

THE INSTITUTIONAL TOOLS OF INTEGRATED LANDSCAPE MANAGEMENT IN SLOVAKIA FOR MITIGATION OF CLIMATE CHANGE AND OTHER NATURAL DISASTERS

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Abstract: The most frequent natural disasters in Slovakia are related to climatic events, in particular to the sudden intensive rains, quick run-off and unbalanced water regime. They induce soil erosion and accumulation, flash floods, landslides, overwhelming waterlogging and also draught. Since these events have an impact throughout the whole landscape – the forest, agricultural and urban landscape, which are under the management of different sectors, the integration of the sectoral planning tools for the mitigation of their consequences is inevitable. Integration is a difficult process of dual character: it requires the development of landscape-ecological methods applicable to land management tools on one side and the creation of legal provisions ensuring the transfer of those scientific principles to legislation, on the other side. This paper deals with both sides of this process in Slovakia.

Key words: Landscape, mitigation, geosystem, spatial planning, legal tools

Abstrakt: Inštitucionálne nástroje integrovaného manažmentu krajiny na Slovensku na zmiernenie dopadov klimatických zmien a iných prírodných hrozieb. Najčastejšie prírodné hrozby na Slovensku sú spojené s klimatickými zmenami, najmä s náhlymi intenzívnymi zrážkami, rýchlym odtokom a nevyrovnaným vodným režimom. Tieto spôsobujú eróziu a akumuláciu pôdy, prívalové povodne, zosuvy pôdy, nadmerné zamokrenie, taktiež vysychanie. Tieto udalosti prebiehajú v celej krajine – v lesoch, v poľnohospodárskej aj urbánnej krajine. Krajinu však manažujú rôzne odvetvia, preto na zmiernenie dopadov klimatických zmien je nevyhnutná integrácia odvetvových plánovacích nástrojov. Integrácia je zložitý proces duálneho charakteru – vyžaduje jednak vývoj krajinno-ekologických metód aplikovateľných do manažmentových nástrojov, jednak vypracovanie zákonných ustanovení, ktoré zabezpečia prenos vedeckých princípov do legislatívy. Článok predstavuje obe stránky tohoto procesu na príklade Slovenska.

1. Introduction

In Slovakia, 1.1% of the inhabitants of EU live and the country produces 0.9% of total Greenhouse Gas (GHG) emissions out of the EU's total amount, but the impact of the climatic changes affects the territory of Slovakia in the same extent as the territories of the big emitters. Then it is obvious that the mitigation and adaptation policies to the expected climatic changes should be more emphasised, than the struggle against the emissions. The basic problem in relation to climatic change in our climatic zone is generally the unbalanced changes in the water regime. The most visible expression of this change is the more often occurring sudden intensive rain and local storms. These are inducing quick surface run-off, which causes soil erosion, silting up of channels and reservoirs, flash floods on small rivers and creeks, and, instability of slopes causing landslides. Beside these disaster-like phenomena also other unfavourable ecosystem changes occur, such as overwhelming waterlogging, or in opposite, draught.

Beside intensive rains in combination with natural conditions like the georelief, soils, geological substratum, another decisive contribution to these phenomena is the human activity, particularly the present land cover created by land-use. Since the disaster-generative agent – the run-off – takes its course throughout the whole landscape – through the forests, agricultural, rural and urban land, which are all under the management of different sectors, it should be axiomatic, that the mitigation of consequences needs harmonisation and coordination of policies in all sectors, such as forestry, agriculture, water management, nature conservation, landscape protection and urbanisation.

Unfortunately, the reality shows, that the sectoral approaches to the management of the landscape and its resources still strongly prevail. The all-day practice is that there are separate management approaches for each single component, such as soil protection, water

management, mineral resources utilisation, waste management, building codes, nature conservation, etc. (Breuste et al. 2009, Belaňová, Kočická, Diviaková, 2014).

