

Szent István University

Doctoral School of Environmental Sciences

THE ROLE OF ECOSYSTEM SERVICES IN THE ASSESSMENT OF
NATURE'S VALUES AND THE MANAGEMENT OF LAND USE
CONFLICTS

Theses of Doctoral (PhD) Dissertation

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1. Research Background

For centuries, the issues pertaining to the relation of nature and man have been among the most important questions of both science and everyday life. A few decades ago a novel approach to the study of this intricate system was provided by the ecosystem service concept, which allowed a more specific assessment and deeper understanding of the values of nature. Within a short time, a number of scientists lined up either supporting or criticising the concept, with both groups trying to get a deeper insight into the topic. Approaches to the protection of nature based on the ecosystem service concept are increasingly gaining ground, while nature protection strategies and international research programmes have put ever-increasing emphasis on the importance of ecosystem services: assessment and mapping of the ecosystem services are carried out both at international and national level. In 2012 an inter-governmental platform was established in order to sustain ecosystem services (IPBES – Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services), which has made the concept a steady element in science and policy. An important part of the area is the concept of ecosystem service trade-off, the study of quantitative and qualitative changes resulting from interactions among the services, which may facilitate the understanding of social conflicts relating to the natural environment from a new perspective. My thesis is based on two pillars: the empirical study of how ecosystem service trade-offs work through examples, and the study of the characteristics of land-use conflicts that result from trade-offs.

My research was carried out in the framework of a four-year OTKA project (research ID: 78514) with the objective to assess the services in four agricultural ecosystems (forest, grassland, plough-land and orchard). In addition to making an inventory of ecosystem services, I also examined the conflicts that result from different requirements of ecosystems in terms of use. I based my work on the concept of ecosystem service trade-off.

2. Main objectives and questions of my research

My overall objective was to obtain an understanding of the characteristics of ecosystem service trade-offs in relation to four agricultural ecosystems, and to explore further correlations by comparing patterns in the four areas in terms of

trade-offs and conflicts. Also, I intended to review the theoretical systems of environmental conflicts. Specifically, my research objectives were as follows:

- To explore and collect the literature dealing with environmental conflicts, with special regard to the types and root causes of conflicts;
- To explore and provide an overview of the literature dealing with ecosystem service trade-offs, with special regard to the characteristics of conflicts resulting from trade-offs;
- To prepare a list of services in the selected four agricultural ecosystems, as perceived by locals;
- To explore what values are associated by locals to the ecosystem services;
- To identify the trade-offs among ecosystem services of the particular areas;
- To explore the characteristics of these trade-offs and the patterns of relations between the services involved in the trade-offs and between the conflicts and those affected by those conflicts;
- To identify the factors that generate conflicts and the ways they work.

In terms of natural sciences, I did not use hypotheses in my research, for I relied on the critical-constructivist paradigm (Norgaard 1989, Tacconi 1998) instead of the tradition of a positivist philosophy of science. Following an exploratory social scientific approach I established presuppositions, which are not for proving whether a statement is true or false, but rather for facilitating a deeper exploration and understanding of the issues related to my questions.

In relation to the review of the literature of environmental conflicts and ecosystem services, my research questions were as follows:

1. How does the literature of environmental conflicts define and categorise environmental conflicts? Is there a uniform and generally accepted system and definition for environmental conflicts and their subcategories? How could we refine the existing typologies with conflicts related to environmental protection in the focus?
2. What theoretical views are represented in the literature regarding ecosystem service trade-offs and in particular conflicts resulting from trade-offs? Can we define general criteria on the basis of which conflict patterns resulting from trade-offs can be classified?

