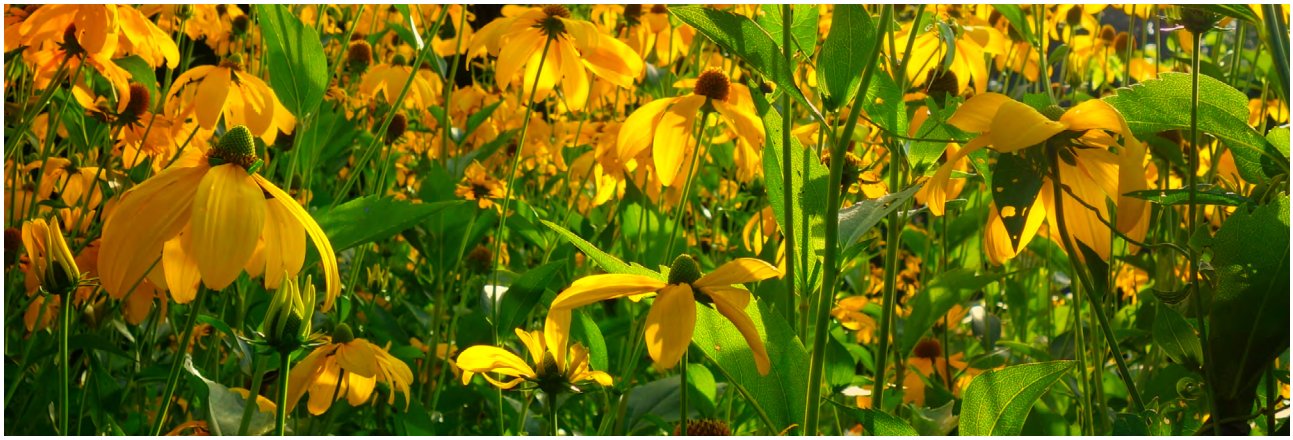
This publication focuses on the mapping and assessment of ecosystem services as part of the key steps and results of our research. Another important result of this research involves possible future scenarios of the Niraj-Târnava Mică region, described in the study "What is the way forward? – Scenarios for the Niraj-Târnava Mică region with relation to ecosystem services" available at www.milvus.ro/ecoservices. We recommend our short summary to all those who think responsibly about the future of the Niraj and Târnava Mică region, wish to find a realistic alternative to preserve our natural assets, and make a difference in the region's life through their conscious activities. The detailed technical report of the research in English can also be downloaded from www.milvus.ro/ecoservices.

[1] Molnár Zs., Gellény K., Margóczy K. & Biró M (2011): Landscape ethnoecological knowledge base and management of ecosystem services in a Székely-Hungarian pre-capitalistic village system (Transylvania, Romania). Journal of Ethnobiology and Ethnomedicine 2015, 11:3.

1. DELICATE HARMONY BETWEEN MAN AND NATURE IN THE NIRAJ-TÂRNAVA MICĂ REGION

The mosaic landscapes of Transylvania hide unique natural values, which are relevant even at European level. The century-long cooperation between nature and the people living in it, not only left a rich legacy here on a social, cultural or landscape level, but also made the survival of an extremely rich and diverse wildlife possible. It is not by chance that considerable populations of species of high nature conservation value even on a European scale can today be found in this region. 55% of the Romanian Natura 2000 sites are located in Transylvania and 24% of Transylvania is covered by Natura 2000 sites. This particularly rich biodiversity is the result of a harmonious and balanced long-term coexistence between man and nature. It is the task of people living today to make sure that this legacy continues.

The Niraj-Târnava Mică region is one of those parts of Romania where the elements of traditional landscape structure and farming have survived to a remarkable degree. In the landscape made up of a delicate mosaic of deciduous forests, semi-natural grasslands, pastures, meadows, extensive orchards and ploughlands, the middle spotted woodpecker (*Dendrocopus medius*) and the corncrake (*Crex crex*) are still common. The lesser spotted eagle (*Aquila pomarina*) population of the area greatly contributes to the fact that over one-fifth of the European population is made up of Romanian lesser spotted eagles. The brown bear (*Ursus arctos*), whilst being present in rather few regions on a Europe-wide level, remains common in this area, perhaps a bit too common if you ask some local people. And while it is still difficult to spot an otter (*Lutra lutra*), its traces can be regularly observed along the riverbanks. Despite the diversity of the landscape and species, invasive alien species, such as the ash-leaved maple (*Acer negundo*) or the cutleaf coneflower (*Rudbeckia laciniata*), Jerusalem artichoke (*Helianthus tuberosus*) and Canada goldenrod (*Solidago canadensis*), which give the landscape its yellow colour between August and October, are on the rise.



The study area was designated to overlap with the four Natura 2000 sites around the Niraj-Târnava Mică region. This was justified by the fact that the natural assets of the region are already well-known; the Milvus Group has been making surveys and various conservation activities in this area for over 20 years. The Natura 2000 sites of the study area thus cover land in three counties and 43 settlements, with the major part located in Mureș County, and smaller areas reaching into Harghita and Sibiu counties (Figure 1).

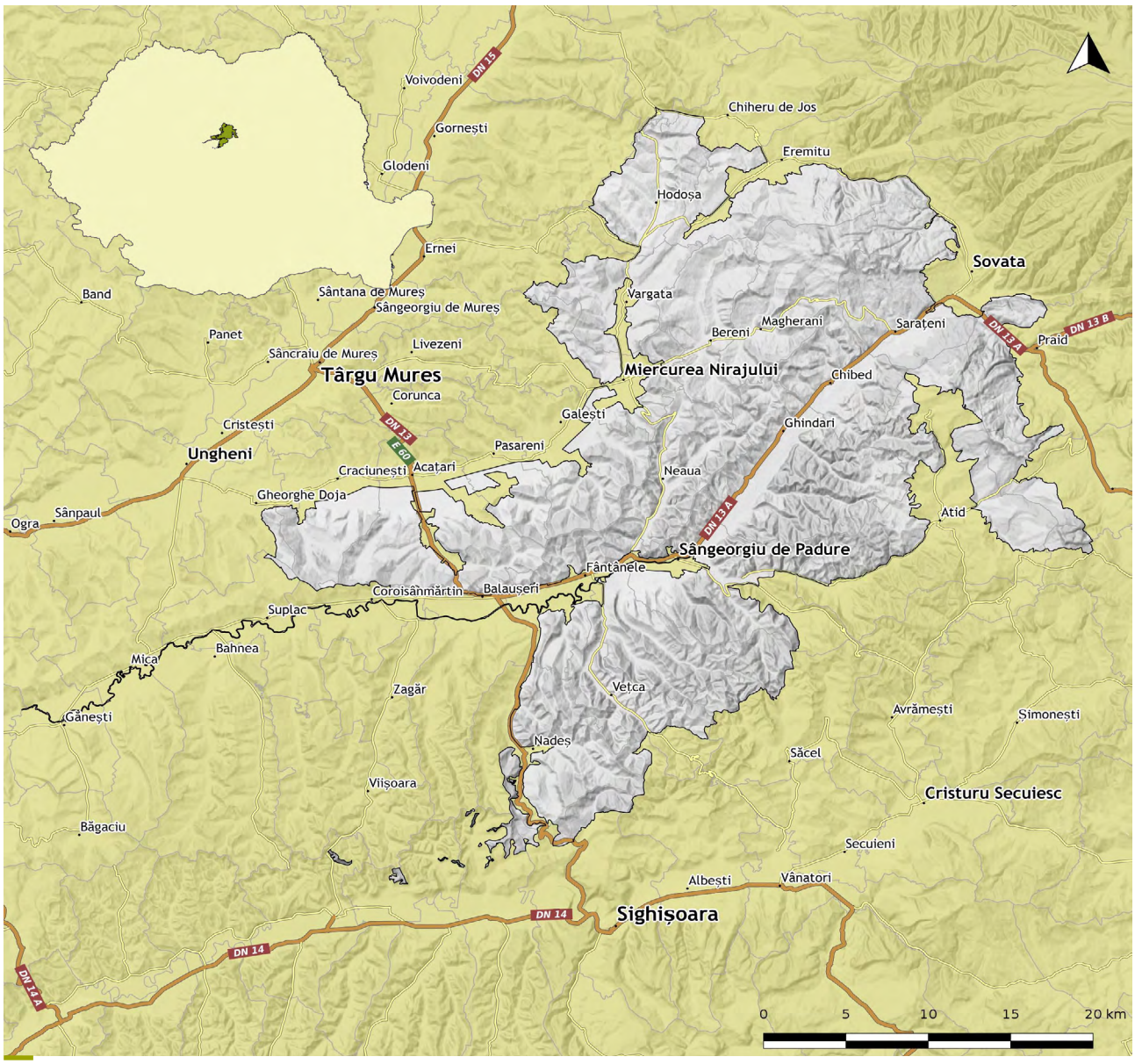


Figure 1: Map of the study area

Two rivers, the Niraj river and the Târnava Mică river pass through the area, and the settlements are mostly located along them. 202 768 people (2014) live on 91 000 ha, with 13% of the population concentrated in the six cities of the region. Average population density is 68 persons/km^2. Since the political transition, the population has been continuously declining, due to three key reasons: (1) declining birth rates, (2) significant migration towards bigger cities, (3) emigration in the hope of better life quality. The population has been decreasing in 78% of the settlements, in some the decrease between 2011 and 2014 was 60%. However, we can take comfort from the fact that the proportion of the active population shows slight growth accompanied by a slight decrease in unemployment in the same period. While there are many agricultural areas in the country, official data show that few people earn a living in this sector. In addition to economic motivation (production of goods, self-sufficiency), preservation of traditions ("let the land be cultivated") is also an important factor in land cultivation. In the Niraj region 39% of the active population are employed in the industrial sector and 26% in the service sector. The Târnava region shows a different picture: 12% of the population receives their income from industrial activities and 18% from the service sector. Unfortunately, at present tourism is still in its infancy in the area, despite the great tourism potential of the region due to its natural and cultural assets. Only three settlements on the border of

the study area are exceptions to this: Sovata, Praid and Sighișoara – these attract great numbers of tourists. The rest of the area, however, has not been able to take advantage of these assets. The region is keen to profit from agricultural and rural tourism, but can offer no suitable touristic programmes as of today. The infrastructure of the main natural and cultural attractions is poorly developed, hence they cannot be sold on the tourism market or if they can, only with difficulty.

At present the region's land use still follows the pattern of traditional land use developed over centuries, adjusting to soil type and hillside exposure. Dominant elements of the lower-lying areas (200-600 m above sea level) are small plot ploughlands, meadows, pastures, orchards, and vineyards, as well as oak-hornbeam forests. In the higher-lying areas (above 500-600 m) there are more forests, but semi-natural meadows and pastures are also common. Agricultural areas and forests still follow traditional management, which also contributes to the persistance of the mosaic-pattern and of biodiversity. In the past couple of years, land concentration has accelerated and in more and more places the small plots have been replaced with larger and intensively cultivated lands. The number of infrastructure investments has also increased. Summer houses and homes converted from provisional buildings linked to traditional land use (e.g. sheepfolds) are common. This change is especially pronounced in the more densely populated riverside areas, which are also more suitable for agriculture.

The spontaneous processes in the area (e.g. land concentration, urbanization, and land use change) are the consequences of external impacts on the local landscape and human community (e.g. globalization, technological development, EU subsidies). However, the local economy and the welfare of the local population is still very closely tied to the rich natural heritage. In addition, the natural environment may hold plenty of untapped potential for development and the economy which we can easily miss if we fully rely on the spontaneous processes. However, in order to recognize opportunities and avoid dangers, we need a deeper understanding of the cooperation between man and nature. The concept of ecosystem services provides an opportunity for achieving this understanding.

2. ECOSYSTEM SERVICES AS TOOLS OF DIALOGUE AND UNDERSTANDING

The concept of ecosystem services strives to capture the multi-faceted relation of interdependence between ecological and socio-economic systems in a simplified way. To achieve this, it borrows an analogy from economy: a provider (the ecological system) offers various services to a beneficiary (society). Vital services that natural and semi-natural ecosystems (e.g. forests, grasslands, marine communities) provide to society are commonly referred to as ecosystem services. The timber of forests, the self-purification of water bodies, or the beauty of the landscape that is our natural habitat are all examples of ecosystem services. Science distinguishes between three main classes of services: provisioning, regulating and cultural services (Figure 2). All three classes of services are indispensable for the healthy functioning of society and the economy, including local communities.

PROVISIONING SERVICES

Material products provided by the ecosystems (eg. food, fuel, timber, herbal substances, natural medicine, genetic resources for farming and animal husbandry, ornament materials etc.).

REGULATING SERVICES

Ecosystem processes providing stable and safe living conditions (e.g. regulation of air quality, climate and of water systems, control of erosion, water purification, control of pests, diseases and natural disasters, pollination).

CULTURAL SERVICES

Non-material goods provided by ecosystems that people can benefit from (spiritual enrichment, cognitive development, inspiration, relaxation, social connections, cultural heritage, aesthetic experience and ecotourism).

Figure 2: The three main classes of ecosystem services

The concept of ecosystem services broke into mainstream science after a long period of incubation in the early 2000s and has, since then, been taken into consideration in many important nature conservation policies on international and EU level (Figure 3). The concept of ecosystem services and its practical application could represent a significant step towards understanding and thus solving the environmental challenges of the 21st century for one of the reasons of today's environmental crisis is that society treats specific services isolated. Thus, it can happen that while society exploits one service to the best of its ability, it generates unexpected shortages in others. The concept of ecosystem services offers a common platform, a common denominator, and is able to translate the complicated processes and connections in nature to a simple language spoken by many. This, however, requires that thinking in terms of ecosys-

ECOSYSTEM SERVICES IN INTERNATIONAL POLICIES

The concept of ecosystem services permeated mainstream science after the publication of the Millennium Ecosystem Assessment in 2005. Since then, numerous important biodiversity conservation policies have advocated for it on both international and EU level, and a new intergovernmental body has been established to facilitate the policy integration of the concept (IPBES, Intergovernmental Platform on Biodiversity and Ecosystem Services). The EU Biodiversity Strategy 2020 lays down the mapping and assessment of ecosystem services and their integration into accounting schemes and decision-making processes as a concrete goal and responsibility of Member States (MAES). This fundamentally determines the key directions of national biodiversity strategies of EU Member States. To achieve this, however, we need a uniform interpretation of ecosystem services, and it is also necessary to clarify survey methodology and make practical examples and guidelines available.

Figure 3: Ecosystem services in international policies

tem services should be spread in social discourse and everyday policy-making (Figure 4). There should also be practical data, surveys and research available that juxtapose different ecosystem services.

The research presented here provides a practical example of the complex assessment of ecosystem services. One of the questions we examined was how ecosystem services contribute to the profitability and sustainability of different economic sectors, such as forestry, agriculture or tourism. During our work we analysed the role of sectors in preserving ecosystem services, so that they can contribute to ensuring well-being in the future (as well). Then we formulated policy recommendations on the integration of ecosystem services into regional and national level decision-making processes. With our work – we hope – we will not only generate useful results and recommendations for the Niraj-Târnava Mică region, but also contribute to the international enrichment of ecosystem service assessments, this unusual new discipline across different schools of thought.

ECOSYSTEM SERVICES IN ROMANIAN POLICIES

In accordance with EU requirements, assessing ecosystem services, halting their decline, using them sustainably and integrating them into different policy-making processes have emerged as goals of Romania's National Biodiversity Strategy, too. In other national policy documents the concept and practical dimensions of ecosystem services are reflected to varying degrees. It is primarily strategies (National Sustainable Development Strategy, National Climate Change Strategy) and programmes (National Rural Development Programme, Operational Programmes) transposing international agreements and EU directives that refer to ecosystem services and the importance of their preservation and restoration. However, these directives have no legally binding power, which significantly impedes their implementation. In terms of stronger pieces of legislation with legally binding power such as laws and regulations (Law on Mining, Forest Act, and Law on Waters), however, ecosystem services are not directly referred to and are not integrated into the texts of environmental legislation.

Analysis of the local regulatory environment shows that with the exception of the Development Plan of Mureș County 2014-2020, none of the documents contain direct references to ecosystem services. They are mentioned indirectly through the description of processes causing the most significant damage to the environment on a local level (soil erosion, surface water and groundwater vulnerability, and air pollution). In addition, development plans focus on the promotion of tourism, which, through efforts to preserve natural and cultural heritage, might indirectly but significantly contribute to the development of local identity, the economy and recreational potential.

Figure 4: Ecosystem services in Romanian policies

3. RESEARCH DESIGN AND METHODS

In order to be able to give a meaningful overview of ecosystem services, the flow of services from nature towards society (Figure 5) needs to be thoroughly examined and understood. This process can best be described by the so called 'cascade model', the starting point of which is the *condition of ecosystems* (level 1) that fundamentally determines their internal processes and operation. This condition enables ecosystems to provide services (*capacity*, level 2). However, the capacity of ecosystems to provide certain services is not the same as the services actually used (*actual use*, level 3) as the latter can be influenced by societal needs, 'demand' at a given place and time, as well as the human inputs expended to obtain services. The benefits of the services used then appear in the form of maintained or increased *well-being* in society (level 4).

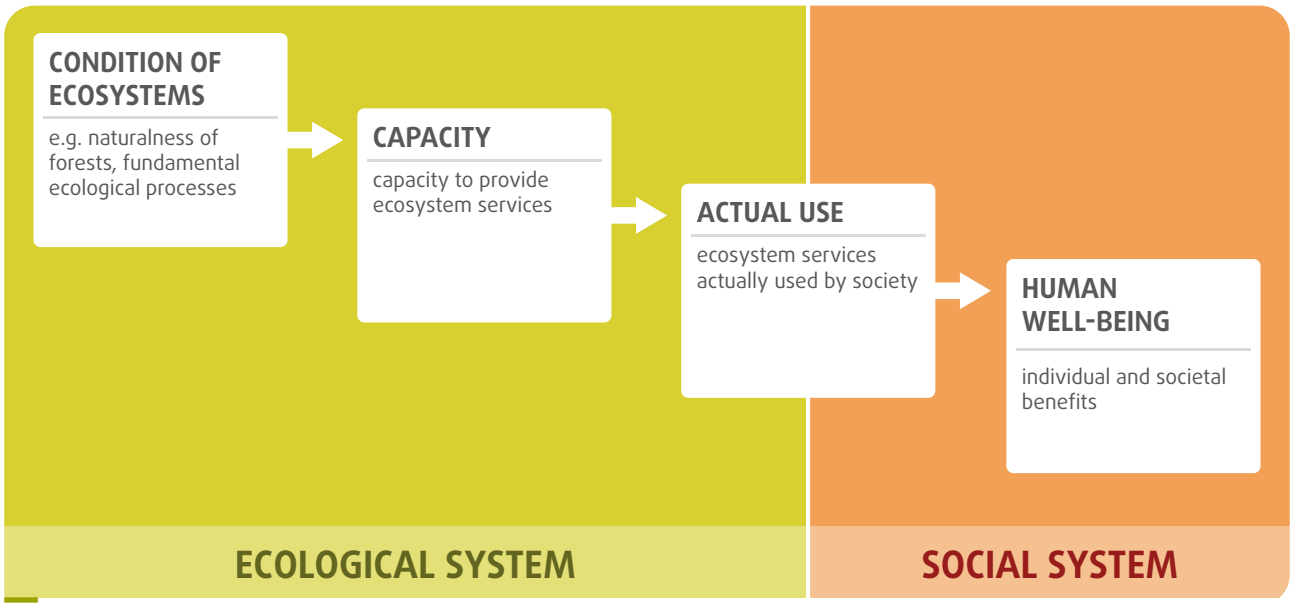


Figure 5: The cascade model: the flow of ecosystem services from nature towards society

However, the key steps of this pathway also provide a framework for assessing the services. Accordingly, we also attempted to trace the path of ecosystem services from nature to society along the components of the cascade model. We used distinct indicators and valuation techniques to describe the four cascade levels:

- The indicators applied to assess the condition of ecosystems are called **ecosystem condition indicators.** Ecosystem condition indicators are not considered 'services' in themselves; instead they describe characteristics of ecological systems that significantly impact the provision of several services simultaneously. Without the maintenance of good ecological status the preservation of services cannot be achieved. During our research we individually modelled and mapped the selected condition indicators (Chapter 5, Figures 16-18).
- We modelled and mapped the **capacity** of ecosystems to provide services for each service during the research (Chapter 5, Figures 19-25) and where possible, evaluated them by applying economic valuation methods (Chapter 6, Figure 15).
- We assessed the **actual use** of specific services by means of statistical data and questionnaire surveys using social and economic valuation methods (Chapter 6, Figure 15).
- We examined the impact of services on human **well-being** only indirectly during the scenario development and evaluation process.[2] The lessons of scenario development related to concrete habitats and services are reviewed and discussed in Chapters 6-7 of this study.