The goal of the paper is to present the **legal tools** affecting the mitigation of the consequences of climate changes, which in presently accelerate the above-described processes and cause harms, but not to discuss the climate changes and neither the character of the harms. The **integration** of the tools for landscape management is highly actual exactly because of coming climate changes. Since we are speaking about **integrated** management, it is to underline that the tools and processes described below serve not only mitigation of the consequences of climate changes but also for solving all types of problems by developing an optimal organisation and utilisation of the landscape.

2. Theoretical-methodological background

A baseline methodical approach and a crucial precondition to the creation and implementation of tools for integrated landscape management is the complex analysis, mutual comparison and synthesis of both:

- the scientific definitions of necessary essential landscape ecological/physical/biological preconditions, which are to be implemented to the management tools on the one side, and
- the legal surroundings, preconditions and provisions formulated in existing, legally supported management tools on the other side.

These bipartite preconditions are born in completely different scientific branches, with different aims, methods and practice, so their harmonisation is a **highly difficult, long-term and demanding process, requiring indispensably harmonised teamwork of different specialists.**

The main elements of this work is the geosystem theory, the applied landscape-ecological analyses and syntheses in form of landscape ecological planning LANDEP, the theory and methods of the ecological networks. Up to the projection of the territorial system of ecological stability ÚSES, the analyses of legal tools, of the management, planning and projecting practice, of the state administration and decision making process, are all very broad themes even for their individual research. The next sections introduce the principles of the harmonisation of the landscape ecological scientific base with the legal surroundings of territory management.

2.1 The methodical process

The specialists devoted to the implementation of integrated landscape management in Slovakia (and in former Czechoslovakia) worked on this harmonisation since the seventies of last century. Accordingly, this scientific works focused on both main sides of this bipartite process, as:

- the development of a methodology appropriate for implementation of landscape-ecological principles and data to the physical planning. This work issued basically
 - the methodics of the landscape-ecological planning LANDEP (in Slovak: krajinnó-ekologické plánovanie, Ružička & Miklós, 1982, 1990), which has been recommended also in AGENDA 21, Chapter 10, and to
 - the specific methodics for projecting ecological networks, in Czechoslovakia called as territorial system of ecological stability "ÚSES" (in Slovak: územný systém ekologickej stability, Buček, Lacina, Lów, 1986, Miklós, 1996).
- the creation of an appropriate content of the act on physical planning (in Czechoslovakia called as territorial planning – územné plánovanie), which was issued for the creation of the Act No.50/1976 Zb. on Territorial Planning and Building Order, which later allowed implementation of elements of the both above-mentioned landscape-ecological methodics, in particularly to their new reading under Act No. 262/1992 Z.z., and later under Act No 237/2000 Z.z.

These acts are still valid, of course with smaller and bigger revisions. Moreover, the projection of ÚSES became part of several other acts (see below). Also, the basic principles of above-

mentioned scientific methods LANDEP and ÚSES are still valid. Nevertheless, they are in a continuous development, applying current knowledge and new techniques, as geographical information systems GIS, remote sensing, etc. (Kozová, Finka, Mišíková, 2007, Miklós, Diviaková, Izakovičová, 2011, Miklós, Špinerová, 2011, Izakovičová, Moyzeová, 2011).