In relation to my empirical work, my research questions were as follows:

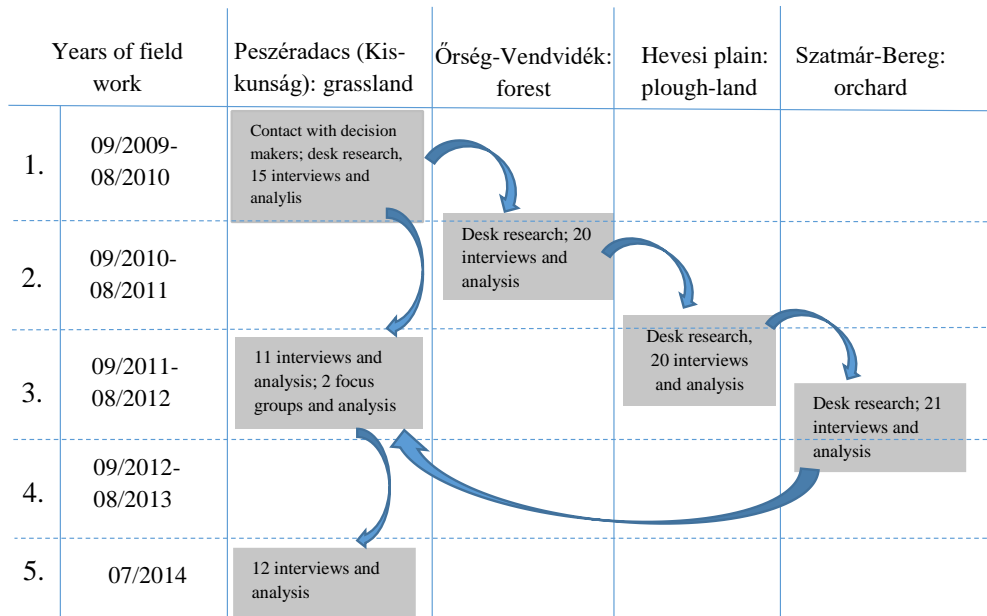
3. List of ecosystem services: What are the ecosystem services that land users and environmentalist groups find most important in the four selected areas? Is there some kind of discernible pattern regarding the values associated to particular services by the stakeholder groups?
4. Characteristics of trade-offs: What are the factors and effects that trigger trade-offs, and typically what service types and in what formations are involved in the trade-offs? Can we establish that certain ecosystem services (e.g. provisioning and regulating services) are typically involved in trade-offs?
5. Ecosystem services and stakeholder groups: What specific relation can we establish between the particular ecosystem service types involved in a trade-off and the stakeholders? Can we conclude that certain services pertain to specific groups?
6. Trade-offs and conflicts: What conflict types do trade-offs generate between the stakeholders? Can we establish a cause and effect relation between trade-off types and conflict types?
7. Factors shaping the conflicts: What are the factors that affect environmental conflicts, and in particular land use conflicts? Can we establish typical relations and mechanisms between the individual factors?

3. Material and methodology

When planning my research, my main objectives were to make sure that it would serve the interest of and be carried out with the involvement of those concerned to the greatest possible extent, and that it should produce results that represent a practical value for locals and decision makers at various levels. To this end, when selecting research locations, we sought to take into consideration local demands and problems the assessment and solution of which could be facilitated by our work. I presumed that problem-oriented research planning ensures a greater level of interest and willingness to participate on the side of the people concerned and the interviewees. We consulted with the decision makers of national environmentalist and agricultural organisations as well as with the management of the four national park directorates about the scope and general objectives of the research, and the issues and problem areas where the results of the research could represent

the greatest practical value. Based on the above criteria, the following four areas were selected as research locations: Órség-Vendvidék (forest), Pészéradacs grassland at the Kiskunság (grassland), Hevesi plain (ploughland), and Szatmár-Bereg (orchard).