To clarify the task, the concept of ecosystem services needs to be more clearly defined, too. In line with the definition presented in the previous chapter, tangible goods provided directly by the non-living physical environment (e.g. mineral salts, extracted drinking water) are not considered ecosystem services. While re-

[2] What is the way forward? – Scenarios for the Niraj-Târnava Mică region with relation to ecosystem services. www.milvus.ro/ecoservices

sembling ecosystem services in many respects they are created without the assistance of biota and are mostly excluded from investigations of ecosystem services in international practice, too. Studies also exclude products derived from industrial ecosystems strongly transformed and controlled by man (e.g. crops from intensive agriculture) which require a vast amount of material and energy input from man (e.g. fertilizers, pesticides, agricultural machinery, fuel). These are regarded by the most widely-held approach as internal products of the economy to which natural ecosystems contribute only indirectly, through other services (e.g. ensuring pollination, natural plant protection, maintaining soil fertility).

WHAT IS PARTICIPATORY RESEARCH?

Participatory research is a new generation of social science methods where the social groups under investigation are not (only) subject to the research or data providers but also actively take part in its planning and the synthesis of the results. Results of research planned and conducted with a participatory approach reflect more accurately the perceptions, needs and recommended solutions of the group concerned. This also increases the chances of implementing the results.

Figure 6: What is participatory research?

These are the general frames that we intended to fill with content during our work. The essence, however, lies in the details: which ecosystem services and condition indicators will be selected and by means of what data sources and methods will we map and assess them. In determining these details our priority was, involving local experts, to obtain regionally utilizable practical results that facilitate the protection of natural heritage and the preservation of the well-being of local communities (Figure 6). Throughout the entire research process we received help from an 'Advisory Board', comprising locals representing the most important economic and social sectors of the area (Figure 7). The main task of the Board was professional supervision and ensuring credibility: every important step and result of the study was discussed with them and their suggestions were incorporated in the analyses, models and evaluations.

ADVISORY BOARD

The implementation of the research project was substantially supported by an Advisory Board representing local experts from a wide range of fields (agriculture, forestry, hunting, water management, tourism, municipalities, civil sphere, regional associations, education, nature conservation, press). The Board, comprising 12 members, met four times during the research process, and we also consulted its members individually regarding questions related to their areas of expertise. The main task of the Board was professional supervision, advisory work and ensuring credibility: every important step and result of the study was discussed with them and their suggestions were built into the analyses, models and evaluations. All members of the Board live and work in the project area, and half of them come from the Niraj-valley, while the other half represent the Târnava Mică part of the study area.

Figure 7: Advisory Board

We planned a complex, interdisciplinary research process that combines methods of natural and social sciences and at the same time is able to join leading-edge research on the topic. The research process (Figure 8) was built on two parallel strands that are interrelated on multiple points but substantially independent. In pursuing the main strand of this research, the mapping and assessment of selected ecosystem services, we filled the frames provided by the cascade model with content. We supplemented this relatively fixed analysis with a scenario development process with which we intended to address a wider group of the local community and thus give a more holistic and systematic analysis of services. As a result, we developed and evaluated, involving locals, four possible alternatives for the future of the area, bringing to life the values, desires and fears of local people. The scenarios and any conclusions drawn from them can be found in our study "*What is the way forward? – Scenarios for the Niraj and Târnava Mică region with relation to ecosystem services*". In this publication we give a detailed description of the process and results of the main strand of the research, the mapping and assessment of ecosystem services.

DETERMINING THE RESEARCH FRAMEWORK

We conducted interviews with local stakeholders and collected data with the aim to explore the natural and social conditions and the landscape use of the area, and the local means of subsistence. We reviewed the regulatory environment, the economic situation and the most important local stakeholders. We created an Advisory Board comprising local experts (Figure 7) which supported our work at key points throughout the whole project.

IDENTIFYING THE MOST IMPORTANT ECOSYSTEM SERVICES

Based on the results of the interviews and the questionnaire surveys conducted among a wide range of local stakeholders as well as the opinions expressed by the Advisory Board, we identified the most important ecosystem services of the region.

MAPPING ECOSYSTEM SERVICES

As a first step of the mapping process, we developed a detailed habitat map, which formed the basis for the mapping of the ecosystem services. We then formulated models based on scientific literature and the knowledge of local experts. The models describing the capacity of habitats to provide ecosystem services were used for the visual representation of the services.

SCENARIO PLANNING

Together with the Advisory Board and additional representatives of local social groups (experts, land users, inhabitants) we examined the most important factors influencing the fate and living conditions of the landscape and the communities living here as well as the possible directions of change. Based on the results, we developed four alternative scenarios.

ASSESSING ECOSYSTEM SERVICES

We assigned monetary values to the results of the models by applying market prices or indirect valuation methods. Beyond the economic value, the different habitats have a social role value as well that cannot be monetised. The forest for example is not only important in terms of its marketable timber as it also provides recreation opportunities. In order to take into account the non-monetised social benefits, we complemented monetary valuation with the social valuation of possible capacities and actual benefits.

EVALUATING THE SCENARIOS

We evaluated the outlined future scenarios in terms of the ecosystem services and human well-being they provide, which we then compared to the current situation. Taking all this into account, the local stakeholders identified the ideal scenario.

LESSONS LEARNED

Together with the Advisory Board we reviewed the results based on which the local experts developed policy recommendations for the sectors that have the biggest impact on the landscape (agriculture, forestry, water management, tourism, municipalities, the civil sphere and regional associations).

Figure 8: Key elements of the research process

4. KEY ECOSYSTEM SERVICES IN THE NIRAJ-TÂRNAVA MICĂ REGION

Nature provides a wide range of different ecosystem services for the population of the Niraj-Târnava Mică region. In order to be able to assess the value that ecosystem services represent to the local community, we first selected the services most important to locals through a multi-step participatory process. As a first step of this process, we conducted interviews with representatives of different sectors directly connected to nature and the land. In the course of 30 interviews the respondents mentioned a total of 35 ecosystem services of which 12 could be categorized as provisioning, 15 as cultural and 8 as regulating. We presented the collected services at a group meeting to the members of the Advisory Board who grouped them and selected 12 services that they deemed most important.

Subsequently, involving a wide group of locals we explored the importance attached to these 12 services at local level using a photo-illustrated preference assessment survey (photo elicitation). We asked a total of 310 people to select five services that they deemed most important. Based on individual rankings we then drew up an aggregated ranking of services: how does the local population value the importance of different ecosystem services? The results are displayed in Figure 10.

As a last step of the process, we designated the ecosystem services, to be mapped and assessed during the research, by taking into account methodological considerations and recommendations of the Advisory Board. We also reviewed the data, methods and indicators available for their assessment. In doing so, we merged some services previously treated as separate, while we represented some elements of the list that were difficult to harmonize with the definition of services only indirectly by using appropriate ecosystem condition indicators (see Figure 5, level 1). Agricultural crops, for instance, however important their role may be in the local economy, cannot be considered real ecosystem services (see Chapter 3). However, as an ecosystem condition indicator we can take into account soil fertility, which is the most important contribution of ecosystems to agricultural production and crop yields. An additional important condition indicator is habitat naturalness, which is a precondition for many ecosystem services, such as pollination and natural plant protection, upon which agricultural production also depends (which have not been studied directly). We modelled and mapped the other services deemed important by locals at the level of capacities (see Figure 5, level 2), complemented by a socio-economic assessment also covering actual

PROVISIONING SERVICES

Wood and timber: Timber and firewood provisioning potential of the habitat. The estimated capacities for this service consider mean annual yields over a full management cycle optimized for wood production.

Natural forage and fodder: Potential forage supply provided by the ecosystems through mowing or grazing. While cultivated or marketed roughage and grain feed are not included in this service, spontaneous vegetation on fallow land, stubble, roadsides and banks with a grazing/fodder value are.

Wild plants and mushrooms: Gathered mushrooms, fruits, berries and medicinal herbs provided spontaneously by the habitat. Cultivated plants and mushrooms are not included.

Honey: Potential of the habitat to supply nectar and pollen for honeybees and thus contribute to honey production.

REGULATING SERVICES

Water retention: Capacity of the ecosystems (land cover) to slow surface water runoff and thus contribute to the recharge of regional groundwater resources, as well as mitigate soil erosion.

Carbon sequestration: Sequestration and storage of atmospheric carbon by the habitat, as contribution to global climate change mitigation.

CULTURAL SERVICES

Touristic attractiveness: Contribution of the habitat to the touristic attraction value of the area. Habitats offer recreational opportunities not only for tourists but also for the local population, and create an emotional bond between locals and the place.

INDICATORS OF ECOSYSTEM CONDITION

Habitat naturalness: The ecological integrity of the habitat in terms of maintenance and resilience of local/regional biodiversity. This ecosystem condition indicator influences the supply of many provisioning (e.g. wild plants and mushrooms), regulating (e.g. pollination), and cultural (e.g. touristic attractiveness) ecosystem services.

Soil fertility: Approximate suitability of the soils for arable and garden cultures. In case of agro-ecosystems, this ecosystem feature determines the ecosystem's potential contribution to agricultural yields.

Landscape diversity: The habitat diversity of the broader landscape, which contributes to the persistence of several plant and animal species, as well as to an aesthetically appealing environment.

Figure 9: The list of indicators for ecosystem condition and ecosystem services examined during the research

use (see Figure 5, level 3). In developing the indicators we merged water retention and mitigation of soil erosion, originally mentioned as separate services, into one collective service on the grounds that the same biophysical process (slowing surface water runoff) underlies both. For a similar reason, we merged the roles of the landscape in shaping touristic attraction value and local identity. Although natural forage and fodder ranked relatively low among ecosystem services, we included it in the list of services to be assessed in detail at the request of the Advisory Board, given the great past and potential future importance of extensive livestock production. A detailed list of the services and ecological condition indicators examined during the mapping and assessment is presented in Figure 9.

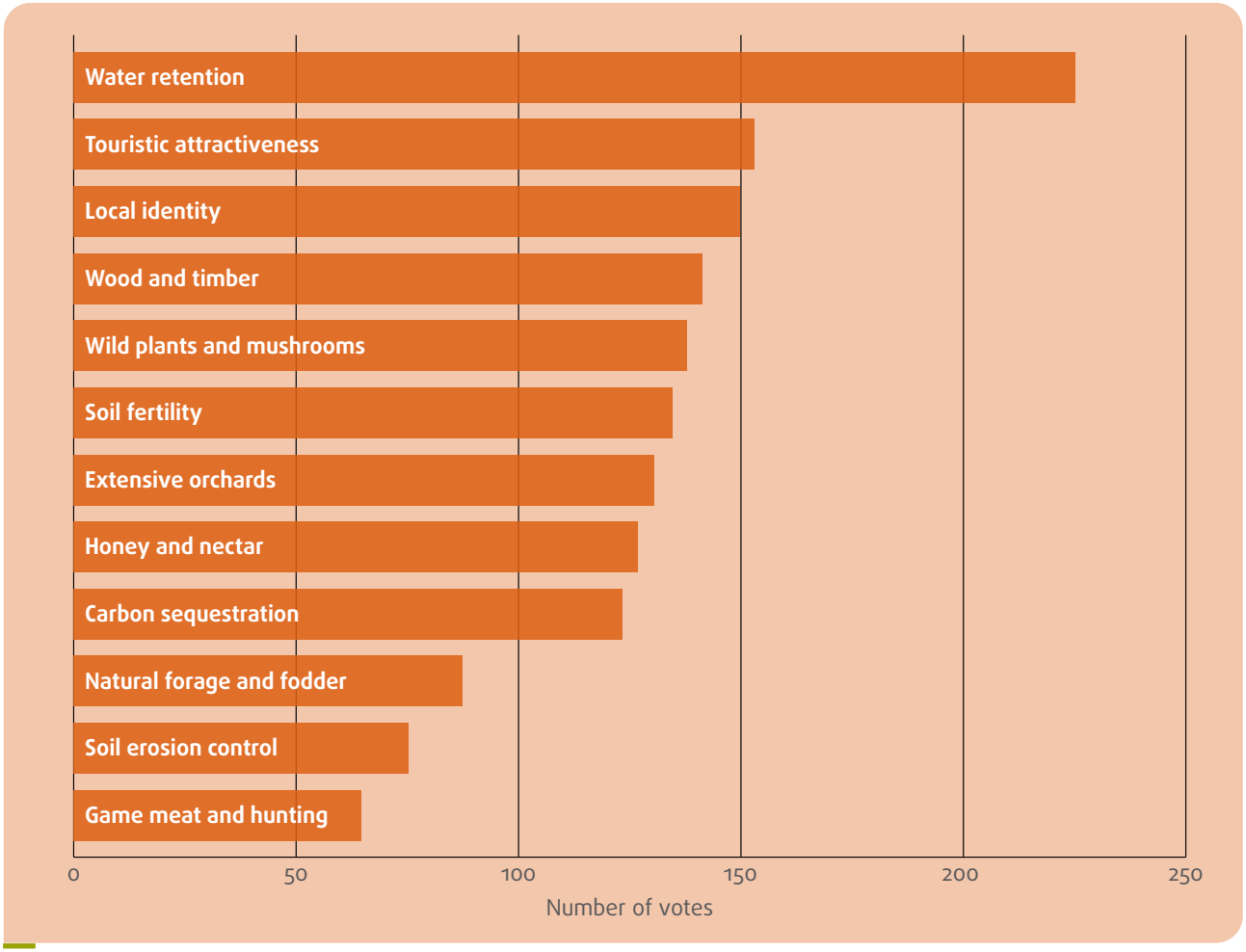
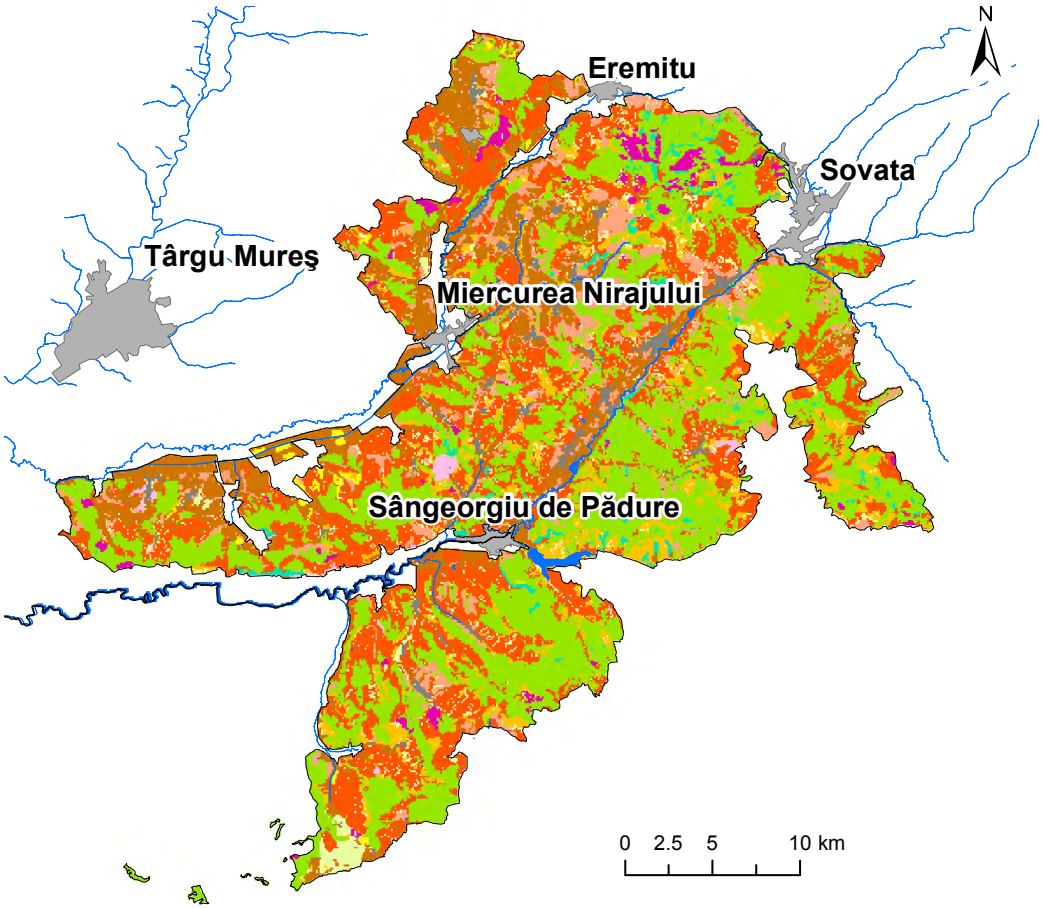


Figure 10: How does the local population view the importance of different ecosystem services?

5. MAPPING ECOSYSTEM SERVICES

Mapping and assessment of ecosystem services and condition indicators was the most central part of the study. While **assessment** is a broader concept, defined as a policy-oriented comprehensive overview of ecosystem services for the whole area, mapping refers to a **spatially explicit representation** of specific services. As a first step of the mapping process we developed a habitat map by analysing satellite images and existing databases. This map displays the most important habitat and land use types in terms of the area's ecosystem services (Figure 11).