2.2 The material basis of the landscape management

In Slovakia, we respect the concept of the **landscape as a geosystem**, as the material basement for the integrated landscape management. The landscape as a geosystem is defined on the basis of the general system theory (Bertalanffy, 1968) as the set of the components of the geosphere and their mutual relations (e.g. Krcho, 1968, Demek, 1974, Preobrazhensky, 1983). This basic theory has been elaborated also for its application to the methods LANDEP and ÚSES (Miklós, Izakovičová, 1997, Diviaková, 2010, Miklós, Špinerová, 2011, Miklós, Kočická, Kočický, Diviaková, 2015, Špinerová, 2010, 2015). This theory as well as our applied methods consequently emphasises that the basic geosystem elements such as the geological substratum, soils, relief, land cover, as well as other man-made objects are never isolated. They always exist in an integrated form on a concrete territory. With respect to the water regime, they are considered as the **pot for the water**. This pot – the watershed for surface water and the aquifer for underground water, is never isolated from the atmosphere and its climatic performances. All these elements are interrelated, the elements of geosystems act according to the natural patterns, **irrespective of which sector manages them**. However, the parts of the same material object, of the same geosystem, are subjects to particular sectoral management regimes. Nevertheless, their integrated character should be considered in all management tools (AGENDA 21, 1992). It should be then obvious that all sectoral policies should respect the given natural pattern and all elements of the different partial geosystems, as well as the geosystem as a whole should be encompassed in the integrated management, planning and assessment (Nassauer, 2012, Grunnewald, Bastian (Eds.) 2015). These principles have been fundamental also during the development of the methods of LANDEP and ÚSES, and should also be part of the most up-to-date concept of the evaluation of ecosystem services.

2.3 Integrated approach to the management of land resources: chosen basic theses

Beside its practical importance, the integrated approach is also a mainstream, a trendy term in science, as well as a favourite theme for politicians (Breuste et al., 2009, Mizgajski, Markuszewska, eds., 2010, Hynek, 2010, Belaňová, Kočická, Diviaková, 2014). The approach is actually not new. Already, in the Agenda 21 from Rio Summit 1992, Chapter 10: "Integrated approach to the management of land resources", it is written, that there is only one space, one landscape and it must be accepted by each sector. The necessary activities of all sectors may find their own area in the same landscape. These activities can be conflicting with each other; therefore an **integrated approach** is needed. The fundamental tool of such management strategies is **physical planning**, which must act as a frame and basis for all plans in each sector. The integrated plan should function as a basic **frame** outlining the optimal organisation and utilisation of a territory for all sectors (AGENDA 21, 1992).

In accordance with these theses we accept:

- a) the landscape management as a **ruling** device, comprising of the chain of activities as planning – organising – controlling;
- b) the integrated management as a ruling device for **harmonization** of the demands of different sectors with respect to the sustainable development. We do **not** consider some executed concrete physical actions as integrated management e.g., in forestry, in the agriculture etc. They can, of course, finally lead to requested effects, nevertheless, they are still physical sectoral actions, not integrated management. The management is just the **ruling policy** forcing the users to provide such actions (Izakovičová et al. 2007, Belaňová, Kočická, Diviaková, 2014).

The above-mentioned provisions of Agenda 21 have been generally accepted and many times applied, both in science and in practice (Barsch, Sauppe, et al, 1993, Langevelde, 1994, O'ahel', 1994, Nassauer, 2012,). On the other side, it must be stated, that these provisions are steadily

valid, but still not fully exhausted! However, in Slovakia, these exact provisions have just served as the canon for the implementation of landscape-ecological principles and methods of LANDEP and ÚSES to the management tools (Ružička, Miklós, 1982, Izakovičová et al, 2000).

2.4 Legal basis of the sectoral planning and integrated planning

Different parts of the landscape are managed by different sectoral planning tools for agricultural land, forests, waters, urbanised landscape, nature conservation, which still act standardly, and, more or less separately. The actual situation implies that it is hardly presumable that the integrated management ever becomes one single over-sectorial tool. It should be rather a rational process of coordination of chosen spatial planning procedures, where the final goal is defined as the harmonisation and satisfaction of the demands of different, if possible, all sectors towards the land resources, with respect to sustainable development. This principle was accepted also in the case of Slovakia.