As we wanted to carry out a qualitative study, we combined various social science methodologies for data collection that took place between September 2009 and July 2014 (Figure 1). In order to set proper foundations for the research, in all target areas first *we analysed the natural, social and economic factors based on historical and land use-related documents*, paying special attention to contents that related to ecosystem services or described the characteristics of land use. During data collection we also heavily relied on *semi-structured interviews*. We conducted 98 interviews with persons connected to the agricultural ecosystems subject to research about how they used the particular areas, how they evaluated the different ecosystem services, and what conflicts they encountered during everyday work. As for the interviewees, we sought to select people who were closely connected to agricultural ecosystems due to their activities or their official positions, and played decisive roles in terms of the condition and use of ecosystems, such as agricultural advisors, local environmental protection professionals and mayors.

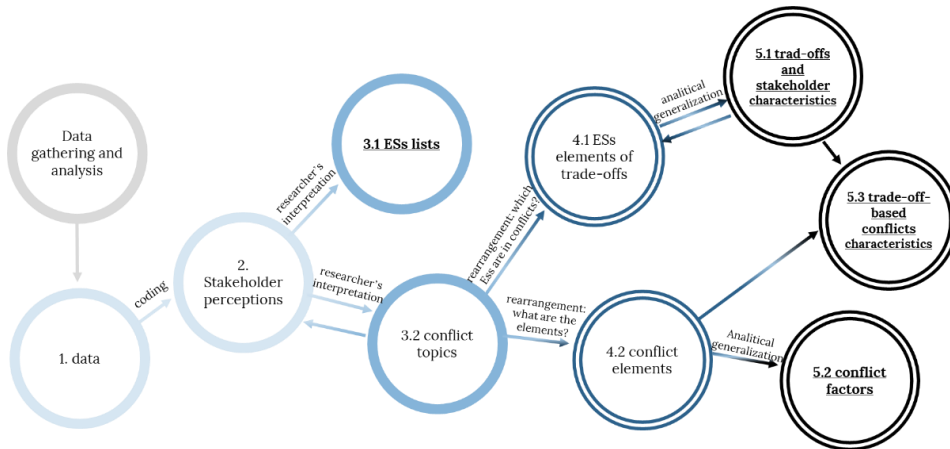


1. Figure: Schedule of the research

In the case of the Peszéradacs fields, I had an opportunity to collect more data, which inspired me to study the local conflict that seemed more serious than at other locations. In addition to a larger number of interviews, here I also set up *two focus groups* in order to help organise and refine the results coming from the previous empirical data collection, and to obtain feedback from the individuals invited regarding the reliability of my existing findings.

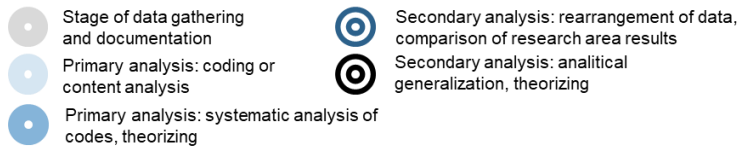
At some of the interviews and in the case of both focus groups audio recordings were made, the transcripts of which were analysed using NVivo 9 data analysis software (CAQDAS). In order to validate the conceptual conclusions drawn in the course of the secondary analysis of the results, I conducted further structured research interviews with individuals related to the Peszéradacs grasslands in the summer of 2014.

My empirical results were reached through several steps (Figure 2). The first stage involved the data gathering (desk research and interviews) and documentation (writing notes and summaries of the interviews).



2. Figure: The process of data analysis

Legend:



Data gathering was followed by its primary analysis as part of the second stage. I started with encoding the content of the interviews word by word, sentence by sentence. By creating codes I searched for the followings:

- Which ecosystem services are mentioned by the interviewees;
- what kind of conflicts are mentioned by the interviewees?

As a result of the primary analysis I interpreted the perceptions of the interviewees related to my two main research focus (ecosystem services and conflicts) and I specified and counted the mentions of ecosystem services. As a second result of the primary analysis based on the perceptions of the stakeholders I identified the main conflict topics.