Settlement [1.7%]: villages, outer areas with gardens and single farms

Pasture [26.7%]: pastures, grazed grasslands of different degrees of degradation

Wood pasture [1.6%]: grassland patches with solitary trees

Pine and spruce forest [1.3%]: coniferous plantations (pine, black pine, spruce)

Wetland and water [1.1%]: major rivers, lakes and fisheries, including the reed banks

Intensive agricultural land [0.5%]: intensive, large arable fields (patches >10 ha)

Hay meadow [6.9%]: hay meadows

Orchard [0.4%]: abandoned or extensively used fruit tree plantations/vineyards

Robinia forest [0.1%]: black locust plantations

Extensive agricultural land [12.7%]: mixed agricultural mosaic of small patches of various uses (patches <10 ha)

Encroached grassland [7.6%]: shrublands, abandoned grasslands encroached with shrubs

Tree row[3.8%]: groups of trees/small forests/tree rows/galleries along small valleys

Broad-leaved forest [35.6%]: deciduous forests of native tree species (e.g. beech or hornbeam-oak forests)

Figure 11: Habitat map of the Niraj-Târnava Mică region

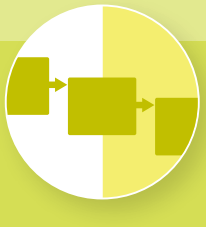
In parallel to developing the habitat map we started collecting all spatial data describing the natural environment of the area (maps and GIS layers) likely to be useful for mapping ecosystem condition indicators and services. In exploring potential data sources we also relied upon the help of the Advisory Board. Based on the data we first constructed maps of condition indicators using simple models (Figures 12-13). To estimate habitat naturalness we calibrated a statistical model with Milvus's bird monitoring data, while landscape diversity was expressed by means of a mathematical diversity-index adjusted in accordance with the landscape perception of humans and numerous bird species (1 km scale Shannon diversity of main habitat groups). We estimated soil fertility relying on scores assigned by experts (a 'matrix model', see below) based on Romania's national soil map. The so created ecosystem condition maps (Figures 16-18) also constituted important input data for mapping the services.

Subsequently, we examined to what extent and in what quality certain parts of the landscape are able to provide specific services. We also created models (Figure 12) to describe the area's capacity to provide services (see Figure 5, level 2). We relied on widely used and accepted methods and the knowledge of local experts to explore the biological and physical laws controlling the functioning of ecosystems. We first created a 'matrix model' (see Figure 12) for most of the services assessed (honey and nectar, wood and timber, natural forage and fodder, wild plants and mushrooms, touristic attractiveness, and water re-

tention). In this 'matrix model' local experts assigned scores from 1 to 10 to the capacity of specific habitats to provide different services. We then further refined these basic models based on expert recommendations and international literature, so that the models take into account additional environmental impacts (e.g. the altitude of a given location, see Figure 13) and express the final result in terms of physical quantities (e.g. m^3 wood/ha/year) instead of scores. We estimated one service (carbon sequestration) using statistical models based on literature. The maps obtained from the results of modelling are displayed in Figures 19-25, and Figure 13 summarizes the description of the specific models.

The resulting ecosystem service maps express the extent to which certain habitats are able to contribute to securing a specific service. By juxtaposing the maps, the parts of the landscape become comparable, and locations and regions that are particularly important for the provision of specific services can become visible. To facilitate this kind of comparison, we created two maps that provide a form of summary about the number of services provided by each location (Figures 26-27). The maps obtained throughout our research are shown and described in detail in Chapter 7.

ECOSYSTEM SERVICE MODELS



The model is a simplified representation of a system reflecting its basic functionality. We use it to approach complex interdependencies to facilitate understanding and representing reality, and to apply it in analyses, forecasts and evaluations. With ecosystem service models the goal is mostly to estimate the capacity of certain habitat types to provide services (see Figure 5, level 2). In this we can rely on environmental data from different data sources, the biophysical or statistical connections between them, and expert knowledge condensing information of these links.

The accuracy of estimates obtained using the model depends principally on the following two factors: the accuracy of input data, and how precisely the internal structure of the model can describe the complicated interdependencies of reality. Ecosystem service models can be categorized into three main types ('tiers') based on the complexity of their structures:

- **Matrix models** (tier 1): The simplest model type is a table ('matrix') based on data from expert opinion and literature that provides an estimate for the capacity of certain habitat types to provide services. The capacity to provide services can be displayed on a map using the table and data of the habitat map.
- **Rule based and statistical models** (tier 2): Geographic information system (GIS) and/or statistical models that take into account a number of different factors influencing the capacity of habitats to provide services.
- **Process based models** (tier 3): If the internal components and their interdependencies are known, and all input data and variables are available, the process through which the service in question is created can be directly modelled in detail.

In the course of our work we used tier 1 and 2 models to estimate and map the capacity of the examined ecosystem services. In developing the models we strongly relied upon the knowledge of a wide group of local experts.

A TYPICAL MODEL-DEVELOPMENT PROCESS

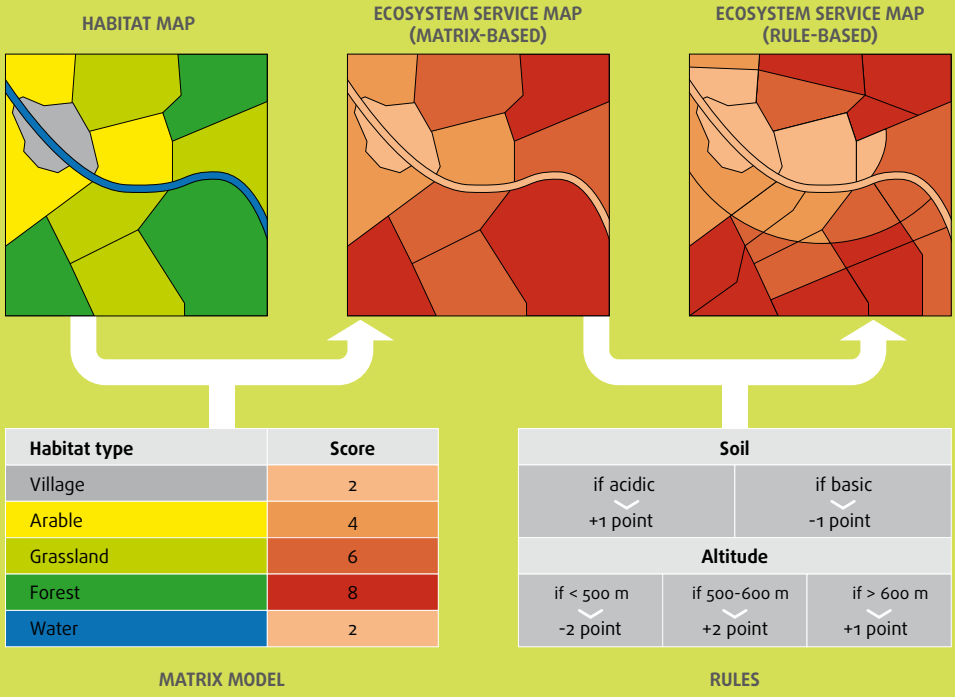


Figure 12: Options for modelling ecosystem services and steps of a typical model development process from this study

		Development of model			Data used	
		type [a]	tier [a]	source of knowledge	for capacity estimates	for actual use estimates [b]
Wood and timber		rule based	2	expert estimates and recommendations, literature (models of crop yield)	habitat type, surface elevation, slope, forestry data (share of main tree species), crop yield tables	statistical data (2015 data on crop yield)
Natural forage and fodder		rule based	2	expert estimates and recommendations, literature	habitat type, naturalness, soil type, surface elevation, slope, grazing intensity	statistical data (registered number of animals)
Wild plants and mushrooms		rule based	2	expert estimates and recommendations	habitat type, naturalness, soil type, grazing intensity	statistical data (collection permits issued)
Honey		rule based	2	expert estimates and recommendations, literature	habitat type, naturalness, landscape diversity, soil fertilty, surface elevation, grazing intensity, honey yield of cultures	statistical data (registered beekeepers, colonies)
Water retention		rule based	2	expert estimates and recommendations, literature	habitat type, grazing intensity	—
Carbon sequestration		matrix	1	literature (IPCC methodology)	habitat type, Romanian national greenhouse gas inventory	— [c]
Touristic attractiveness		rule based	2	expert estimates and recommendations	habitat type, naturalness, landscape diversity, surface elevation, distance from water, accessibility	questionnaire survey, statistical data
Habitat naturalness		statis-tical	2	literature (statistical methods), expert recommendations	habitat type, soil type, surface elevation, slope, accessibility, satellite images (Landsat OLI TIRS), data on bird sightings (Natura 2000 recordings)	—
Soil fertility		matrix	1	expert estimates and recommendations	soil type	—
Landscape diversity		statis-tical	2	literature, expert recommendations	habitat type, habitat needs of birds, topography	—

[a] : A more detailed illustration of model types and tiers can be found in Figure 12

[b] : To assess actual use, we also relied upon data used for estimating capacity; here we only indicate those that were used in addition

[c] : In the case of carbon sequestration, capacity and actual use are defined the same; for other services with no data provided, we did not estimate actual use

Figure 13: Modelling the selected ecosystem services and condition indicators

6. VALUATION OF ECOSYSTEM SERVICES

Ecosystem services improve people's individual and social well-being in many ways. A healthy environment contributes to preserving the physical and mental health of local people. The local population has an attachment to the land that provides them with roots, identity and common values cohering the community. Well-functioning ecosystems are more resilient to external forces (e.g. climate change) and can better mitigate environmental risks. A significant share of services improves the local economy and livelihoods of locals also directly in the form of market goods and added value.

The total value of services, however, cannot be expressed in monetary terms in a simple and direct way. Health, security and community cohesion for instance are values that are critical for the future of the local community in an ever-changing world full of challenges. However, money is not an appropriate unit of measurement to express their value. Nevertheless, all elements of human well-being (see Figure 5, level 4) should be equally represented in decision making. Representing and quantifying these values, however, is by no means an easy task (Figure 14).

THREE MAIN AREAS OF ECOSYSTEM SERVICE VALUATION

Three main approaches have evolved in the international practice of ecosystem service valuation: biophysical valuation, economic valuation and social (socio-cultural) valuation. The three ways of valuation follow the methods and approaches of the three main scientific fields addressing the topic (natural sciences, economics and social sciences). In order to obtain a complete overview of the path of ecosystem services from nature to society (see Figure 5) and all important societal benefits of these services (e.g. health, security and material well-being), we need to use all three approaches simultaneously ('in an integrated way').

	BIOPHYSICAL VALUATION	ECONOMIC (MONETARY) VALUATION	SOCIAL (SOCIO-CULTURAL) VALUATION
Subject of analysis	Quantity of ecosystem services expressed in biological or physical units of measurement	Economic value expressed in monetary terms, economic benefits of the functioning of ecosystems	Benefits provided to different groups of society expressed in monetary or non-monetary terms, identifying the reasons for their values
Common questions	How many m^3 of trees can grow in a given area? The production of how many kg of lamb/mutton could be enabled by natural vegetation	How much monetary value can forests produce under long-term sustainable management (RON/ha/year)? How much does the monetary value of annual timber harvest volume amount to?	Which ecosystem service is deemed most important in an extensive questionnaire survey, and why? The lack of which services would jeopardize our future, and why? What score do experts assign to the honey production capacity of different habitat types?
Main source of data	Data from literature or measurements, biophysical models	Economic and statistical data, results of the biophysical and social valuation	Opinions and consensus of experts and local stakeholders
Advantages	Natural science basis, numerical, standardized (constant, reproducible) methods. More basic model types (matrix models and rule based models) can be well combined with elements of social valuation (expert scoring).	Principal language of the economy and politics. Makes comparison of different services possible, easily comparable to economic indicators of other sectors, good comprehensibility of results.	Applied also for valuation of non-monetary benefits (e.g. spiritual, cultural values). It is able to take into account local knowledge, experience and local specificities. It is also able to identify individual and collective valuation criteria and human factors.
Disadvantages/ limitations	Quantifying (e.g. modelling) complex systems can be prohibitively complicated, lack of data is a common issue, and many relevant features of the systems cannot be measured. In most practical cases they are not applicable without integrating social methods.	Societal benefits can be diverse, monetary benefit is only one of them. Available methods involve a large amount of uncertainty. The economic value may be significantly influenced by the current economic and political environment.	Results are strongly influenced by the way experts and stakeholders consulted assess the value of services. The researcher is part of the research, thus in order to obtain the most objective results specific techniques need to be applied. Results always apply to the given context examined (mostly not generalizable), and are difficult to apply in other fields.

Figure 14: Three main areas of ecosystem service valuation

In our work we strived to implement the valuation of a wide range of ecosystem services integrating biophysical, social and economic aspects. With this in mind, almost every step of the research process constitutes a form of ecosystem service valuation: ranking of the services in the survey (see Chapter 3) can be considered as an extensive social valuation, while the mapping of the majority of services constitutes a biophysical valuation combined with social elements. During our work we supplemented these already existing valuation steps with additional social and economic valuation steps to obtain a complete and comprehensive overview that presents the value and importance of ecosystem services in the Niraj-Târnava Mică region from various aspects simultaneously.

In estimating the economic (monetary) benefits of ecosystems we relied upon two sources: based on the results of the models used for mapping, we were able to give an estimate of the capacity of habitats to provide services (capacity, see Figure 5, level 2), while statistical and local data provided the basis for the valuation of the current actual use of services (Figure 5, level 3). We used various methods for the monetary valuation of capacities and actual use. For the majority of provisioning services (wood and timber, natural forage and fodder, wild plants and mushrooms, honey and nectar) the main products derived from the services (e.g. timber, honey) provided the basis for valuation. In the valuation process we strived to consider least processed products and average prices measured on local markets in the past

few years (available to local farmers). We aggregated the monetary benefits of specific habitats for the entire area, thus arriving at a total amount that is provided to the local and national economy by the area as a whole. For services that cannot be valued using direct market valuation methods (e.g. touristic attractiveness), we applied indirect valuation methods widely used in international practice (see Figure 15).

The process of economic valuation is fraught with a large amount of uncertainty; therefore, a careful interpretation of results must be performed. A key source of uncertainty is the valuation methodology and the supporting data. The results of capacity valuation translate all uncertainty of expert models into the estimated prices. Statistical data describing actual use should not always be considered objective truth, either: these data are prepared for other purposes (e.g. payment of agricultural subsidies), and they might not contain all relevant information in terms of service valuation (e.g. separating grazing and housed livestock). Downscaling settlement or county level statistical data to the study area can result in additional inaccuracy.

Applying market prices inevitably adds uncertainty to economic valuation, too. This is a result of the fact that market prices always reflect the current state of the economy, thus cannot be regarded as an objective and unchanging indicator for a specific product or service (Figure 14). Any unexpected rearrangement in the world economy can upset market prices: what had been cheap before becomes suddenly expensive, while other goods and services lose their previously high value. These changes can occur suddenly, while social changes take longer to materialize. It is

thus important that in decision-making processes we also take into account the social embeddedness and modes of utilization of services in addition to prices. For these reasons the monetary values obtained through economic valuation should be considered estimates of scale that are only applicable in the current social and economic situation.

In order to mitigate uncertainties related to economic valuation and to achieve the most extensive and integrated valuation of services, we supplemented the monetary valuation with the social valuation of capacities and actual use. We chose an approach consisting of three main elements:

1. We obtained the first core component of the social valuation as a result of the extensive survey described in the ranking of services (Chapter 4). The ranking of services and, in particular, the justifications are of great importance in understanding the role of each service in the local community and in identifying non-monetary benefits.

2. To supplement the survey ranking the services we carried out an additional targeted survey among stakeholders of the local economy. In this survey following the methodology of the 'Corporate Ecosystem Services Review' we placed emphasis on understanding how and to what extent the different sectors of the local economy depend on each ecosystem service.

3. The third and most important component of social valuation is the development and evaluation of scenarios. It is necessary to examine the uncertainty, expected abundance/shortage as well as substitutability of services to arrive at an extensive valuation. These factors cannot, for the most part, be identified using traditional tools of natural sciences and economics. The scenario development process carried out with the broad involvement of the local community is a central component of our research (Figure 8). The participatory development and evaluation of scenarios enable outlining the uncertainties related to services and their expected future importance. This activity provides the added value of enabling a common understanding of the broader connections between society, the environment and ecosystem services through a dialogue developed through the participatory process. We present the developed scenarios and the lessons learned in detail in a separate study[3], while here we only briefly summarize the conclusions directly related to each ecosystem service.

Key results of the economic and social valuation are displayed in Figure 15. The next chapters provide an in-depth discussion of the main conclusions of our work.

[3] What is the way forward? – Scenarios for the Niraj-Târnava Mică region with relation to ecosystem services. www.milvus.ro/ecoservices

KEY RESULTS OF THE SOCIAL AND ECONOMIC VALUATION OF ECOSYSTEM SERVICES

		Economic value		
		capacity [e]	actual use [f]	methodology
		million RON/year		
Wood and timber		20.1	14.8	*capacity:* based on average annual growth during the economic life cycle of forests, without discounting *actual use:* based on logging data
Natural forage and fodder		–	14.1	based on market off-take of grazing sheep and cattle populations
Wild plants and mushrooms		–	1.7	average quantities calculated based on the number of collection permits issued, multiplied by average buying-in prices per species
Honey and pollination	honey, nectar	4.5	3.8	*capacity:* based on the estimated annual quantity of honey that can be collected on average in different habitats of the area *actual use:* number and average production of registered bee colonies
	pollination	–		
Water retention	Water regulation	–		
	Erosion control	–		
Carbon sequestration (climate protection)		5.7	5.7	drawing on the methodology of the Romanian national greenhouse gas inventory, based on emission-trading market prices [g]
Touristic attractiveness and local identity	tourism	–	16.9	based on the number of visitors in the area and the amount of money spent by them for touristic or recreational purposes
	local identity	–		

[a] : based on the results of the questionnaire survey carried out among the local population (see Chapter 4) (what percentage of respondents ranked the specific service among the five most important)

[b] : based on the questionnaire survey carried out among economic stakeholders (score assigned by businesses as a percentage of the maximum score)

[c] : sectors that were assigned a score of above 50%

[d] : based on the results of the scenario planning process: the average trends of expected changes in the four possible scenarios; a detailed description of the results can be found in the publication "What is the way forward? - Scenarios for the Niraj and Târnava-Mică region with relation to ecosystem services" available on the www.milvus.ro/ecoservices website

Figure 15: Key results of the social and economic valuation of ecosystem services

Importance perceived by the population (%) [a] and the most common reasons		Importance perceived by economic stake-holders (%) [b] and sectors most affected [c]		Expected future changes in the services [d]	
				trend	uncer-tainty
45%	raw materials, livelihood, building materials, oxygen production, clean air	52%	logging, wood processing, plant production, livestock farming	slight increase	small
28%	livestock production, livelihood	28%	livestock farming, plant production	slight decline	small
44%	health, medicine, food, livelihood, recreation	32%	(none among sectors consulted)	strong decline	large
41%	pollination, health, food, healing properties, livelihood, experience	26%	livestock farming (beekeeping)	constant	medium
		40%	livestock farming, plant production		
72%	basic needs, water quality, health, wildlife, food, livelihood (fishing), recreation	72%	all sectors	slight decline	large
25%	landslides, soil erosion control, basis for food production	38%	livestock farming		
40%	climate change as a global problem	46%	livestock farming, plant production	slight increase [h]	small [h]
49%	livelihood, potential for development, acquiring knowledge, experience, beauty, clean environment, valuable natural environment	48%	food retail, catering, tourism, livestock farming, plant production	constant	small
48%	respect for traditions, emotional bond, national self-awareness	62%	food retail, catering, tourism, plant production	—	—

[e] : esimated economic value of ecosystem service capacities per year (Figure 5, level 2: service that can be exploited sustainably under current land use ratios)

[f] : estimated economic value of current actual use (Figure 5, level 3) in the year 2015

[g] : carbon sequestration, similarly to other regulating services, is 'used' without conscious human involvement, which is why actual use can be considered equivalent to capacity

[h] : carbon sequestration, a service difficult to interpret at the local level, was not included in the scenario planning process, but the results obtained for the service 'wood and timber' in terms of trends and uncertainty were considered valid for this service, too

7. BEYOND THE NUMBERS: WHAT DO THE RESULTS INDICATE?

In the previous chapters, we have explored how the concept of ecosystem services can help to make nature's benefits more tangible in the Niraj-Târnava Mică region. We have reviewed the purpose, methods, and limitations of the mapping and assessment process, and demonstrated most of the results that we have obtained. In this chapter, we present the final bits of our results (the ecosystem condition and service maps), and put them into context discussing the underlying problems as well as possible solutions. First we give an in-depth examination of the relationships between ecosystem services and the local actors (inhabitants, companies) followed by a detailed description of the individual services as well as the interpretation of the calculated values and maps. Finally, we summarize the main lessons we have drawn in the course of our work.