This approach is not new. In developed countries, one may find many good practices (e.g. Fabos, 1979, Ružička, Miklós, 1982, Haber, 1990, Barsch, Sauppe et al. 1993, Jongman, 1995, Breuste et al. 2009, Kolečka et al. 2011). The most frequently used spatial planning tools which might be subject for integration are the physical (territorial, spatial) planning, regional planning, watershed planning and management, flood management, agricultural land arrangement (land consolidation) planning, land-use planning, forestry planning and ecological network planning. Nevertheless, their spatial harmonisation and integration remains a still not fully solved problem.

One basic precondition of the desired harmonisation is the definition of the integration by law. A clause from the original reading of the Act No. 7/2010 Z.Z. on Flood Prevention in Slovak Republic, might serve as an example. The §9 (on coordination of management plans) read as follows: „ ... *plan of the flood risk management and the watershed management plan shall be coordinated with the land arrangement projects, the territorial plans, the forest management plans. They altogether will **constitute the tool of integrated landscape management on the whole territory of the watershed***”.

However, the practice is still not satisfactory. The results of the effort towards integrated management, particularly focused on the implementation of landscape ecological principles to the legal system in Slovak Republic, is discussed in the next section.

3. Results: the institutional tools for landscape management in Slovakia and their integration

During the last 30 years, the landscape-ecological principles and methods have been implemented gradually to the existing, amended, as well as to the newly created legal tools, making them appropriate for integrated landscape management. This process was quite difficult.

The precondition for the integration of different tools into an integrated system is the elaboration and implementation of such legal clauses to the respective acts, which ensure the mutual recognition of their key provisions for a synergistic cooperation. Another precondition is their correct factual&time arrangement according to their character and successive role in the integrative process. Accordingly, we may rank and characterise the current landscape management tools in Slovakia as follows:

3.1 The integrated spatial information base (obviously GIS based)

These tools should serve as the unified information base for all kind of activities in the landscape, therefore we consider them as the information base for integrated management of the landscape. The legal base of these tools is:

- Act No. 3/2010 on the national infrastructure for spatial information, which is the adoption of the Directive 2007/2/EC/EP (INSPIRE) to the Slovak legal system, and,
- the landscape-ecological base for integrated management in the Act No. 7/2010 on flood prevention. In this act the basic data on the geosystem, necessary for integrated landscape management are itemised.

3.2 The tools acting as the physical basis and spatial frame for all other sectoral plans

The most basic tool for the whole integration process is the territorial planning (spatial/physical planning). In fact, it plays the role of the „frame and basement for all other sectoral plans“, as defined in the AGENDA 21. This is also the tool for the transformation and transfer of the landscape-ecological data to the real executive planning tools, i.e. conveys the results produced by LANDEP and ÚSES – which are obligatory parts of the territorial planning – to other spatial planning tools. The legal base of this tools is the

- Act No. 50/1976 Zb., on territorial planning and building order, in particular its amendment **Act No. 237/2000 Z.z.**

The most important provisions for integration of landscape-ecological principles into the planning defined in the amendment Act No. 237/2000 Z.z. are as follows:

- the definition of the **landscape as the geosystem** is fully in accordance with scientific definitions;
- the definition of the **properties of the landscape elements** as obligatory **regulative** – i.e. bans, limits, allowances – for the ecologically optimum organisation and utilisation of the territory;
- the **landscape-ecological planning** as the obligatory result of the surveys and analyses, as the tool for ecologically optimum organisation and utilisation of the territory;
- the **ecologically optimum utilisation** of the territory is defined as obligatory regulative;
- the **territorial system of ecological stability** ÚSES, which includes the definition and localisation of the biocentres, biocorridors and interactive elements, as the obligatory regulative for the territorial plan on regional and community level.

The Act – beside many other provisions – defines also the obligations of other planning tools to respect the results of the territorial plans as frame and basement.