After the primary analysis of data gathered on all research areas, I continued with secondary analysis (as part of stage 3) based on the step 3.2. (see Figure 2). I searched for the answers for the following questions by rearrange the previously defined codes:

- Which ecosystem services were in trade-off;
- what characterizes the trade-offs;
- how conflicts develop from trade-offs;

- what are the elements of conflicts;
- how these elements appear in the different research areas;
- if they appear, what are the similarities;
- if they not appear, why;
- is it possible to aggregate the elements for a higher abstraction level;
- are there any connection between the elements?

4. Results

1. I created an inter- and transdisciplinary analysis framework, which provided theoretical (1.1 and 1.2) and practical (1.3) recommendations to help the exploration of environmental conflicts.

1.1. I pointed out that the complex study of environmental conflicts can only be comprehensive if an inter- and transdisciplinary combination of the theoretical approaches and tools of various disciplines are applied.

I reviewed the development of scientific theories regarding general social conflicts, and in particular environmental conflicts, through the approaches applied by the key disciplines (sociology, social psychology, economic science, political theory, political ecology), compared them, and also examined their strengths and weaknesses from a critical point of view. I pointed out that the exploration of environmental conflicts requires an approach that relies on a range of disciplines, as the different disciplines, using their own tools, are only able to gain a deeper understanding of particular segments of a conflict. A complex study requires that the conflict in question is examined in the framework of inter- and transdisciplinary theories and tools, to which political ecology provides an adequate theoretical background, as it integrates local and scientific knowledge on the one hand, and theoretical and empirical knowledge on the other hand.

1.2. Within the heterogeneous theoretical system of environmental conflict categories and definitions available in the literature, I developed a typology that can be applied as part of an inter- and transdisciplinary analysis process.

I reviewed the Hungarian and international literature of environmental conflicts focusing on definitions and categories, collected the different interpretations of environmental conflicts, and identified their most typical

typologies. I found that the use of nomenclature and definitions of environmental conflicts is neither uniform, nor consistent. By comparing the definitions available in the literature, I drew up the hierarchical system of concepts of environmental conflicts, which follows the schools using an inter- and transdisciplinary approach (Figure 3). In the system of environmental conflicts I defined four main branches, which, at the same time, also represent four different levels of examination.

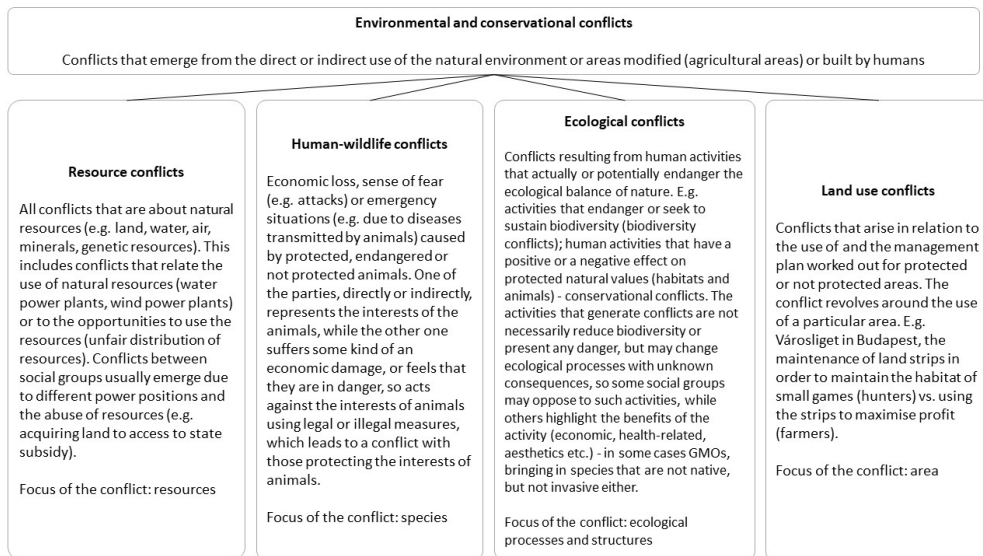


Figure 3: The interpretation of nomenclature and definitions of environmental and conservational conflicts

During the classification I relied on the definitions already existing in the literature. However, I tried to rephrase them and provide a more accurate interpretation of them. In certain cases I used characteristics that had not been used in the literature to further clarify the meaning of particular conflicts.