THE IMPORTANCE OF ECOSYSTEM SERVICES FOR THE LOCAL POPULATION AND ECONOMY

The **interviews** made with local stakeholders reveal that, although local people use a great number of ecosystem services (35 are mentioned in the interviews), they do not really regard them as assets or are not really aware of the vulnerability of these services. They take their existence for granted and begin to appreciate their value only when certain capacities are suddenly reduced. Of the 35 mentioned sevices, **15 are cultural** in nature, which is a rather high rate and suggests that landscape is an important part of local culture; local people are attached to it, and treat it as part of their identity. The natural environment that surrounds these local people still greatly contributes to their quality of life. Compared with other parts of Europe, people still live as part of the landscape and they have not yet lost the romantic memory of this and the knowledge necessary to do so. This, in turn, can contribute to a relatively good degree of satisfaction with their lives in relation to their financial situation as the mentioned factors greatly contribute to their well-being. In the **preference assessment survey** carried out among the **local population** (Figure 10), based on the shortlist of 12 ecosystem services selected by the Advisory Board, **water retention** was deemed the **most important service**. This dominant, first position must have been the combined result of several, partially unrelated causes. One of them is that water represents the basis for life for everybody; another is that issues related to water shortage are com-

mon in the media as well, increasing the population's awareness of the issue. More and more streams are becoming temporary in the country, and the much reduced water quantity in the wells poses a serious problem in most settlements. Thus, **water** is the service that **has become especially important in local people's eyes due to its shortage**. It would be expedient to raise awareness of other ecosystem services before problems arise due to their shortage. **Local identity** was ranked second on the list. Its importance showed no difference across the younger and older generations, which might suggest that emigration from the region has primarily economic causes rather than a lack of attachment to the land on the different generations' part or a preference for other regions. This, in fact, is encouraging, because, in creating scenarios, local people regarded the **cohesive power of the community** as the **key pillar of well-being**, its most decisive factor and simultaneously, the most critical point of their envisioned future. In recent years, community cohesion is drastically decreasing both in larger and in smaller places. Perhaps now, when local identity is equally important for all generations, this process could still be reversed or at least stopped. The **touristic attractiveness** of the landscape is also among the key services probably because many people in the countryside regard this sector as a breakout opportunity. Despite the fact that a significant proportion of the population in the study area relies on agriculture for their partial or full livelihood, services tied to the agricultural sector (**natural forage and fodder, soil fertility, and soil erosion control**) took lower positions on the preference assessment of the 12 key services. A large body of research shows that the biodiversity and the naturalness of the landscape are greatly affected by the mode and intensity of the agricultural activity carried out there. Changes in farming practices can substantially worsen the capacity of the landscape to provide services, and, as a result, the ecosystem services that people are not yet aware of will gain value as shortages arise (like it happened to water). It would be desirable to avoid reaching a

stage, as some developed countries have, where ecosystem services are so degraded that pollination, for instance, needs to be performed using bee colonies hired at great expenses in areas of intensive farming.

Examining the relationship between ecosystem services and the **region's economic actors**, we asked how important companies deemed the different elements of nature and ecosystem services for the effectiveness of their activity and how dependent they thought they were on them. The answers provided by the companies showed about the same ranking as the one given in the survey carried out among the local population (with substantial differences only in the valuation of honey and wild plants – both are more important to the population than to companies). Our results show that for companies, like for the population, good **water** quantity and quality is **the most**

important service, a result understandable given the global and local conditions. The companies showed a **high level of dependence on biodiversity**. Half of the sectors examined – those that are more directly involved in land use – ranked biodiversity highest. This reflects a rather high degree of awareness as biodiversity only has an indirect effect on these sectors, and its lack cannot be felt as directly as that of water. Those involved in processing and trade were less likely to tie the success of their enterprise to biodiversity. Soil fertility was ranked very high by companies involved in **agriculture** or **beekeeping**. Surprisingly, though, soil erosion control was not important to them. The strong relationship between these two services is probably less or not at all known to local people. This is also reflected in real life in soil cultivation and grazing practices. Lack of awareness about this relationship reflects a lack of knowledge in the region in the field of agriculture. To improve this situation, the Advisory Board (Figure 7) made recommendations on how agriculture, which is significant on a societal level in the region, could be made more attractive and its standards raised. There is another issue worth examining: the local food industry thinks that for them, landscape, pollination, natural forage and fodder, soil erosion control or wild

plants are not important, when in fact these are indispensable for the production of raw material for the food industry. This ambiguity can also be explained by the fact that the few existing local **food industry** companies do not use local raw materials, instead, they use raw materials from import or other intensive production. Also, farmers and wild plant collectors of the Niraj-Târnava Mică region either sell their produce abroad, or market their fruit, mushrooms, or wild plants that they collect from nature or produce locally using extensive farming elsewhere, at rather depressed prices. In theory, the rich natural environment and the extensive, near-natural technologies could be serious value-adding factors on the market, however, due to a lack of appropriate organizations, trademarks and underlying cooperation, the effects of these factors are not observed. What makes the situation even more paradoxical is that it **is the local people who sustain this landscape with great diversity and naturalness**, however, they neither have access to its products, nor can they earn economic profit from it. Companies involved in **tourism** attributed only little importance to natural assets (biodiversity, wild plants), however, they did mention that the diversity of the landscape was touristically important. This dualism probably stems from the fact that economic stakeholders think in terms of landscape scale but do not yet regard the elements of biodiversity as factors attracting tourists. In fact, in a region like this, poor in touristic programmes but rich in species, natural assets smaller than landscape scale should be put to good use. All it would take is to simply recognize and understand "nature's free goods" and to develop touristic programmes that attract visitors in the long term.

In our assessment of the **companies**, we also tried to find out **whether they were consciously mindful** of the ecosystem services that they consider important for their success. With the exception of one company leader all representatives of the companies made reference to mandatory external regulations and said they made some efforts to preserve the given service only by observing them. Only the representative of a single company (tile stove maker) reported on responsibility for 'internal motivation' pointing beyond observing mandatory regulations, who tries his best to ensure soil erosion control during his work even without external regulations. These results reveal the fact that the majority of economic stakeholders have not yet recognized the need to make an effort to preserve the ecosystem services they use, as doing so would have economic consequences as well. Those local companies that have a long-term vision have a vested interest in preserving ecosystem service capacity facilitating the success of their own businesses. Naturally, knowing which of the regulations pertaining to them actually protect ecosystem services is already an important step. Actors should protect at least those services that serve their interests, as through their use, these actors have the greatest impact on the services' quality. In this field, involvement of and guidance by larger companies would be essential as smaller ones usually do not have the financial means to do so. It is also true, though, that there are some things that would not require money and could be done through simple attentiveness and consciousness. Our survey shows that companies lack even the knowledge necessary to achieve this.

The fact that the background of sectoral regulations seems to be unclear for business or political leaders can undermine the effectiveness of these regulations. Nobody is keen to observe regulations which they find totally meaningless, in fact, more often than not, they try to evade them using different tactics. In order to better observe these laws, legislators should not only introduce mechanisms for control but should also adequately inform the sectors about the reasons for the regulations for environmental protection. They should make economic actors understand that preserving ecosystem services is not merely an idea of legislators but the companies' own economic interest, too. Legislators should be able to find the necessary human and financial resources to secure this.

INDICATORS AND VALUATION OF ECOSYSTEM CONDITION AND SERVICES

Valuation of the various ecosystem services and condition indicators is based on the mapping of natural habitats. The habitat map (Figure 11) shows the landscape divided into functional units relevant from the aspect of ecosystem services. For this we represented different natural habitat and land use types. In some cases this structure may be different from the way a particular area is displayed in an official registry.
More than one-third of the region is covered with deciduous forests and over 40% is some kind of grassland (pasture, meadow, encroached grasslands or wooded pasture). Only 13% of the studied four Natura 2000 areas is cultivated agricultural land. A mere 3.5% of the agricultural land has intensive cultivation with the overwhelming majority (96.5%) being small-scale agriculture.
A great proportion of the studied 91 thousand ha are covered with some kind of natural vegetation, which provides a solid basis for high biodiversity.

HABITAT NATURALNESS AND LANDSCAPE DIVERSITY

We considered the natural or altered state, diversity, and wealth of ecosystems using two **ecosystem condition indicators** on two different spatial scales. We characterized fine-scale biodiversity of wildlife using a **naturalness** index (Figure 16) based on bird occurrence data while a **landscape diversity** index (Figure 17) was used to describe the diversity of habitats representing a major broad-scale spatial pattern in the landscape. The Niraj-Târnava Mică can be regarded as an area of outstanding diversity from both aspects on a European as well as a Romanian level. A landscape's naturalness is primarily determined by its biodiversity and the landscape structure (landscape diversity) affecting it. The basis for the high biodiversity of the region is provided by **deciduous forests, pastures, small-scale agricultural areas, as well as meadows and encroached grasslands**. It is worth pointing out among these, the importance of small-scale, mosaic agricultural areas, which, due to their naturalness and landscape diversity, greatly contribute to the region's biodiversity. This is a fine example of the balance between human activity and nature, which seems to be dangerously deteriorating. Habitat naturalness and landscape diversity are ecosystem condition indicators which are not directly 'utilized' but contribute to providing many different ecosystem services indirectly. The 'value' of these condition dimensions manifests itself only indirectly in the economy, too. However, naturalness **was ranked very high** by local economic actors. The interviews conducted at the beginning of our research also reveal that, although local people have a strong attachment to their natural environment, they are less aware of what the activities and impacts are that can lead to the deterioration of the region's naturalness. The basis for maintaining naturalness is preserving landscape structure. It is necessary to avoid land use change or fragmentation of the landscape (breaking its integrity with roads or other elements impassable for living beings). **Landscape structure** secures the high biodiversity of this region, enabling ecosystem services to contribute so greatly to the well-being of local people. In today's rapidly-changing world this preservation of habitats and landscape structure is perhaps one of the greatest challenges. This, according to local people's most preferred scenario, is most likely to happen when community solidarity becomes strong in the region.[4]

[4] What is the way forward? – Scenarios for the Niraj-Târnava Mică region with relation to ecosystem services. www.milvus.ro/ecoservices

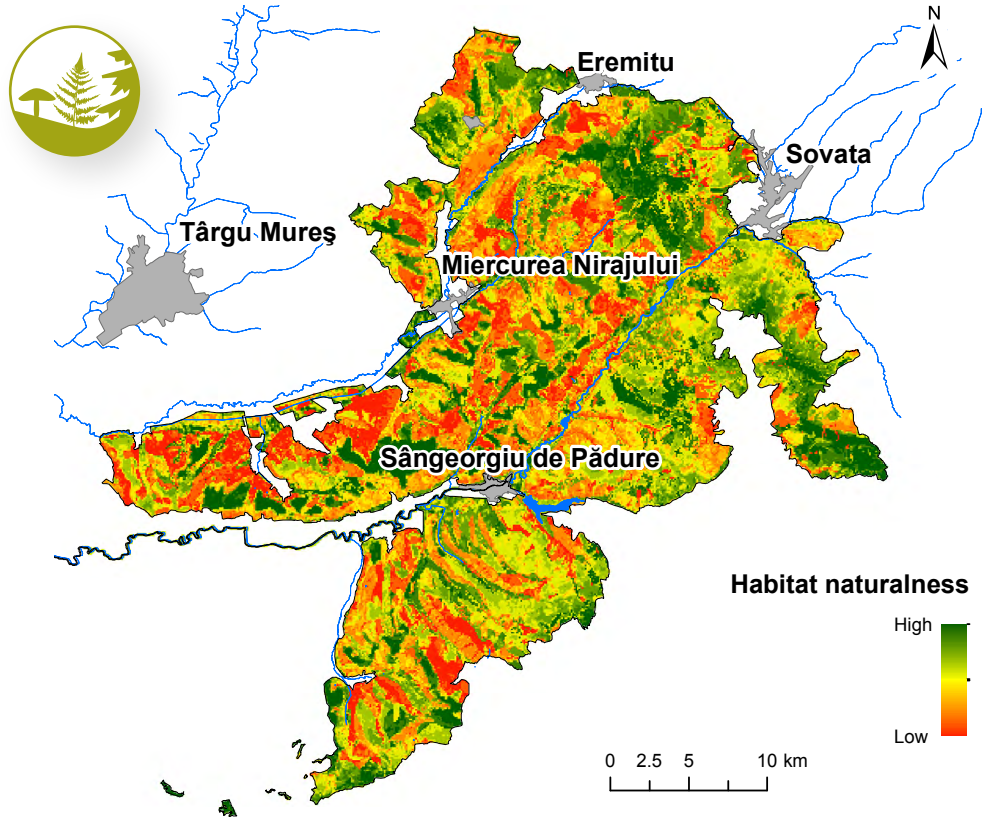


Figure 16: Naturalness of habitats: the capacity of habitats to maintain biological diversity estimated using statistical models based on bird distribution data, satellite images and other environmental variables

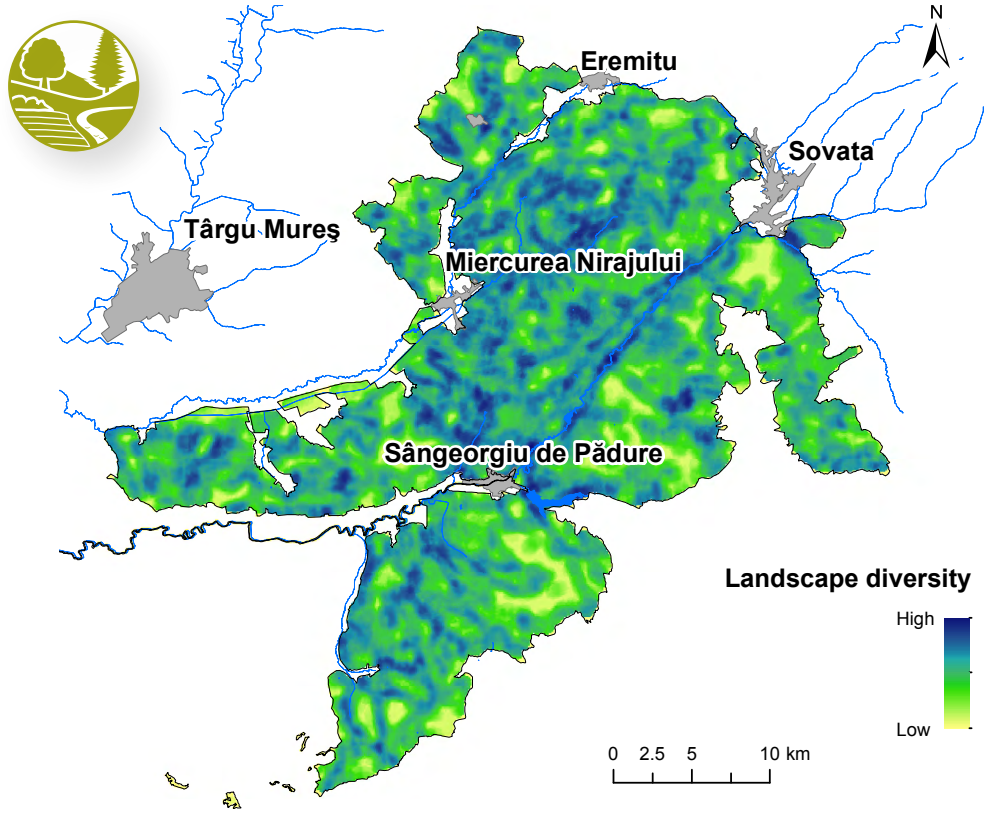


Figure 17: Landscape-level habitat diversity expressed with a mathematical formula (Shannon diversity index of the main habitat groups at a rough (~1 km) scale)

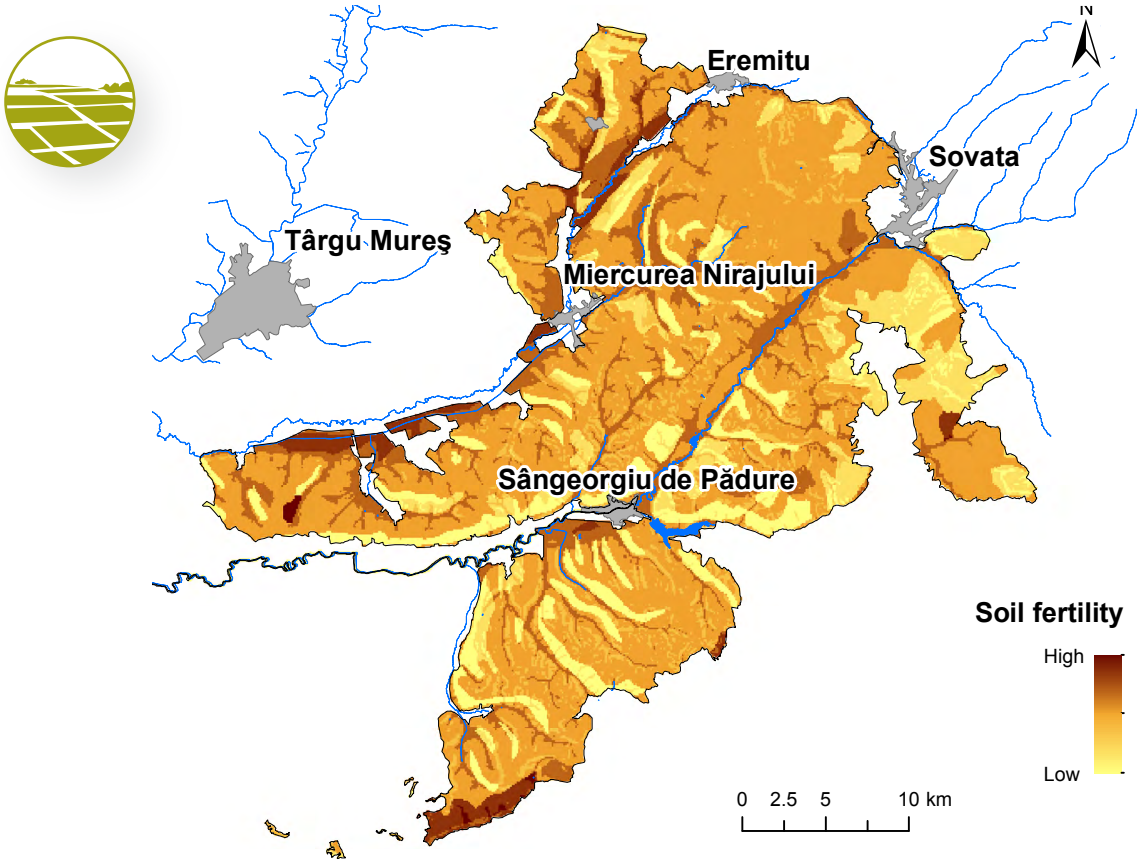


Figure 18: Estimated soil fertility (capacity to be used for arable land and stoop crops) on an expert rating scale

One of the key agricultural sectors of the Niraj-Târnava Mică region is arable farming and horticultural crop production. Since in today's production practices nature's contributions are almost 'dwarfed' by different human contributions (fertilizers, machines, fuel, chemicals, various elements of the food chain), crops themselves cannot be regarded as ecosystem services. However, it is important that they should be present when taking stock. In our research, nature's contribution to agricultural production is mainly reflected through soil fertility as an ecosystem condition indicator.