3.3 Executive sectoral planning and management tools

These traditional, well-functioning tools, are in generally meant to execute the concrete demands of the sectors through planning and projecting to the territory. The desire of the integrative efforts is the implementation of landscape-ecological principles and data to these tools. It happened in two ways: firstly, through the obligatory recognition of the territorial plans, which includes both LANDEP and ÚSES; secondly, through the recognition of the results of the ÚSES specially elaborated as obligatory basis for sectoral plans.

The legal base of these tools is:

- for **nature conservation**: the Act No. 543/2002 Z.z. on Nature and Landscape Conservation. This act defines the limitations of nature conservation for all sectors. Moreover, as a pro-active new concept of nature conservation, the Act defines also the territorial system of ecological stability ÚSES as the system of bio-centres, bio-corridor and interactive elements. ÚSES became the obligatory part of several other sectoral planning.
- for planning and projecting of **agricultural land**: the Act No. 330/1991 Z.z. on Land arrangement and consolidation, executed according to several newer revisions. This act defines ÚSES as an obligatory part of the land arrangement and consolidation projects. The ÚSES might even play the role of a reason for new land arrangement project.
- for **forestry planning**: the Act No. 326/2005 Z.z. on Forests. A number of provisions of this act forces the protection of nature and nature resources, e.g., it defined the forests in 3 basic groups: apart from the timber productive forests, the protective forests are aimed mainly at the protection of water and soils, and forests of distinctive determination, in particular, the forests in nature conservation areas.
- for **water planning and watershed management**: the Act No. 364/2004 Z.z. on Waters. This act comprises of a number of ecological provisions respecting the Water Framework Directive

(EP/EC 2000/60/EC). The key part of the act concerning integrated management is the watershed planning, where the cooperation of different planning tools are forced. The landscape-ecological principles are implemented among others through the obligations of plans to consider the positive effects of the ÚSES.

- for **flood protection** management: the Act No. 7/2010 Z.z. on flood protection. It is a quite new and modern act, which recognises the flood protection as a real **integrative activity** requiring cooperation of all sectors. Among others, it is comprised of the data needed for the integrated landscape-ecological information base, the acceptance of environmental goals, and, characterisation of the watershed management as the harmonisation of different planning tools. The original wording comprised also of the exact definition of the integrated management of the landscape. The newer amendments slightly changed the original wording, nevertheless, the basic integrative sense of the act remained.

All above-mentioned tools must respect the territorial plans (described above) as integrative frame and basis. In an ideal case, these tools convey and execute the landscape-ecological and integrating principles from the territorial plans and ÚSES projects to the concrete territory.

The function of the integration is given by the system of cross-connections and relations of the provisions of different acts, which bear landscape-ecological aspects. This cross connections define basically:

- what concrete **activity**, document or other base material is obligatory for other tool – (the obligatory basic document), e.g. project of ÚSES is an obligatory base for land arrangement projects, or the LANDEP is the obligatory basic document for the territorial plan. To be underlined: not just a part, to act just a part is a weak position, but basis to be accepted in further process.
- what **tool** should be incorporated after its elaboration to other tools – e.g., the plan of the flood risk shall be incorporated to the plan of the watershed management; the project of ÚSES shall be the basic document of the documentation of nature conservation management;
- what **parts** of basic documents should be accepted by the decision process (the obligatory regulative), e.g., the properties of the landscape elements defined by LANDEP shall act as an obligatory regulative, i.e., bans, limits and allowances, for the ecologically optimum organisation and utilisation of the territory in territorial plan;
- what **information** are obligatory for a concrete tool, e.g., the information comprised in territorial plans shall be submitted to plans of flood risk, or the information on nature conservation for land arrangement plan;
- what **aspects** of a tool should be accepted in other tool, e.g., the plans of the watershed management should accept the positive effects of the ÚSES.

3.4 Tools for the assessment and regulation of impact on the environment

In Slovakia, this role is executed by environmental impact assessment and by integrated pollution prevention and control, which also have an integrated character. These tools are not oriented to a direct management of the landscape, but on the control and assessment of the impact of the sectoral spatial activities. Therefore, we can consider them as the important tools for impact regulation.