By making the definitions more accurate I intended to facilitate a common use and understanding of conflict situations, rather than to provide a simplified description for them. Under the individual categories I listed factors and examples that may help professionals outside the realm of social sciences, e.g. biologists, ecologists and engineers better understand conflict situations, which in turn may facilitate the use of consistent nomenclature and definitions by professionals working in the field. I believe that by highlighting the characteristics, focal points and objects of the individual conflict types, this classification helps us define the first steps towards solving the conflicts.

1.3. For the dynamic analysis of land-use conflicts I designed a model that includes six factors.

Based on the literature dealing with factors that affect conflicts, and my own research findings, I designed a model that includes six factors, which helps us understand the specific dynamics of conflict situations related to land use. I pointed out that the factors shaping conflicts are varied, and that the way a factor affects a conflict situation should always be studied in the given context. I interpret the factors as interrelated elements of a dynamic system, which results in the introduction of new points of view that may help us better understand how environmental conflicts emerge and change (Figure 4).

1. *The type and condition of an agricultural ecosystem*, that is, from the perspective of social sciences, what are the types and quality of gains the ecosystem can provide to those concerned. These factors determine the forms of agricultural land use, and also affect the presence of natural values. In areas where ecosystems represent both agricultural and natural value, the chance of conflicts to emerge is higher.
2. *Economic factors*: They can be divided into two categories: the income of the farmer from *production and subsidies*, which determine the financial stability of the farm. If a farmer has limitations in terms of land-use, they may be more sensitive to environmental protection regulations, which may result in a more serious conflict.
3. *Power and institutional structure*, that is, the *social factors* that determine local power balance between the state environmental authority and the locals. This factor can be broken down into five components: *characteristics of the decision-making processes, ownership, the flexibility of the institutional system of environmental protection and agriculture, the quality of communication between the parties.*
4. *Cultural and historical background*: *Sense of identity* of the locals and the level they are tied to the area. As the interviews revealed, the identity of farmers is determined by several factors. Farming activity, traditions of land use, a strong emotional attachment to cultural heritage may intensify resentment towards environmental protection regulations that restrict farming activities.
5. *Interpersonal relationships and communication*: Mostly it refers to the role of environmental protection officials and rangers in a conflict, as well as their relationship with the local farmers and their attitude towards farmers. A ranger who is from the area, is open and flexible, and has good social skills, is more likely to be accepted by local farmers.
6. *Weather conditions*: The emergence and intensity of a conflict may also be affected by the external factors that influence the relationship between

nature conservation and farmers at the time of the conflict. Weather conditions that are detrimental to farming may intensify conflicts.

These factors continuously influence each other, which may intensify or weaken the overall effects. Figure 4 displays the relationships among the factors.