The region's soils possess medium quality fertility – there are no soils with nationally outstanding fertility in this region of the country (Figure 18). Areas with higher than average fertility are found only in riverside fields. These once riverine floodplains have lost the natural supply of their fertility due to today's river regulation practice. One-sided water management practice only concentrates on the earliest drainage of the increased amount of water. This, however, not only hurts soil fertility but also adversely affects the region's water management.

The larger arable lands were formed on the best soils of the region, however, erosion control and water retention in these areas are particularly poor. In order to counteract this, attention must be paid to plant cover and planting or preserving elements of green infrastructure (e.g. bushes, lines of trees) in the vicinity of these areas. One-third of encroached grasslands are located on soils with very poor fertility. If owners clear bushes here to obtain subsidies, this will lead to further erosion and further loss of fertility for these soils. This, in turn, will further decrease their ability to help local communities with different types of ecosystem services.

Soil fertility was ranked among the key ecosystem services by half the population: it is the sixth most important ecosystem service for local people. With a view to the future, it is especially important that it is ranked high by young people, too.

Companies, too, indicated high dependency: soil fertility was ranked the third most important service for them. It was found particularly valuable by companies involved in agriculture, beekeeping, logging and wood processing as well as the food industry. In contrast with other services, this condition indicator was ranked high even by companies not directly dependent on soil fertility (e.g. wood processing and the food industry). This is probably explained by the fact that soil fertility is a well-known service, in comparison to some other services (e.g. soil erosion control) which do not receive attention due to a lack of information, leading to the impairment of the service's active protection and preservation. There are established methods for the preservation of soil fertility but in

many cases the region's agricultural practice lacks the knowledge to utilize these ("I spread manure the same way as my neighbour"). Let us remember the mindless use of fertilizers in the communist era and its practice existing even today, as a result of which the region's water supply is infused with nitrates. It would be advantageous if the region had agricultural practices which would not damage other natural assets through their activities.

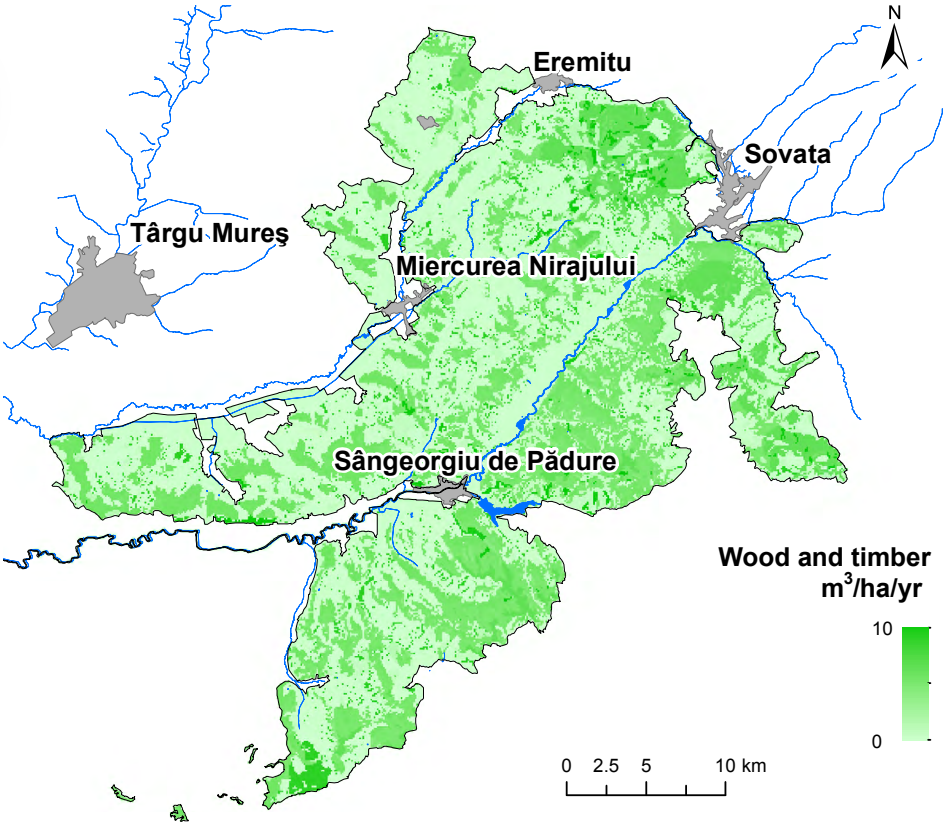


Figure 19: The landscape's long-term capacity to provide wood and timber

Half the area possesses some degree of wood-producing potential but a considerable portion of wood production is secured by the natural deciduous forests covering one-third of the area (Figure 19). The wood producing potential of these forests represents medium quantity but the wood and timber produced in them (oak, beech, etc.) are considered particularly valuable. Planted pine and black locust forests have a greater specific contribution to the area's wood-producing capacity, however, due to their small size, they are less important.

Similarly, the wood-producing potential of the tree rows and narrow galleries consisting primarily of riverine willow and alder groves is exceptionally good, while due to their low-value wood their importance lies mainly in conservation and climate regulation.

The annual **capacity** of forests under forest management in the study area is about **20 million RON (4.4 million EUR)**. Roughly **74%** of this capacity currently appears in the official economy. We must not interpret this result as underuse for the following reasons:

1. In case of heavily regulated services like wood and timber there are established methods for capacity estimation from which we cannot divert. However, these methods were developed to take, of all the potential ecosystem services of forests, only wood and timber into account while neglecting other services. One hundred percent exploitation of the annual wood and timber production would be very dangerous on a regional level. This use around 75% brings us very close to exploiting maximum capacity, which would damage the region's multifunctionality. Thus in the case of forests capacity reserves are only illusory: further increase of production, even if it was possible, would lead to heavily exploitative use, which, in turn, would cause damage to the ecological condition and the other ecosystem services.

2. According to official data, illegal cutting of trees accounts for 50% to add to legal harvest nationwide. This may mean that in the region the harvested quantity may greatly approach, if not exceed, annual production. In addition, illegal logging does not take into consideration norms that even otherwise profit-oriented forestries observe. Instead, they carry out the logging driven by their greatest momentary profit or easiest 'access'.

3. As a combined result of legal and illegal logging, the extent of forest use is already approaching maximum capacity. This, however, impairs the ecological condition of forests under forest management (and, due to illegal logging, even that of officially non-managed forests). Impairment of ecological condition, in return, represents loss of wood and timber yield as well as of other services (water retention, carbon sequestration, etc.) provided by forests, which may have serious economic consequences.

22% of the forests in the Natura 2000 areas of the Niraj-Târnava Mică region are not under forest management. There are also wooded areas that are not officially considered forests (1122 ha). If we want to be able to obtain wood and timber from the area in the present quantities, while at the same time paying attention to the capacity of wooded habitats to provide other ecosystem services and we wish to do all this without damaging the ecological condition, we need to be more serious about enforcing and observing laws.

A number of forests are not under management at present because the types of tenure and property deeds of a portion of forests returned to smallholder farmers after the political regime shift is still unsettled. On the other hand, in some cases the owners did not place forests on settled lands under forest management, either. Also, there are areas that are currently registered as some other land use type, but they are already spontaneously afforested with at least 40% cover. Such areas should be upgraded to a forest by law when their area reaches 0.25 hectares. The relevant local governments fail to do this sometimes out of neglect, other times out of sheer interest related to the fact that this way they can freely issue felling permits.

Although the forestry sector has a long-term vision, still, it concentrates primarily on the most efficient way of wood harvest. Companies involved in the forestry sector are not receiving any subsidies to preserve other potentials in the managed forests. Even if some companies would like to consider all this (luckily, there are a few forestries in the region that would), it puts them at economic disadvantage at present.

Although the present forest management norms cannot be considered integrated, either, the ecological condition of the region's forests are mostly threatened by the black economy, illegal felling. This nationwide problem has been recognized even by the government who is trying to introduce measures to tackle the problem but in many cases these measures affect the local population adversely, making it difficult for them to obtain wood and timber. This is a problem because these measures to protect forests can only be efficient with the active cooperation of the population. In addition to laws protecting local communities' interests, community cooperation, a feature of the local people's coveted scenario, is necessary.

Half of the population consider wood and timber in the area of the project very important, and also half of the companies show some degree of dependence on this raw material. Naturally, logging companies' dependence is particularly great on this ecosystem service. Wood represents the basis for local well-being. This could contribute to the local economy in a greater proportion than at present if the local population and local businesses were to be the first recipients of logging and the raw material (i.e., they would be the ones to use or process them) rather than extra benefits being made primarily by external actors.

According to the outlined scenarios, the region's wood and timber producing **capacity will slightly increase**, largely due to stricter forest management regulations and afforestation of abandoned encroached grasslands. If local people and communities began to think in integration and sustainability terms about the use of forests, the expected increase in wood and timber, together with other services of the forests, could contribute to the region's well-being on a much larger scale.

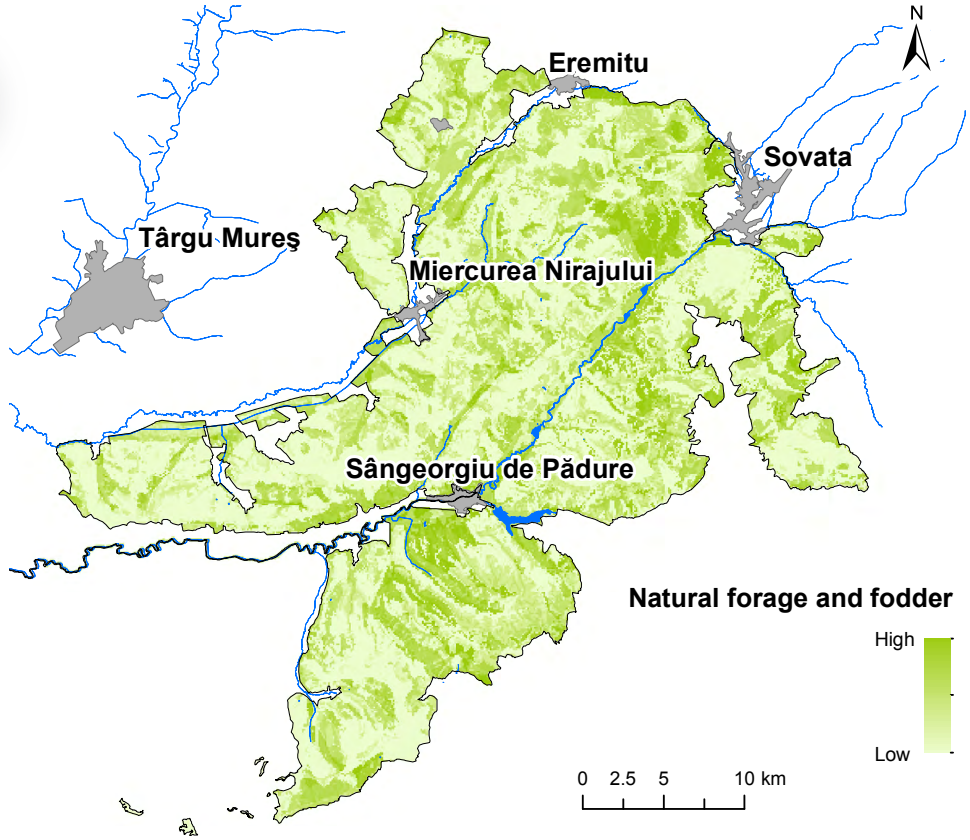


Figure 20: The landscape's capacity to provide natural forage and fodder for domestic animals

Obviously, **pastures** and **meadows** were ranked highest for this service. Also high rankings were given to wood pastures, encroached grasslands, and tree rows and galleries (due to the herbaceous vegetation accompanying them). As a whole, the area's capacity and its utilization show a very heterogeneous distribution (Figure 20). There are places where overuse has already appeared, mostly in the form of **overgrazing** while some other places are characterized by abandonment or undergrazing, which also leads to the deterioration of the quality of grasslands.

Three quarters of pastures and meadows are of medium or very good capacity. One quarter, however, is very poor in capacity for various reasons and their combined effect. A grassland's capacity to provide natural forage is greatly affected not only by various physical factors (slope, soil acidity, altitude above sea level) but also by its naturalness and grazing intensity. To prevent these poorer capacity areas from significantly degrading, it is necessary to consider pastures' rather diverse abilities to provide this service when determining grazing pressure. To be able to do this, users need to possess knowledge and awareness. In the region this is present either as traditional knowledge or expertise, but in places where there are farmers who became farmers out of necessity or ones that are only interested in momentary profit making, degradation of grasslands may increase. In addition to determining ideal grazing intensity, it is also very important not to allow its naturalness to worsen. It is not possible to preserve the naturalness of individual patches of grasslands; this can only be done on a regional level, which can be achieved through the conscious activities of local communities and leaders. Over 10% of all officially used areas are overgrazed at present, but if we consider nationwide tendencies and Transylvania's similar but more intensively cultivated areas, then further increase in overgrazing can be expected in this region, and we need to prepare for it as soon as possible.

The present Romanian law on grasslands is rather strict and thorough, but in many places authorities lack the expertise to implement complicated requirements. Furthermore, the local governments need to prepare the grazing plan for all the grasslands of the settlements, for which they do not have the appropriate experts.

Only one-third of the population said that they found natural forage and fodder important despite the fact that the region's livelihood is heavily dependent on agriculture. Similarly, only companies involved in livestock breeding reported dependence. Grasslands' capacity to provide forage and fodder (as grazing or hay) at present contributes **14 million RON (3.1 million EUR)** to the economy of the Natura 2000 areas of the Niraj-Târnava Mică region. If we consider the

fact that grasslands provide numerous other services in addition to forage and fodder (e.g. herbs, mushrooms, touristic attractiveness, soil erosion control, and water retention), we can see that their role in the local economy is even greater. The area's capacity is much greater than this, since encroached grasslands, which account for 7.6% of the area and harbor many former pastures and meadows, still represent some kind of reserve for forage and fodder. According to the scenario outlined by local stakeholders the region's capacity to provide natural forage and fodder will slightly decrease primarily due to loss of habitat. If we want to make sure that this decrease affects local economies and farmers as little as possible, the quality of grasslands must be preserved. In addition to local awareness further legislature acknowledging the multifunctionality of grasslands is needed in order to avoid overgrazing.

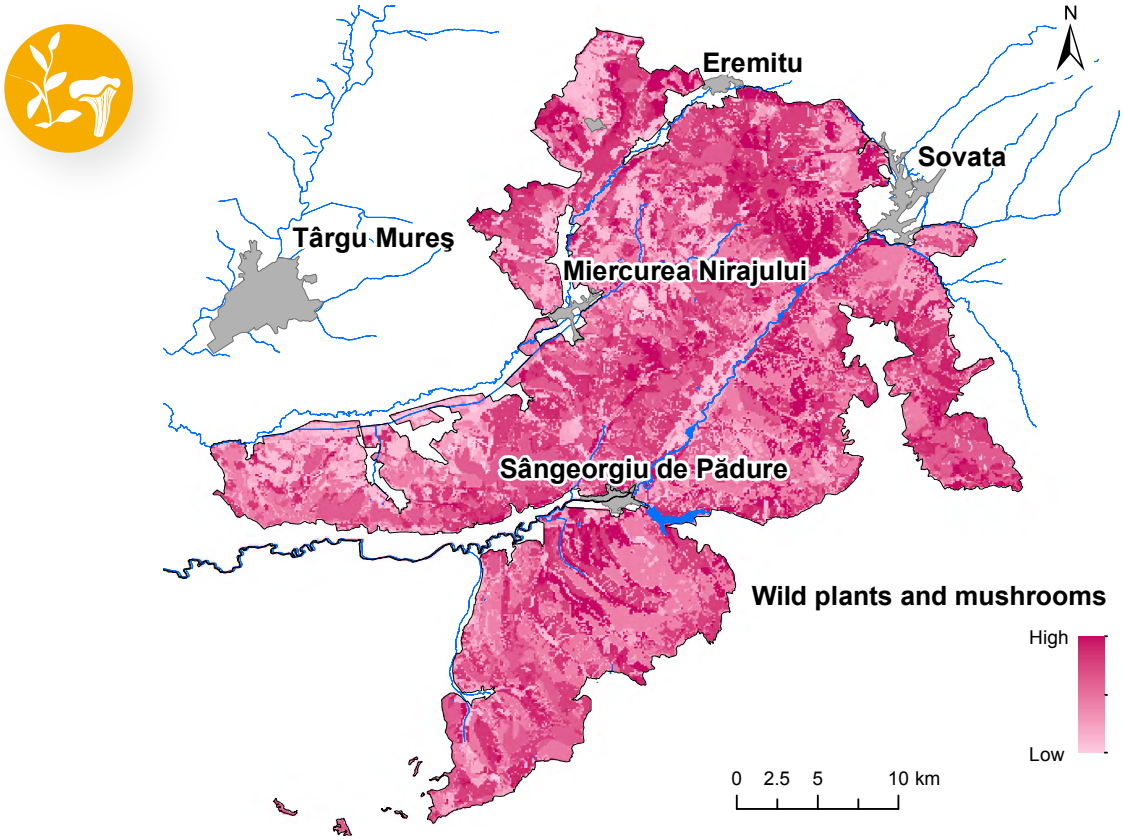


Figure 21: The landscape's capacity to provide wild edible mushrooms, berries and medicinal herbs

The area as a whole has a large capacity in terms of collecting wild products (Figure 21). The diverse grassland types are of particularly large capacity (wood pastures, pastures, meadows, encroached grasslands), but deciduous forests, groups of trees, extensive orchards and even small-scale agricultural areas also greatly contribute to the region's capacity to provide 130-300 tons of mushrooms, herbs and plants per year officially. Wood pastures have the highest capacity, but, as a whole, due to the smaller size of the area they occupy, they contribute to the landscape with their edible goods to the same extent as other types of grassland.