The legal base of these tools is:

- Act No. 245/2003 Z.z. on the Integrated Pollution Prevention and Control
- Act No. 7/2010 Z.z. on the Environmental Impact Assessment (E.I.A.) and Strategic Environmental Assessment (S.E.A.), both according to later amendments.

One of the key landscape-ecological element in these tools is the obligatory consideration of ÚSES.

The logic order of those tools from informational base, through physical frame, through execution up to assessment and control, is crucial for their integration. An ideal relation scheme of such

data and planning tools is shown in the Fig.1. The key elements for the realisation of an integrative approach to the landscape management, i.e., for the integration of the sectoral planning procedures are:

- an integrated GIS-based spatial (not sectoral!) information system;
- the landscape-ecological planning for transfer of landscape ecological principles and data to other planning processes, as the basic document of the territorial plan for ecologically optimum organisation and utilisation of the territory ;
- a spatial (territorial, physical (not sectoral!) planning as a legal, obligatory frame for each sectoral plan, as it was stated also in the provisions of Agenda 21;
- the sectoral planning respecting the results of integrating spatial plans (physical, territorial plans).

In Slovakia, the territorial system of ecological stability ÚSES defined by law is the key integrative ecological element. ÚSES is determined as an obligatory principle in all above-described management tools.

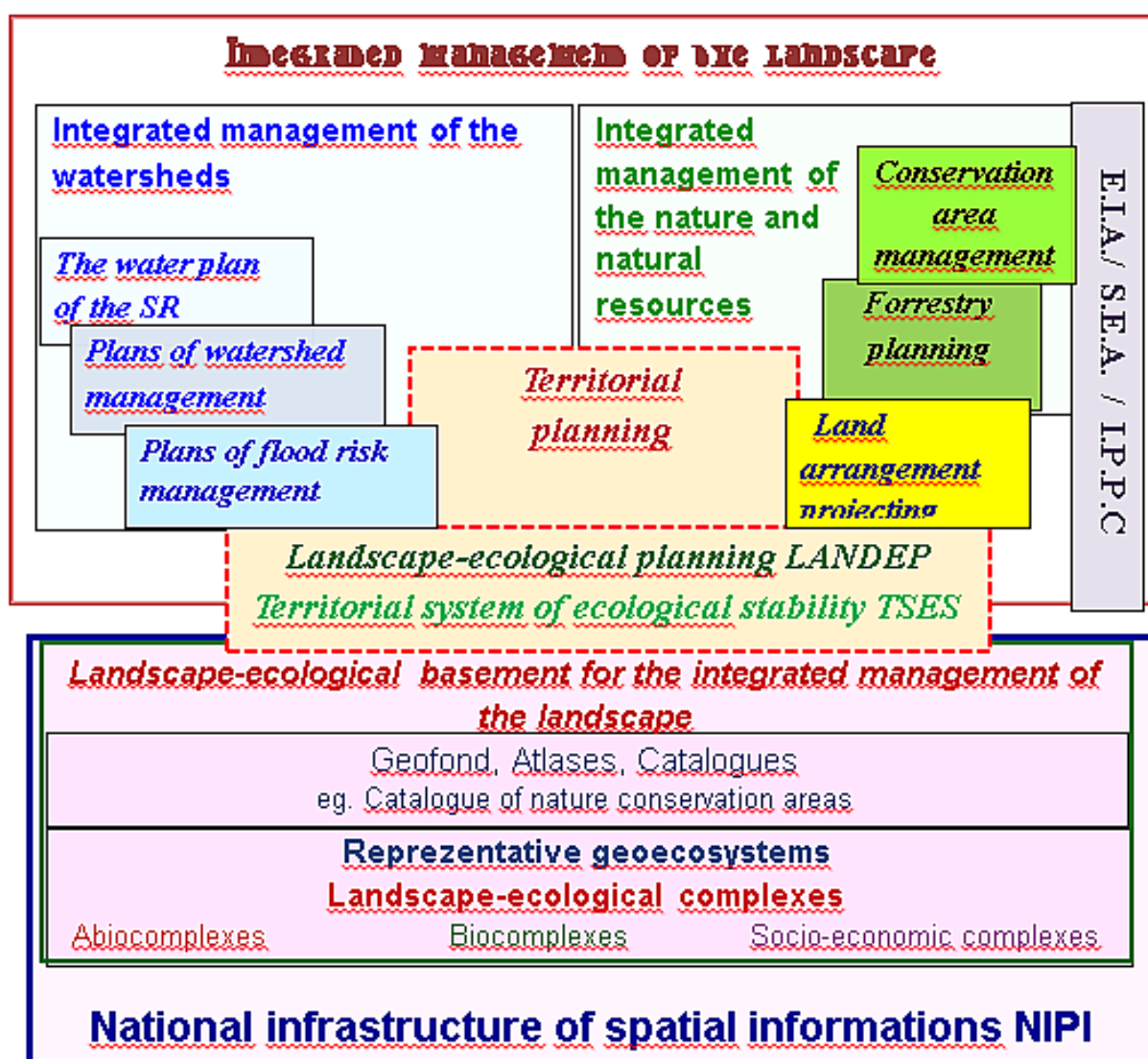


Fig 1. The scheme of the relations of the tools for the integrated management of the landscape in Slovak Republic.

4. Conclusion: problems of the implementation

As described, both the methodical and the legal basis of the integrated management of the landscape is in Slovakia on quite appropriate level. This fact is proven by the reading and mutual relations of the provisions of existing legal tools and methods. Nevertheless, the application of the integrative principles in practice is not yet satisfactory. Inadequate application is obvious – in comparison with the wishes of landscape ecologists – in the real plans and projects, where often even the ready-for-use landscape-ecological plans or ÚSES projects remain just as an annex to those projects without their effective use. There are still problems with practical cooperation and coordination. The