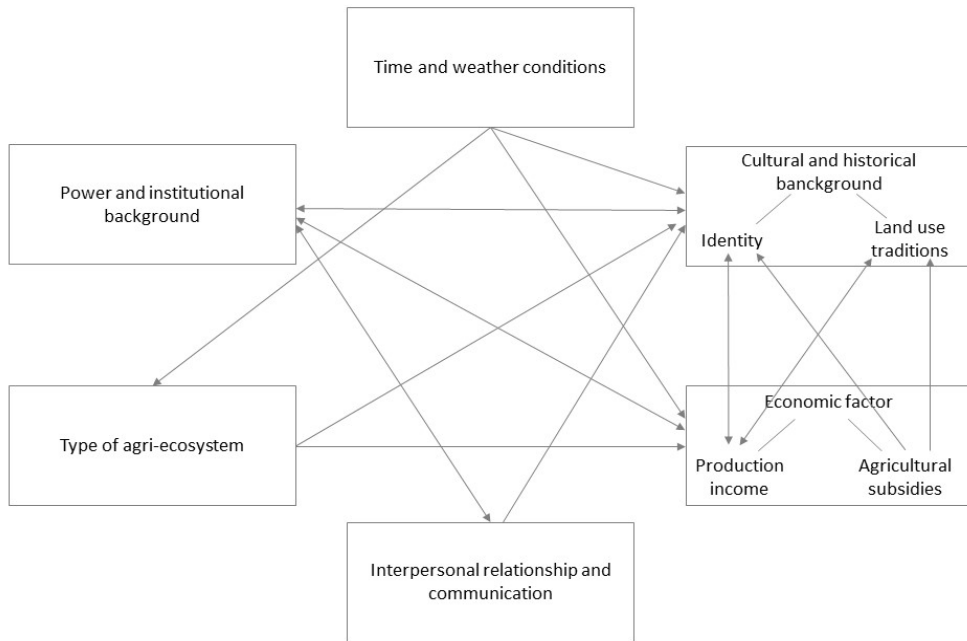


Figure 4: The factors of land-use conflicts and their connections

The examination of the factors in the context of the four research areas revealed that the same causes of conflicts evolve into conflicts in different ways in the different areas. A particular factor may generate a serious conflict in one area, while in another area it may keep the problem under the surface. The differences can be interpreted accurately only in the light of the given context.

2. *I created a list of the most important ecosystem services in the four agricultural ecosystems from the perspective of locals.*

According to the results, the richest was the Szatmár-Bereg area, where locals often mentioned natural goods in all the four groups of services. The most reference was made to provisioning and cultural services in relation to orchards, but many locals mentioned the positive effects resulting from the proximity of the river Tisza as well, which belong to the groups of the regulating and the supporting services. The list of ecosystem services was

somewhat shorter for Órség-Vendvidék. However, here too, frequent references were made to the provisioning, regulating and cultural services related to forests, in particular to wild plants that can be collected in the woods, the multipurpose use of wood, the ecological processes controlled by forests, and the traditions of generations.

In terms of the variety of services, the list of ecosystem services for Hevesi plain was no different, but the number of references was lower compared to Szatmár-Bereg or Órség-Vendvidék. Out of the ecosystem services available in the Peszéradacs grasslands, water regulation, which belongs to the regulating services, was mentioned most frequently in the interviews, while the number of references made to provisioning services was significantly lower than at the other locations. Out of the cultural services, recreation, as well as identity and traditions of the area were referred to.

At all locations it was typical that the interviewees listed services they found important for the whole area, and not for individual ecosystems. This highlights the holistic way of thinking of people living in the countryside.

3. Based on an analysis of ten instances of trade-offs in four agricultural ecosystems, I defined the ecosystem service combinations typical to the trade-offs, the patterns of trade-offs and of the resulting conflicts, and the correlations between the ecosystem service types involved in the trade-offs and the preferences of actors involved in the conflicts.

3.1. The trade-offs typically involved provisioning and regulating services, which is in line with the literature, according to which this is one of the most frequent types of trade-offs. However, I observed that when there is a provisioning service that is strongly linked to environmental protection, it may happen that two provisioning services are involved in the trade-off. Cultural services are usually involved in a trade-off in connection with another service type (provisioning or regulating). Whether a cultural service is on the positive or on the negative side depends on whether the service represents natural or social value.

3.2. As for the conflicts that result from trade-offs, I observed that based on the service in the negative position in a trade-off the type of the resulting conflict can be determined. If there is a regulating service or a provisioning service on the negative side, the result will be an ecological or land-use conflict, respectively.

3.3. Conflict situations are manifold, and in most cases the causes cannot be separated from one another. Generally, interests and values are

intertwined, and by continuously affecting each other they represent one of the most dominant factors that shape conflicts.