Close to half of the population consider these gifts that can be picked from nature important. Those who did find them important ranked them among the key services for them. People in many places use these as part of their way of life for nutritional or health reasons, while others look at picking these goods in nature as a recreational activity.

One-third of the companies feel dependent on these goods albeit slightly. However, among the companies interviewed there was not a single company involved in the processing or official harvesting of these goods. The economic value of the officially harvested quantity of these goods is almost **1.7 million RON (370 thousand EUR)** annually. This is not a service of outstanding economic value; however, its societal function is very significant. This contradiction is also revealed in the comparison between the services: while wood and timber was considered as important as wild plants and mushrooms (45 and 44%, respectively) by the same number of people, the estimated economic value of it is ten times higher than that of the latter.

It is mostly private individuals who collect wild products with official authorization (permits) from the municipalities, and they then pass the collected goods on to resellers generally outside the sample area. This way only a small fraction of these natural goods remains in the area. Foraging in nature as a touristic attraction or programme is at present an unrealized potential of the region. If these activities were sustainably integrated into the local economy, they could significantly increase the well-being of locals and visitors.

Collecting is also a significant source of livelihood in this region, mostly for people living in extreme poverty who have little or no chance of finding employment. In certain villages large groups of people have lived off these activities for generations. The traditional ecological knowledge these people have of the various herbs, edible berries or mushrooms and their places and times of collection is such that can

be regarded as valuable in itself. In spite of this, these groups of people are frequently in conflict with local municipal and forestry authorities. This is primarily explained by the fact that intensive harvesting causes damage to the primary products in the area (e.g. wood or grass fodder). It would be important to establish a legal framework that would create coordination between owners of areas and the people intending to gather wild plants there. This would facilitate preservation of individual traditional knowledge, and prevent the situation where society has to spend valuable resources to support this marginalized group, who otherwise could sustain themselves, as well as significantly contribute to local and national economies with the healthy food they collect from nature.

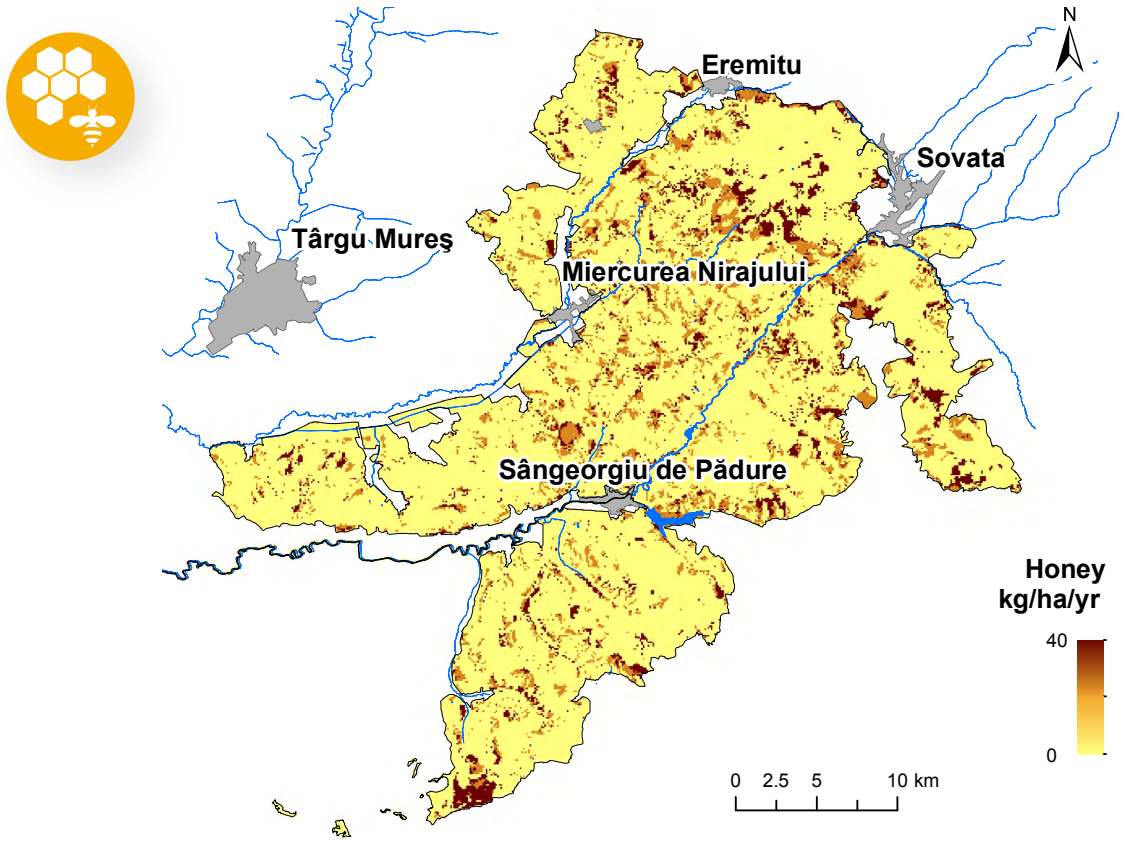


Figure 22: The landscape's capacity to provide source of bee pasture and honey production

The Niraj-Târnava Mică region does not belong to the most outstanding bee pastures in Romania. In spite of this, there are a number of villages in the area with remarkable apiculture and expertise. Beekeeping plays a relatively important role in the local economy as well. This is reflected in the fact that, similarly to what we experienced with the valuation of wild plants, while the economic value of honey is only a quarter of that of wood and timber, its importance for the local people rivals that (41% compared with 45%). Naturally, larger apiaries also perform the practice of transhumance (seasonal relocation of bee colonies), which means that nectar production from other regions appears as well in the local economy. We intended to eliminate this in our calculations for the area's potential honey-producing capacity (Figure 22), and its actual utilization. According to these calculations, the area's honey-producing **capacity amounts to 4.5 million RON (1 million EUR) annually**, 86% of which is currently realized in the economy. (Obviously, the value that local beekeepers produce from the honey collected during migration is significantly larger than this.)

The honey from the nectar collected in bee pastures is closely linked to another, regulatory service: pollination of crops. Like soil fertility, this service can also be regarded as a basic service provided by natural ecosystems to secure the success of agricultural cultivation. Its monetary value is very difficult to express but, according to international calculations, it greatly exceeds the monetary value of the collected honey. Bee pastures with an appropriate area, nectar abundance and biodiversity sustain honeybees and beekeepers in addition to their own remarkable wild bee fauna, which also contribute to the productivity of neighbouring agricultural habitats. Decrease in the number of natural pollinating insects is a worldwide tendency which threatens the successful pollination of many crop and even natural plant species. It is to be expected, then, that the role and value of this service will rise in the future.

As the value of an area is determined by the same feature (floral abundance) of the area for honeybees and wild bees, the estimate and map that we have prepared to represent the capacity of the nectar- and honey-providing services can simultaneously be regarded as a good capacity estimate for pollination as an ecosystem service. Providing honey and nectar is thus a service of outstanding importance. It is not only necessary to preserve its capacity but it is also worth considering increasing it.

Beekeepers get subsidies primarily for migrating. In an area of relatively low nectar-providing capacity this brings stationary (non-migrating) beekeepers into an even more disadvantageous situation. It must be feared that without subsidies they will give up on

being stationary, diminishing thereby the pollinating capacity of the area.
The region's nectar-producing capacity can be increased in cooperation with the farmer population only. To achieve this, an integrated plan for the management of meadows and arable fields needs to be developed that would integrate the benefits derived from the various ecosystem services. Farmers' organic production, in turn, creates safe conditions not only for bees but also for other pollinating insects. To implement all this, it is indispensable to create awareness and cooperation in all actors involved in the various sectors (e.g. farmers, beekeepers) along with subsidies and forms of organization that offset momentary financial disadvantages.
Securing pollination was ranked as important by close to half of the population. The fact that they not only attributed great importance to bees' pollinating work but they also found the health and enjoyment value of diverse apiculture products important reveals a great degree of awareness. A quarter of the economic actors found pollination important; of these beekeepers ranked it very high while actors in other sectors attributed little importance to it. Interestingly, in contrast with the population, companies involved in agriculture recognized their dependence on pollination to a lesser extent. It is generally true that we do not seem to appreciate anything whose role we are not aware of. For this service to survive in the future, too, farmers also need to be aware of its importance. This is also vital for achieving the farmer-beekeeper cooperation.

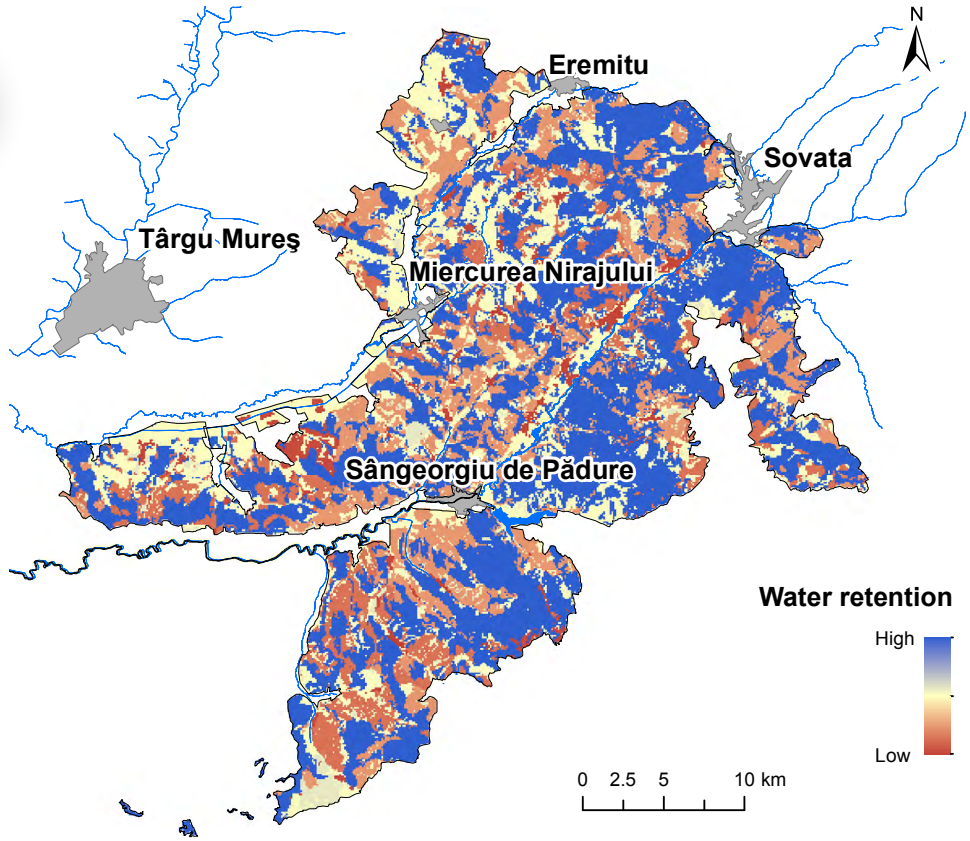


Figure 23: Capacity of ecosystems to slow surface water runoff, and thus contribute to the recharge of regional groundwater resources and mitigate soil erosion

The soil erosion control and water retention of the different habitats are determined by the same factors. Realized soil erosion mitigation and water retention depends primarily on the vegetation covering the soil, that is, on the given habitat but it is also greatly influenced by the area's slope, too (Figure 23). **Forested habitat types** have the largest capacities but **encroached grasslands** are also very important.

From the aspect of soil erosion, habitat types that are bare, without vegetation cover, for a portion of the year are the most vulnerable. These are typically arable fields, or in some cases gardens which belong to the village, but forestry cultivation systems involving interference with the soil also lead to significant erosion over a long time. In the case of settlements soil sealing (development of built environment on agricultural or other rural land) involves increased water drainage even without erosion, which, in turn, leads to water loss. Of the various grassland uses grazing, especially sheep grazing, may cause risks of erosion and decreased water retention as sheep grazing results in much shorter and more erodible grass than cattle grazing. However, the water retention of meadows as closed, untrodden grasslands, in many cases rivals that of wooded habitats. Thus in addition to their other benefits, **meadows** also have a key importance through their **water** retention and soil erosion control function, which goes well beyond the borders of the particular habitats.

The population ranked water as the most important service. Three quarters of local people found the region's water retention important, whereas only a quarter of them had the same view of soil erosion control. The same ratio can be observed in the study of companies' dependence. Interestingly, companies that signalled strong dependence on soil fertility did not find soil erosion control important. These results can probably be explained by a lack of information about the interrelationship between soil fertility, soil erosion control and water retention.

According to the scenarios outlined by local people, the region's capacity will decrease in this service because they think that some degree of intensification in agriculture and infrastructure development is inevitable in addition to global impacts.

In the fight against global climate change, in addition to emission reduction (mitigation), it is important to shape a region's land use in a way that dampens the impacts of increasingly extreme weather conditions caused by climate change (adaptation). Everybody can contribute to the reduction of damages caused by droughts or extreme rainfall events by avoiding illegal felling, the tillage of grasslands, the drainage

of wet meadows, and other bad agricultural practices (e.g. hill-valley direction ploughing) – to name a few of the most common problems, which significantly reduce the Niraj-Târnava Mică region's capacity for water retention and soil erosion control.
There is a great need for integrated decisions that consider cross-sectoral impacts from the various professional and political decision makers. Land users and decision makers need to make concerted efforts to preserve and maintain the quality of habitats that are of high importance in terms of water retention and erosion control. Only this way can they provide these crucial protective and regulatory services for local people.

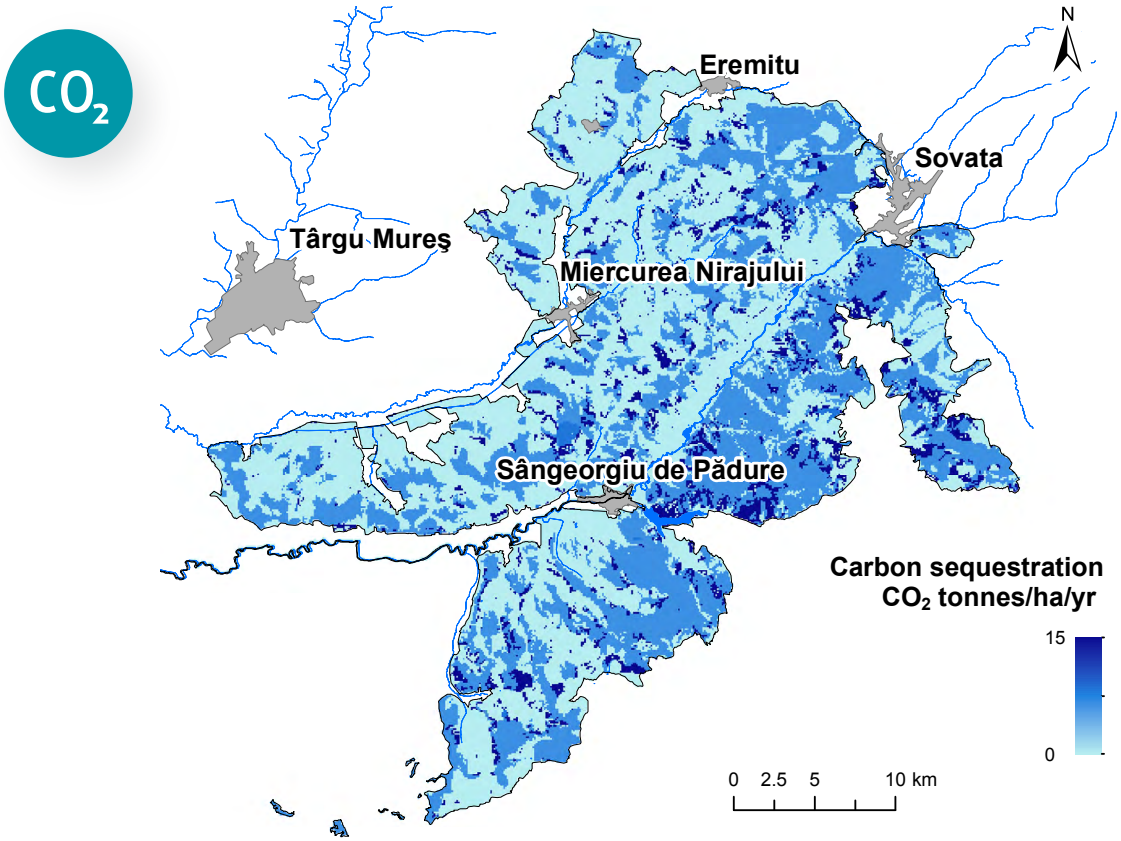


Figure 24: The landscape's contribution to carbon sequestration and thus to global climate change mitigation

Sequestration of carbon dioxide as the primary greenhouse gas involves storage of carbon in the biomass that is increasing (from year to year) in habitats. Thus the habitats covered by the quickest-growing perennial woody plants possess an **extremely high** capacity for carbon sequestration, namely: **encroached grasslands**. Also significant is the capacity of deciduous forests, black locust plantations and orchards to capture CO_2. The other habitat types do not capture CO_2 in net terms, at least not in ways detectable for the simplest calculation methods in the international guidelines (Figure 24).

Although **deciduous forests** have medium capacity, due to their size (they cover one-third of the project area), they contribute the most to the region's carbon sequestration, amounting to two-thirds of the total capacity. The other one-third is provided by encroached grasslands, although this habitat type only accounts for **7.6%** of the area.

The economic value of the region's CO_2 capture is **5.7 million RON (1.3 million EUR)** per year. This capacity is utilized 100% since the growth of the biomass capturing carbon dioxide is realized 100%, thus capacity always equals actual use. Most of the time the economic value of CO_2 capture is not taken into consideration when planning land use or creating forestry regulations. Timber growth in forests contribute a further 50% economic value to their worth through their CO_2 capture capacity.

In view of the fact that encroached grasslands have double the CO_2 capture capacity of forests, decision makers should perhaps consider raising the proportion of areas that can be left encroached when allocating subsidies for grasslands. At present a farmer can only receive any kind of farm subsidy if they do not have more than one are of bushes per hectare on their pasture or meadow. (Unfortunately, due to a clumsy current practice, inspectors from the Agricultural Payments and Interventions Agency (APIA) tend to impose sanctions for even less than that.)

Encroached grasslands are not only important factors in the fight against climate change, in fact, they facilitate other ecosystem services, too: they also have larger capacities in water retention and soil erosion control than completely cleared pastures. In terms of nectar yield, they are incomparably better than 'simple' pastures.