sectoral tools still act more or less autonomously, which cause conflicts during their implementation to the territory. For example, the unwillingness to procure the landscape-ecological plans or ÚSES in appropriate quality and appropriate time should be mentioned, or the unwillingness to accept the landscape-ecological regulative to the territorial or other, e.g., forestry plans. Another type of conflicts concerns the coordination of water plans and land arrangement projects.

This situation is caused by problems of different character. Methodically, the concept of integration is understood very differently by different sectors – rarely as the real integrative decision-making on optimum subdivision of the whole landscape for each sector. Therefore, obviously there is a need to enhance the trade-offs between science, policy and sectors.

All this also needs changes in education. Integrated management of the landscape is not one single topic of study, but a systematically organised set of topics. This requires a balance between all the natural sciences (geographical and biological disciplines, landscape ecology, environmental disciplines), technical (basement industrial, agricultural, forestry, construction knowledge), as well as social sciences approaches (law, economics, management).

Another problem is the lack of the political will for integration. Publicly, nobody objects to the integration, nevertheless the resistance of the sectors to be integrated under any trans-sectoral planning prevails. Also the aversion to accept the nature and landscape limitations as obligatory regulations still exists. Sectors and companies, as well as the communal authorities and other interest groups consider the integration only if it offers any (short-term) profits, not looking to the interest of other sectors and long term effects.

Nevertheless, new real situation in the landscape, in particular, climate changes, will increase the pressure on natural resources, which will increase competition between sectors acting in the landscape. Therefore, the demand towards implementation of integrated approaches will increase. Consequently, the implementation of various integrative approaches, like the Slovak approach presented here, or the "Nexus" approach (Hettiarachchi, Ardakanian, eds., 2015), the Integrated Water Resources Management (IWRM, Shah, 2016) and others, will develop in the near future.

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