3.4. In a trade-off it is usually the service type that represents more the interests of the social group that has a bigger influence locally that comes to the foreground. It is also important whether there are regulating and legal tools or financial incentives that underline the dominance of the given service. Regulating services are mainly important for environmentalists (national parks, directorates), and to a lesser extent for farmers using traditional agricultural methods, while provisioning services are mainly important for groups of farmers and, to a lesser extent and in the case of environmentally conscious agricultural activities, for environmentalists. Cultural services may be preferred by all concerned, depending on the type of value the particular service represents.

5. Conclusions and suggestions

1. The literature of environmental conflicts is manifold and varied, which is due to the wide variety of situations and the complexity of conflicts. Experts in the area seek to use concepts that best reflect this complexity (e.g. ecological, biodiversity, human vs. nature, conflicts relating to land-use, installation and nature protection) and definitions that provide the most detailed description of the given situation. However, often there is an overlap between the definitions of the individual types.

If environmental conflicts are so complex and varied, the question arises whether there is a need to force them into a framework of clear-cut categories. I believe that such a classification may be of use for researchers in understanding conflicts, providing that we are able to use such a framework in a flexible way, sometimes even with restrictions, and accept the complex nature of conflicts as well as the fact that conflict causes often trigger and overlap each other. This classification may provide guidance to analysts by helping them to identify the object of the conflict and, consequently, the entities concerned.

I find it necessary to start further exploratory research programmes to assess the usefulness of the classification and analysis framework applicable to environmental conflicts, and to assess the applicability of the above framework to the types of environmental conflicts that I did not examine in depth. I suggest

that scientists and experts dealing with environmental conflicts should test the framework on their own cases. My suggestions regarding the theoretical, methodological and practical aspects of analysis when applied in different cultural, economic and environmental conflict situations may result in new findings, and the system may be completed with new components, which may strengthen and improve the theoretical basis of examining patterns in the mechanism of environmental conflicts.

2. One of the most clear-cut concepts in the literature of ecosystem services is trade-off, which has been dealt with in a number of scientific articles both in Hungary and abroad in recent years. These articles claim that ecosystem service trade-offs lead to a conflict if the social groups using or otherwise related to the services are unable to manage the consequences of the trade-off to the satisfaction of both parties.

The use of the concept of ecosystem service trade-off allows us to predict the ecological and social consequences of our decisions regarding the natural environment, its effect on the wellbeing of society, and the role of ecological changes in generating conflicts. The concept has presented scientists with a new tool for studying environmental conflicts and for gaining a deeper understanding of the phenomena we already know. For instance, when examined in the context of ecological services, the issue of social inequalities due to power imbalance can be translated into the issues of equal access to natural goods and a fair distribution of resources. *It seems necessary to re-interpret the relevant cases of environmental conflicts in the light of ecosystem service trade-offs, which would result in making decisions with more accurately predictable consequences.*

When a decision may result in a change of landscape and/or in conflicts, I suggest that policy-makers take into consideration the concept of ecosystem trade-off, and my findings regarding the correlations between trade-off types and conflict types. The early recognition of trade-offs and conflicts allows policy-makers to devise targeted policy measures, such as subsidy or compensation programmes, buy-out programmes, tenders to ease conflicting interests, and communication campaigns that can efficiently prevent or mitigate conflicts between the parties involved.

3. Our data collection among the locals concerned revealed a wide range of ecosystem services. Environmentalists in most cases emphasised the social and cultural values connected to regulating ecosystem services and the intrinsic value of habitats, while groups of farmers highlighted mainly the economic value of provisioning ecosystem services, and then the cultural values. However, this pattern is not constant, as economic values can be related to the

maintenance of regulating values the same way as cultural values to provisioning services. So we can draw the conclusion that economic or market values are often intertwined with cultural and social values. Consequently, there is no point in applying a rigid classification when studying the values connected to services. Instead, we should explore the role of the individual services in the lives of those using them through an examination that looks at the situation from multiple angles and also takes overlaps into consideration.