A smaller proportion of the population think that climate change mitigation is a very important service of the region, while the majority find it less important. Of the economic actors only beekeepers and those involved in crop production, i.e., those who are most directly affected by consequences of climate change, attributed greater importance to climate change miti-

gation from the aspect of their businesses. Other sectors attributed little importance to climate change mitigation despite the fact that companies living off livestock breeding, the food industry or tourism can be heavily affected by issues caused by climate change.

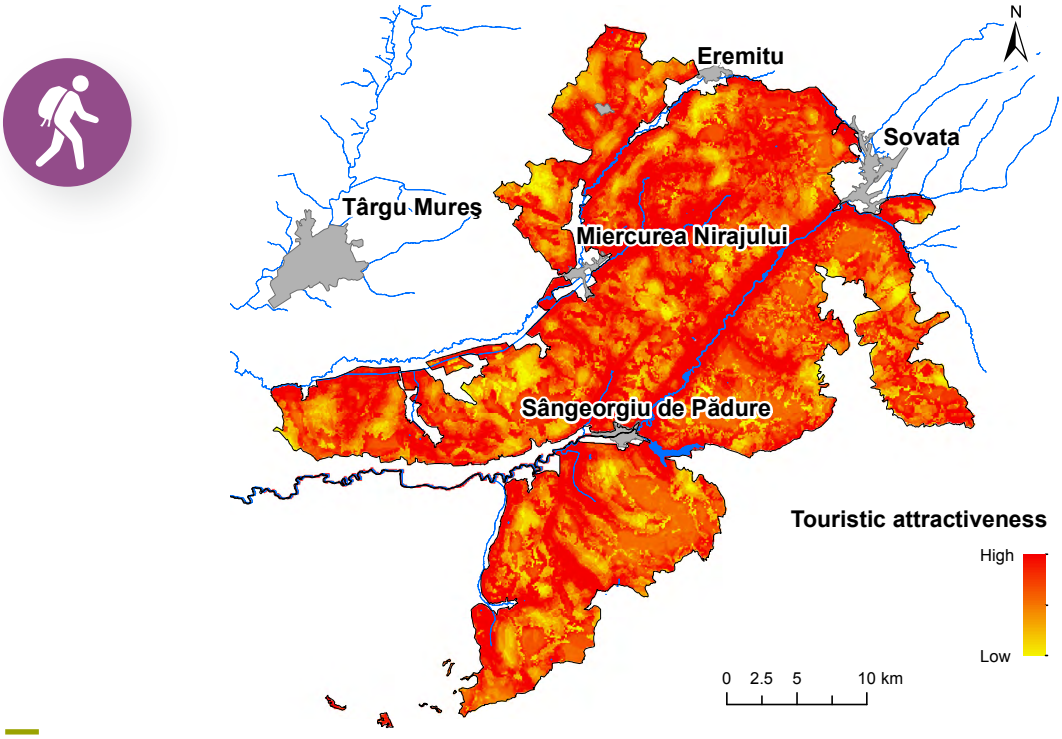


Figure 25: The landscape's contributions to touristic attractiveness and sense of place

Close to half of the region's landscapes were ranked very high in terms of touristic attractiveness, offering important resting and recreational opportunities both for tourists and for local people, creating a base for emotional attachment. The highest scores were given to villages, deciduous forests, wetlands, wood pastures and small-scale agricultural areas. It is interesting to note that small-scale agricultural areas have greater capacity to attract tourists or create local identity than meadows or pastures (Figure 25).
Half of the local population found the landscape's contribution to touristic attractiveness and local identity important. For a majority of respondents, probably those who are not involved in tourism, this service is not primarily important from this aspect, instead, they view it as a factor contributing to their well-being by offering recreational opportunities. Many see the landscape as an asset in itself. Close to half of the companies attributed some degree of importance to this service. Companies involved in catering, retailing and crop production found it more important and beekeepers thought it was more important than average.

At present tourism's annual contribution to the local economy amounts to **17 million RON (3.7 million EUR)**, but the region has a much greater potential as its tourism is not significant compared with other regions. The natural assets in this region should be recognized by local people as valuable. It is necessary to precisely assess what elements of the landscape should be highlighted in this region, what types of touristic programmes can be developed that would make tourists not only interested in them, but also encourage them to spend a longer period of time there without adversely affecting these assets (soft tourism).
To be able to do that, we need to preserve the traditional image of the villages and water, including wetland habitats in the landscape. The ancient trees of the wood pastures are also worth more as touristic attraction than the mere wood and timber or carbon they contain. Also, it is recommended to design forest exploitation practices in a way that preserves the forests' naturalness in the most frequented places and along potential hiking routes.
Boosting tourism would not require great amounts of financial investment; all it would take is to recognize and show natural and cultural attractions. Transylvania is one of Europe's most 'exotic' touristic destinations – but the efficient way to get the immense cultural and natural values recognized by a broader audience (including locals and potential tourists) still has to be found. After opening up to Europe, local people should also realize that things still common to them are, in fact, being lost in Western Europe. If they fail to recognize this and to appreciate the value of their heritage, they will lose it. This is important not only because of the financial potential for tourism but also because this could function as a basis for the 'cohesive force' keeping local communities together that is so critically important for the region's future, as testified by the conclusions of our scenario planning work.[5]

[5] What is the way forward? – Scenarios for the Niraj-Târnava Mică region with relation to ecosystem services. www.milvus.ro/ecoservices

AN OVERVIEW OF THE ECOSYSTEM SERVICES IN THE NIRAJ-TÂRNAVA MICĂ REGION

There are several areas in the Niraj-Târnava Mică region that generate disproportionately high contributions to ecosystem service provision. To illustrate this, we have prepared maps that show, for every single point (pixel) of the study area, the number of services being provided at above average (the upper 50%, Figure 26) or outstanding (the top 10%, Figure 27) performance. Places that have above average or outstanding capacities for a number of services should be definitely preserved. Most of these areas are located on higher, varied terrains, and consist in a mosaic of different natural and near-natural habitats.

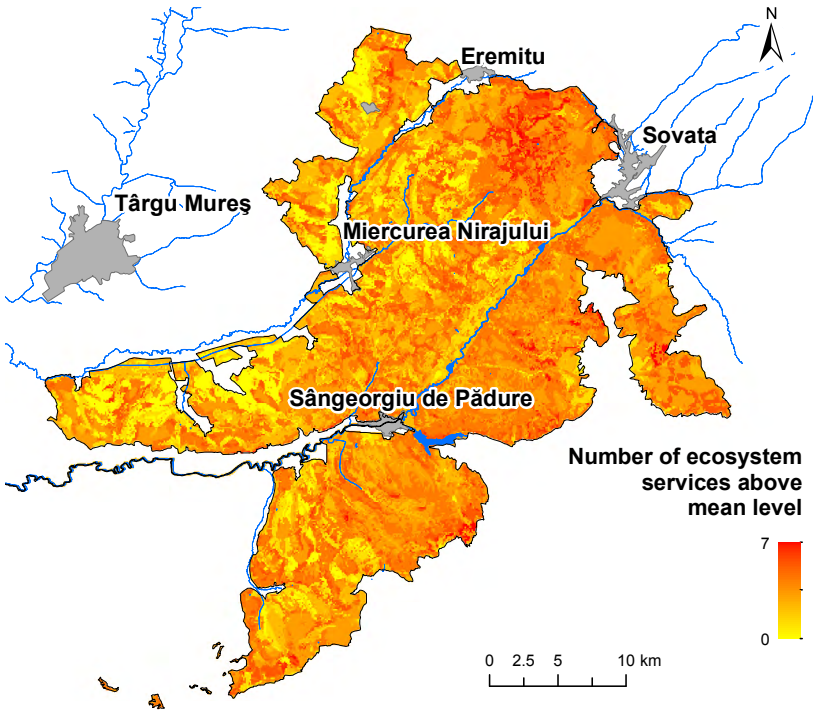


Figure 26: Overview of ecosystem services in the Niraj-Târnava Mică region: the number of services provided at an above average level for each spatial unit (pixel)

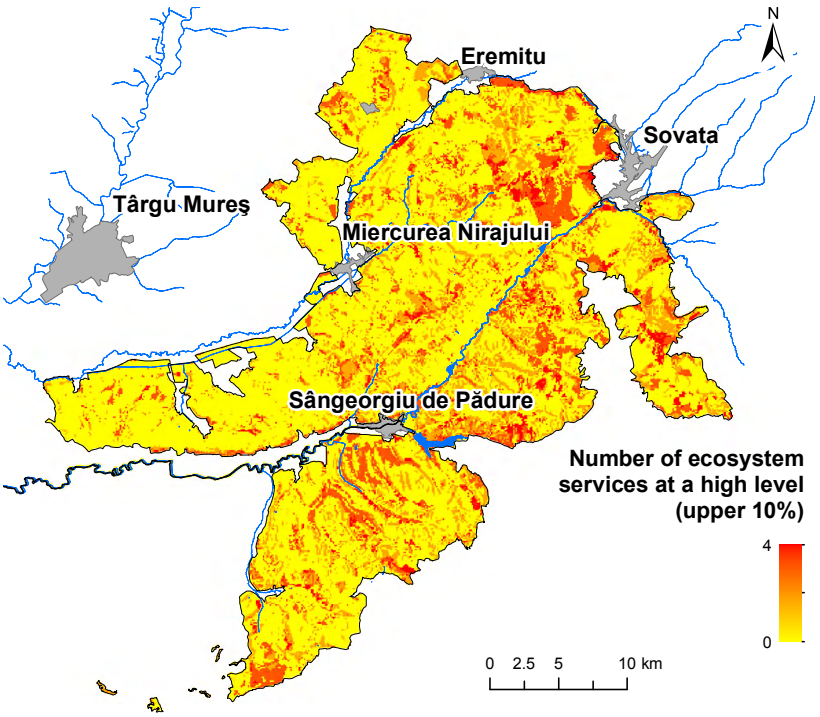


Figure 27: Overview of ecosystem services in the Niraj-Târnava Mică region: the number of services provided at an outstanding level for each spatial unit (pixel)

Except for the agricultural areas (the main crops of which we did not consider ecosystem services as described in Chapter 3), however, all habitats are inherently 'multifunctional', i.e., capable of providing several different services. This means that practically all habitats contribute to the well-being of the region by creating economic benefits as well as values that cannot be expressed in monetary terms. The results of our work suggest, though, that intensive agricultural areas only marginally create added value. In designing different spatial development plans it is necessary to take account of the goods offered completely free by nature, as comprehensively as possible, together with the benefits that a particular area can provide and that appear in the economy or remain hidden.

During our research, out of the 35 ecosystem services identified by the local population, we were able to map seven in detail and estimate the economic value of six services. However, in addition to these, many ecosystem services could and did remain hidden, which we were not able to assess due to inevitable research limitations. An annual value of 57 million RON of the (probably underestimated) economic valuation of less than 20 percent of the services used by the local population to a greater or smaller extent is reflected in the economy.

Cultural services are of particular importance to local people. Of all the service types these are the ones that form the greatest part of their everyday lives, but these values cannot be expressed in terms of money at present. They can represent economic benefits as touristic attraction, which at present is estimated at **17 million RON (3.8 million EUR)** annually. However, the study area is likely to possess even greater actual potential as the region is not regarded as a popular touristic destination at present.

Provisioning services can be easily marketed in today's economic practice. They represent the economic foundation for local life. The economic worth of the four provisioning services that we assessed amounts to **34 million RON (7.5 million EUR)** per year. Of the provisioning services that we studied wood and timber, as well as natural fodder are of the highest value. They possess roughly the same economic potential.

Mapping and assessing **regulating services** is highly challenging. For the local people their importance and value increases only as they become scarce. At present the area's water retention and self-purification capacities are particularly valuable since this is a globally scarce service by now. Pollination and climate change mitigation were ranked among the 12 key services despite the fact that the local communities have not yet or barely experienced their shortage. Although carbon sequestration has global market value, it can be realized only in the national budget but not in the local economy. This value is close to **6 million RON (1.3 million EUR)** per year.

If the region lost some of these regulating services that are at present free, so that they would need to be replaced from elsewhere, **the costs** of these replacements would probably greatly exceed the amount that should be invested today to preserve them.

The people living in this region think that preserving ecosystem services can be realized mostly in those **desirable scenarios** that are characterized by **strong community cohesion**. A strong and cohesive community is able to compensate even for the shortcomings of weak legislation whereas in weak and divided communities even the best legislation cannot deliver results. However, for these strong and cohesive communities to make rational use of nature's assets and services, **relevant knowledge** and integrative thinking are also necessary.

Like in other parts of the world, the knowledge necessary to achieve this is lacking in this region as well. While there are local decision makers and land users (farmers, foresters, and beekeepers) who have the will to implement sustainable practices, on their own and without relevant professional support, they cannot prevail.

Professional and political decision makers should make **decisions in an integrated fashion in** which they take into account multiple interests and factors simultaneously. It is the joint duty of land users and decision makers to ensure that the condition of and service flows from habitats is preserved and maintained. Cooperation between the various actors is indispensable in this complex optimization problem, so that the region's overall capacity to provide ecosystem services could increase and maximally contribute to the local and national economy.

WHAT HAVE WE LEARNED DURING OUR RESEARCH?

- Deep involvement of local communities throughout a research process demands considerable amounts of time and efforts. However, this is absolutely necessary for establishing a cooperative atmosphere with stakeholders, and acceptance of the research outcomes. The involvement of the local communities has already triggered a mutual learning and awareness-raising process during our work.
- The first step in preserving nature and ecosystem services is to recognize the value of these assets.
- The local population found community cohesion to be particularly important from the aspect of their own future and the preservation of ecosystem services.
- In our ever-changing and unstable world the rapidly eroding traditional ecological knowledge is of irreplaceable value as a potential source of future resilience.

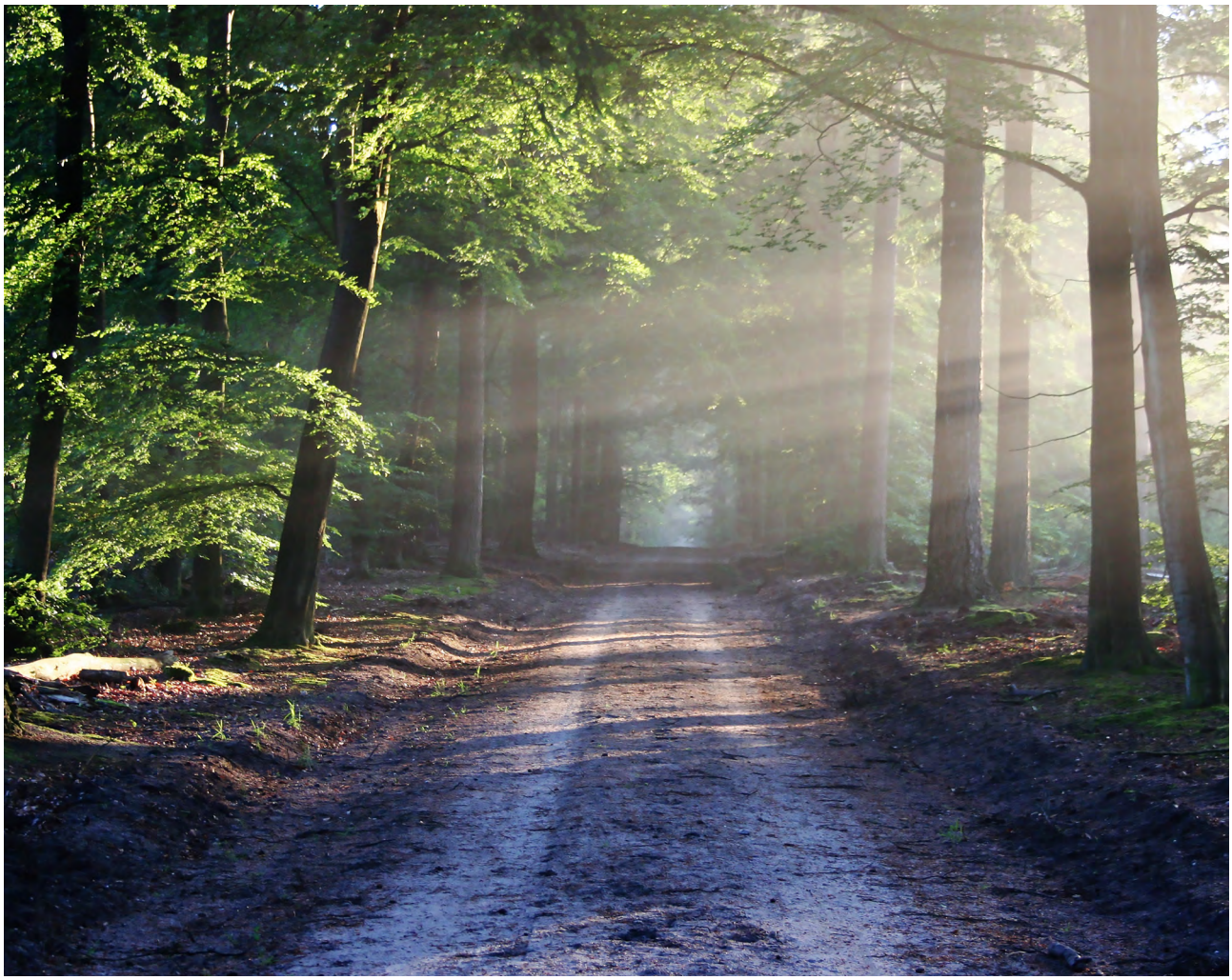
IN ADDITION TO THE CONCRETE RESULTS

- We contribute at a European Union level to the process of Mapping and Assessment of Ecosystems and their Services (MAES) set out in Target 2 of the EU Biodiversity Strategy.
- We have prepared a concrete case study about how to map and assess key ecosystem services in a participatory manner at a regional level using methods recommended by MAES.
- Our work, which also features methodological innovations, is one of the first Romanian examples of a comprehensive and participatory regional MAES study.

Figure 28: Key results and conclusions of the research

8. RECOMMENDATIONS FOR DECISION MAKERS

Our research shows that protected Natura 2000 sites provide a vast number of services to society – the total value of the six services selected in our research alone amounts to **57 million RON (13 million EUR)** per year. Nevertheless, measures integrating and emphasizing the importance of ecosystem services are non-existent or are not properly applied. The following recommendations for decision makers offer help in how they can start preserving our natural assets for the future generations, with appropriate policies and funding.



NATURE CONSERVATION AND ENVIRONMENTAL POLICY RECOMMENDATIONS

Natura 2000 sites form the largest network of protected areas in the world, being designated under the EU Birds Directive and Habitats Directive. Funding and implementation of the Natura 2000 network is not adequate, despite the fact that even small investments in the sites deliver significant benefits (Figure 29). In addition to the comprehensive implementation and adequate funding of **Natura 2000** measures, the implementation of the international **Convention on Biological Diversity** and the **EU Biodiversity Strategy 2020** could improve ecosystem service preservation efforts. Prioritizing habitat restoration and implementing the **Green Infrastructure Strategy** would enable a qualitative and quantitative improvement of ecosystem services. It is important that decision makers consider nature conservation a priority, and allocate sufficient funding and resources from national funds accordingly.

Local people identified 35 ecosystem services which they do not necessarily regard as values, and in most of the cases they are unaware of the risk of losing them. Awareness raising campaigns concerning natural assets and ecosystem services, support for activities from national and EU funds, as well as underlining the importance of natural resources in communication and education are crucial.

TO ACHIEVE THIS WE RECOMMEND:

- Increasing the budget for Priority Axis 4 of the Large Infrastructure Operational Programme (POIM), specific references to ecosystem services and green infrastructure and prioritizing projects targeting this objective,
- Funding measures in the Rural Development Programme (such as agricultural areas of high nature value) that facilitate the preservation of ecosystem services,
- Increasing funding for Operational Programmes and other state budgets that support related trainings and the improvement of nature conservation related human resources,
- Increasing the political and financial priority of the National Biodiversity Strategy,
- Integration of Natura 2000 sites in spatial planning processes, developing and implementing management plans for all Natura 2000 sites as rapidly as possible, and formulating tender specifications that allow appropriate expert organizations to apply,
- Increasing resources (currently 50 000 RON) allocated to communication and education in the National Biodiversity Strategy and supporting additional awareness raising campaigns of high quality.

WHY INVEST IN NATURA 2000?

The Natura 2000 network – the world's largest network of protected areas – covers 18% of the EU's land area. Annual maintenance and management costs amount to 5.8 billion EUR, while the value of provided ecosystem services is estimated at 200-300 billion EUR annually. The network plays an important role in mitigating natural disasters (e.g. droughts and landslides), the restoration of which cost 163 billion EUR between 1990 and 2010. In addition, Natura 2000 sites represent significant touristic value; according to a 2011 report of the EU Directorate-General for the Environment the network provides full-time employment for 4.5-8 million people.[6] Furthermore, the network contributes to economic growth on a national level as well – in Spain the Natura 2000 network increased GDP by 0.1-0.26%, while in France management activities of sites deliver 142 EUR per hectare. In the Netherlands the benefits of ecosystem services of Natura 2000 sites amount to 4.5 billion EUR per year.[7]

Figure 29: Why invest in Natura 2000?

[6] European Environmental Agency (2012): European waters – assessments of status and pressures. http://www.eea.europa.eu/publications/european-waters-assessment-2012

[7] Nedelciu, E., (2013): Enriching society through natural solutions: Why and how to make Green Infrastructure projects a sustainable answer for ecological, social and economic problems? CEEweb for Biodiversity, Budapest, http://www.ceeweb.org/wp-content/uploads/2011/12/enriching_society_through_natural_solutions_green_infrastructure.pdf

CLIMATE POLICY RECOMMENDATIONS

As the preservation of ecosystem services would also help to achieve climate policy objectives, we recommend taking greater account of ecosystem services in climate change mitigation and adaptation. Preserving and prioritizing habitats with high carbon sequestration capacity is of particular importance for climate change mitigation. In this respect, encroached grasslands are particularly important as they have carbon sequestration capacities twice as large as forests. The most important action for facilitating adaptation is the preservation of a diverse, multifunctional landscape of high nature value. Furthermore, water retention is expected to be of high importance, which is why all habitats that improve water retention and mitigate soil erosion should be supported. Encroached grasslands that form a mosaic of shrubs and groups of trees are also considered favourable in this respect. It would be important to develop subsidies for grasslands within the Rural Development Programme that help preserve these habitats and transform them into wood pastures.

TO ACHIEVE THIS WE RECOMMEND:

- A detailed examination of the roles of protected and natural areas providing ecosystem services and greater emphasis on their roles in the National Climate Change Strategy and POIM (Priority Axis 5),
- With the aim of climate change mitigation, developing subsidies for grassland management that enable farmers to receive subsidies, even if there are bushes or trees on it,
- As the preservation of ecosystem services would also help to achieve climate policy objectives, we recommend taking greater account of ecosystem services in climate change mitigation and adaptation.

BUSINESS RELATED POLICY RECOMMENDATIONS

Our survey conducted among businesses shows that there is no sufficient knowledge in the business sphere about ecosystem services and their underlying factors, not even in areas directly impacting the activities of specific businesses (e.g. businesses in the tourism industry did not attach high importance to landscape diversity). Due to their lack of knowledge none of the businesses have integrated these services and their sustainable use into their operations. No internal rules (e.g. sustainability strategy) exist in terms of ecosystem services. As the business entities appear to be unaware of the requirements necessary for their operations, their medium and long-term sustainability can be questioned. It is essential that businesses integrate services in their business plans and be aware of their dependence on these services and how they can manage it. Funds facilitating the catching-up process of the economy need to incorporate this important aspect and offer good practices and expertise to assist primarily more vulnerable small and medium-size businesses.

TO ACHIEVE THIS WE RECOMMEND:

- Including references to the sustainability of businesses, more specifically to their dependency on ecosystem services in the Operational Programmes on improving competitiveness and introducing trainings and consulting on integrating the services into business operations.

WATER RELATED POLICY RECOMMENDATIONS

The service deemed most important by locals was water retention, mostly because its lack and related problems have already impacted people's everyday lives. Despite the important role of water and water retention, only 193 water bodies in the country are in good ecological status out of 681 recognised by the **Water Framework Directive**.[8]

In order to preserve water retention in the long term and improve the ecological status of waters it is necessary to create a basis for sustainable water management. Water management needs to take an integrated approach and address the river basin area as a whole in a complex manner instead of only focusing on streams. Drastic riverbed transformation measures should be replaced with more natural solutions, such as restoring floodplains and protecting forests of river basins. Wetland conservation – supported also by EU and international conventions – should be a priority. Water retention and good water quantity should be achieved among others by undertaking small-scale water retention measures, as well as by improving water-efficiency and water conservation practices (e.g. drip irrigation, precipitation retention, and permanent plant cover). Measures to stop water contamination should include strengthening environmental protection standards for forestry and agriculture, and developing an appropriate incentive scheme.

TO ACHIEVE THIS WE RECOMMEND:

- A full implementation of the Water Framework Directive until 2020,
- Proper integration of natural water retention measures (Figure 30) into river basin management plans,
- Strengthening wetland conservation and implementation of appropriate management measures,
- Greater support through the Rural Development Programme for measures that enable water-efficient practices and water retention measures,
- Ensuring strict compliance with the Nitrates Directive and other environmental regulations aiming to curb pollution and informing the public and users,
- Developing an incentive scheme especially for primary polluters that motivates them to favour appropriate management instead of water contamination,
- Implementation of communication campaigns that raise awareness of the importance of and options for preserving good water quality and quantity.

[8] European Environmental Agency (2012): European waters - assessments of status and pressures. http://www.eea.europa.eu/publications/european-waters-assessment-2012

NATURAL WATER RETENTION MEASURES

Natural water retention measures (NWRM) are essential in improving the quality of European waters, especially in mitigating the effects of floods and droughts. NWRM incorporates multifunctional measures (e.g. building buffer strips, mulching, conserving floodplain forests or restoring the natural form of water bodies) that aim to conserve water sources. They address water related challenges by preserving the natural characteristics of ecosystems and water bodies and using natural tools and processes. NWRM methods improve or restore the water retention of natural or man-made soils and aquatic ecosystems, drinking-water quality and the chemical and ecological status of water bodies by restoring naturally functioning ecosystems and services provided by them.
Restored ecosystems are essential in climate change mitigation and adaptation, reducing incidence of waterborne diseases, flood protection, storm protection, the production of good biomass, and improving services related to nature conservation. In addition to involving less energy and infrastructure investment, the environmental impact of using NWRM is also significantly lower than that of major riverbed and basin reconstruction projects. Funding of NWRM measures is supported by national funding resources as well as EU funds (e.g. different LIFE projects, Rural Development Programme, Cohesion and Structural Funds).[9]

Figure 30: Natural water retention measures

POLICY RECOMMENDATIONS RELATED TO CULTURE AND LOCAL IDENTITY

Local identity and strong community cohesion are highly important to respondents regardless of age, gender or profession. It is important to halt the current high level of emigration, through offering adequate employment opportunities, infrastructure and leisure programmes (e.g. sports communities, choirs and groups formed to preserve local customs). Adequate expertise, training and demand are needed to revive and sustain traditional professions. It is also important to facilitate the acceptance of minority groups, as well as their social and economic integration, in order to bind communities together. To this end, integration and poverty alleviation strategies need to be developed that reflect possible solutions to potential conflicts. These need to be incorporated into local and regional development strategies. Well-equipped schools and hospitals are essential, too, in places where municipalities have greater flexibility in development decisions. Furthermore, it is crucial to develop and implement appropriate national strategies and provide structural funds, primarily in education and health care.

TO ACHIEVE THIS WE RECOMMEND:

- Strong support for local social infrastructure developments and for the creation of traditional jobs, within the framework of the Operational Programmes targeting competitiveness and regional development,
- Integrating aforementioned objectives (e.g. job creation, infrastructure, community building) into regional and county-level development plans,
- Prioritizing the poverty alleviation components in these development plans.

[9] NWRM (2013): Assessment methods for effectiveness of Natural Water Retention.
http://nwrm.eu/sites/default/files/sd3_final_version.pdf
and Introducing Natural Water Retention Measures: What are NWRM?
http://nwrm.eu/sites/default/files/sd1_final_version.pdf

TOURISM RELATED POLICY RECOMMENDATIONS

Tourism is one of the potential leading economic sectors in the region. For tourism to build on ecosystem services and to contribute to their preservation, it is essential to develop soft tourism focusing on small-scale, local, natural and cultural values. Adequate small-scale infrastructure (high-quality local catering, nature trails, cycle paths, renovated public spaces, drinking water wells and public restrooms) is needed along with spatial planning regulations that preserve traditional landscapes and villages. To attract tourists it is also important to take stock of natural assets and provide relevant information to tourists (e.g. maps), develop appropriate promotion strategies for the region, offer attractive programmes and adequate expertise. This requires financial support for regional and local tourism organizations. Furthermore, it is possible to introduce a special tourism related tax that is allocated to a separate fund supporting touristic infrastructure development.

TO ACHIEVE THIS WE RECOMMEND:

- Highlighting the importance of small-scale environmentally friendly tourism in the National Tourism Development Master Plan,
- Supporting small-scale environmentally friendly tourism (supporting job creation, developing local tourism infrastructure, as well as compiling and disseminating relevant information) in the framework of the Operational Programmes targeting competitiveness and regional development,
- Launching high quality educational programmes for the region's tourism enterprises-entrepreneurs,
- Developing a financing mechanism e.g. in the form of a special tax whose revenue only serves the development of touristic infrastructure,
- Establishing local, small-region, county or regional level tourism associations that perform primarily promotional, advocacy and human resource development tasks.

POLICY RECOMMENDATIONS RELATED TO AGRICULTURE AND APICULTURE

Many ecosystem services assessed in our study are strongly influenced by the current EU agricultural policy. Land and non-performance-based subsidies benefit intensive agriculture and large-scale farmers thus jeopardizing the mosaic landscape and related natural assets. Land-based subsidies benefit intensive agriculture and large-scale farmers across the EU and significantly contribute to the decline of natural assets in quality and quantity.[10] In order to preserve the local traditional landscape and society, it is important to favour small-scale farmers and those who contribute to the preservation of natural assets. It is therefore necessary that payments be allocated based on quality performance instead of land area. To achieve this, we recommend that the agri-environmental programmes (agromediu) be redrawn in a flexible approach, in which farmers may choose voluntarily from a set of criteria, and the actual payments based on performance (thus if they fulfil more criteria, they receive more payment). Nature conservation and related requirements should be included among the key objectives of these criteria.

Reviewing target areas related to the already existing agricultural subsidy schemes is also necessary, as traditional orchards of the Niraj and Târnava Mică region, for instance, are not included under any of these schemes. Without including traditional orchards in the target areas, local orchard owners are not eligible for agricultural subsidies for the renewal of their plantations, and areas traditionally engaged in fruit production such as Vădaș (municipality of Neaua) are thus losing the potential to benefit from it.

In order to create better employment opportunities in the field of agriculture, products should be locally processed and sold in processed form. This requires support for the local small-scale processing industry in the form of enabling farmers without substantial capital to become involved in this industry, too. The current requirement of 50% own contribution is too high for many local farmers and entrepreneurs. Furthermore, strict hygiene rules pose an additional significant obstacle in selling processed products (vegetables, fruits, or cow's milk). Weakening the strict hygiene requirements – along with the agri-environmental subsidies promoting cattle farming in the framework of the Rural Development Programme modified in 2015 – would provide more incentives for cattle farming in the region (which would play a role in maintaining the mosaic landscape, reinvigorating traditional cattle grazing and curbing the more environmentally destructive sheep grazing).

To make small-scale farmers and their products competitive, potential opportunities under the subsidy scheme need to be made available. This requires a

[10] Nedisan, A., Pruneau A. (2014): Towards a better integration of biodiversity concerns in the Common Agricultural Policy. CEEweb for Biodiversity http://www.ceeweb.org/wp-content/uploads/2011/12/SRDI-Biodiversity-CAP-final-draft.pdf

transparent subsidy scheme, providing relevant information and professional advice to farmers.
The number of beekeepers in the Niraj and Târnava Mică region is particularly high. Nonetheless, honey produced in this region is an important service not for its quantity but for its high quality, due to species-rich semi-natural bee pastures. This applies particularly to honey collected from traditional meadows and pastures. Unfortunately, however, large declines in meadow area have been witnessed and pastures are under increasing pressure from the growing number of animals. However, with smaller changes in land use practices, the above problems could be solved and the quantity of honey increased.
It is important to assess and develop the potential market for locally processed products by supporting awareness raising efforts, elaborating relevant campaigns and product development strategies, and providing relevant training for farmers (e.g. branding, promotion, marketing, sales, and business studies). Developing local products, as well as their brand and communication plays a role in persuading consumers, for which financial support should be provided. Short distribution chains should be popularized and functionalized, too. The LEADER programme could provide an appropriate source of funding, with the condition that local action plans include specific requirements for local product development.
Targeting the market also requires cooperation among farmers. To achieve this, establishing agricultural cooperatives should be incentivized. Furthermore, it is important to create room for farmers to establish relationships, thus strengthening cooperation.
Ensuring relevant expertise among local farmers is essential for developing the agricultural sector. Firstly, it would be important to support trainings that facilitate the production of healthy products and protection of clean drinking water (e.g. chemical and fertilizer-free or water-efficient farming). In addition, it is essential to ensure high quality vocational schools (of an adequate standard) for future farmers. This requires obtaining an adequate level of professional practice that should be integrated into vocational school curricula as a compulsory element. It is also recommended that model farms to be established, which would provide opportunities to present sustainable agricultural practices.

TO ACHIEVE THIS WE RECOMMEND:

- Reviewing and reforming the Common Agricultural Policy so that payment is based on performance and results,
- Reviewing the current Rural Development Programme before 2021 and increasing subsidies for ecosystem service conservation (e.g. soil and water protection),
- Developing an agricultural subsidy scheme based on quality performance that builds on a set of criteria in a flexible approach taking into account the protection of environmental assets,
- Reviewing the agricultural scheme target areas in the Rural Development Programme,
- Greater support to small-scale farmers through subsidies to finance their own contribution or ensuring pre-financing loans, and revising hygiene requirements to facilitate sales of processed products,
- Subsidizing chemical-free arable production and bee pasture cultures (phacelia, lucerne, clover),
- Planting fruit trees in public spaces of settlements ,
- Preserving meadows with using traditional management techniques, in particular above 500 m a.s.l.,
- Better exploitation of Green Infrastructure elements (hedges, rows of trees) and promotion of their advantages among farmers,
- Regulating the number of grazing animals to prevent over-grazing,
- Subsidizing the preservation of the traditional mosaic agricultural landscape,
- Developing the infrastructure and human resources connected to the Rural Development Programme and the Common Agricultural Policy,
- Improving opportunities for communication and information exchange among farmers,
- Developing and promoting relevant trainings (e.g. business, marketing, branding and sales knowledge, traditional agricultural practices – both in adult and youth education),
- Designing awareness raising campaigns targeting purchasing power,
- Elaborating subsidies that enable the establishment of strong cooperatives.

POLICY RECOMMENDATIONS RELATED TO FORESTRY AND WILD PRODUCTS

To preserve ecosystem services provided by forests it is necessary to adopt sustainable forestry practices. It is essential to implement land consolidation, to strengthen requirements for logging permits, and to ensure greater compliance with nature conservation laws. It would be important that municipalities be able to regularly monitor forestry operations and compliance of rules. It would also be essential to value forests based on not only timber quality but also other ecological and cultural services, factor it into the price of forest products, and take it into account in preparing the forestry management plans.
To achieve sustainable logging, log exports should be restricted by imposing duties. To keep timber in the region, wood processing should be performed by local businesses that could initially receive state and EU funding. Woodlands outside the current forestry fund should be treated as forests, and adequate compensation should be provided to owners of Natura 2000 sites. Due to the protected nature of Natura 2000 sites and related nature conservation requirements, forest owners would need compensation as a reimbursement for lost income incurred due to logging restrictions. The collection of wild products (plants and mushrooms) should be permitted under a reasonable set of rules.

TO ACHIEVE THIS WE RECOMMEND:

- Introducing stronger requirements for logging permits and their inspection,
- Integration of other ecosystem services of forests (non-wood/timber) into forestry management plans,
- Elaborating Natura 2000 payment schemes for forests in the framework of the Rural Development Programme,
- Regulating foraging activities in the forest so as to prevent the overexploitation of forests and their services and at the same time enable the sustainable use of those services for society.

ACKNOWLEDGEMENTS

This publication would not have been possible without the active commitment of locals, stakeholders and experts of the Niraj-Târnava Mică region and the continuous vital guidance we received from the Advisory Board.

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PROJECT PARTNERS

The Association of Milvus Group is a non-profit, non-governmental organization and research institute in Romania, acting in the fields of education, research and advisory work. It has participated in many projects including the designation of the Romanian Natura 2000 network, several species protection, educational and regional development projects, and it also operates a bird-rehabilitation centre. It manages seven Natura 2000 sites autonomously and four in partnership. It thus takes part in the management of the Natura 2000 sites in the Niraj-Târnava Mică region, where the research for the present study was conducted.

Centre for Ecological Research of the Hungarian Academy of Sciences (MTA ÖK) is active in basic and applied research in the fields of ecology and conservation biology. MTA ÖK has a long tradition of studying complex policy-oriented research questions, and performing regional ecosystem assessments in policy sensitive landscapes. MTA ÖK is a key institution in providing scientific support to the field of Hungarian nature conservation, including tasks related to the Mapping and Assessment of Ecosystem Services, MAES.

CEEweb for Biodiversity is a network of 50 environmental non-governmental organizations in the Central and Eastern European region working for 20 years in 20 countries. Its mission is the conservation of biodiversity through the promotion of sustainable development. CEEweb works through advocacy, influencing decision-making, common projects, capacity building, networking and awareness raising.