I believe that the list of ecosystem services of the four locations and my findings in relation to the background of preferences might be useful to all my interviewees and especially the managements of national parks. Studying the services local land-users find important and the related values allows a more precise understanding of conflicts between land-users and directorates, and new perspectives may arise regarding solving the conflicts.

I suggest that the inventory of ecosystem services should be integrated into the rural development and tourism strategy development and implementation programmes of local governments, and into the ecotourism and environmental education programmes of national parks, for the long-term maintenance of the social and natural values represented by the services. Sustainable land use, and consideration of cultural, economical and natural values can only be ensured without conflicts if all services that are considered important by all groups concerned remain available.

When looking for a solution for land-use problems, we must not forget that interests and values are often difficult to separate from each other, and while financial incentives or compensation can be efficient measures for solving interest conflicts, they may be worthless when it comes to value conflicts. As the literature points out, value conflicts may deepen so that they become unsolvable, thus jeopardising the solution of conflicts of interests as well, in such situations it is suggested that social science methods should be applied to identify the value differences, and experts should be involved (mediator, facilitator, communication expert) to organise events (e.g. forums, guided discussions) where the parties have an opportunity to get to know and understand each other, even to accept each other's value preferences.

4. The trade-offs identified at the research locations were triggered by different factors, but, either directly or indirectly, they all resulted from human decisions or processes. My findings reinforce the literature in that whether that service comes to foreground or not greatly depends on the power position of the actor who prefers a given service.

The combination of ecosystem services in the trade-offs is varied. However, based on the trade-offs I studied, in most cases the parties compete for the benefits from the regulating and provisioning services of a particular ecosystem. In fact, in these cases the key issue is moderateness (or immoderateness), which can be directly influenced by the tools of market economy.

In decision making processes regarding the protection of nature it should borne in mind that a measure that prefers an ecosystem's ecological functions (regulating services) is likely to push a provisioning service into the background, which may appear as an economic and cultural loss for local land-users.

5. There is a definite correlation between service types and the social groups affected by the services. This can bring new perspectives into the analysis of those involved in conflicts by understanding the groups involved in a conflict as groups with different relationships to the ecosystem and maintaining different value of the ecosystem, instead of conflicting and competing groups.

The above observation allows us to make more predictable decisions regarding landscape planning, land-use and environmental protection, because we can identify the actors involved in an ecosystem service trade-off as early as in the planning process.

6. As for the relation between ecosystem service types involved in trade-offs and conflict types, we could observe that when a regulating service was pushed into the background in a trade-off, an ecological conflict emerged, and when a provisioning service was pushed into the background, a land-use conflict arose. This leads us to conclude that if we know what type of trade-off (what services it involves) results from a decision regarding land-use, we can predict with a high degree of certainty what type of conflict will arise, which means that we can identify the solutions and ways to prevent a potential conflict when it is still latent.

I did not examine whether the above conclusion holds in conflicts involving resources and between human and wildlife, and I did not find any related findings in the literature either, so it would be useful to launch research programmes into the above two conflict types.

7. I defined six factors that are very likely to influence the emergence of land-use conflicts in protected areas. These factors are interrelated and directly interact with each other. They are not always present in conflicts, and the level

of their influence is varied. Their dominance is determined by the local social, economic and ecological context, and the extent to which they mitigate or strengthen each other's effect. In the case of latent conflicts, the conflict-generating effect of the factors remains dormant below the surface until a social, economic or policy decision or an ecological feature disturbs the balance between the factors.

I suggest that conflicts should be analysed using the above six factors in cases when there is sufficient information available about a conflict (that is, we know the parties involved and the key causes of the conflict), but we also seek to explore the dynamics between the causes in order to find a really efficient and targeted solution. Understanding the connections and interactions allows us to predict the effect of potential solutions on the factors that shape the conflict.

As there was only one research location where I could more thoroughly study the interaction among factors, I suggest that researchers interested in the topic should process further cases of conflict situations with a view to making my findings more accurate from an analytical point of view.

6. List of relevant publications

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