

Questionnaire
Summary of the main activities of a research institute
of the Slovak Academy of Sciences

Period: January 1, 2012 - December 31, 2015



INSTITUTE OF LANDSCAPE ECOLOGY
SLOVAK ACADEMY OF SCIENCES

Bratislava, 2016

1. Basic information on the institute:

1.1. Legal name and address

Institute of Landscape Ecology SAS

Štefánikova 3, P.O.BOX 254

814 99 Bratislava

Slovakia

1.2. URL of the institute web site

<http://www.uke.sav.sk/>

1.3. Executive body of the institute and its composition

Directoriat	Name	Age	Years in the position
Director	RNDr. Zita Izakovičová, PhD	57	2012 -
Deputy director	Mgr. Henrik Kalivoda, PhD	46	2002 -
Deputy director - Branch Nitra	RNDr. Ľuboš Halada, CSc.	56	2012 -
Scientific secretary	Dipl.Ing. Dagmar Štefunková, PhD	56	2002 -

1.4. Head of the Scientific Board

RNDr. Róbert Kanka, PhD (since 6. 2. 2012)

Dipl.Ing. Jana Špulerová, PhD (since 22.1.2016)

1.5. Basic information on the research personnel

1.5.1. Number of employees with university degrees (PhD students included) engaged in research projects, their full time equivalent work capacity (FTE) in 2012, 2013, 2014, 2015, and average number of employees in the assessment period

	2012		2013		2014		2015		total		
	number	FTE	number	FTE	number	FTE	number	FTE	number	averaged number per year	averaged FTE
Number of employees with university degrees	36,0	32,000	34,0	30,000	35,0	30,000	34,0	30,000	139,0	34,8	30,500
Number of PhD students	9,0	8,600	11,0	10,300	9,0	9,000	9,0	8,600	38,0	9,5	9,125
Total number	45,0	40,600	45,0	40,300	44,0	39,000	43,0	38,600	177,0	44,3	39,625

1.5.2. Institute units/departments and their FTE employees with university degrees engaged in research and development

Research staff	2012		2013		2014		2015		average	
	No.	FTE	No.	FTE	No.	FTE	No.	FTE	No.	FTE
Institute in whole	36,0	32,000	34,0	30,000	35,0	30,000	34,0	30,000	34,8	30,500
Department of ecosystem analysis	9,0	8,000	8,0	7,000	9,0	7,000	8,0	7,000	8,5	7,250
Department of landscape ecological syntheses	11,0	11,000	11,0	10,000	12,0	11,000	12,0	11,000	11,5	10,750
Department of diversity of ecosystems and landscape - Nitra branch	16,0	13,000	15,0	13,000	14,0	12,000	14,0	12,000	14,8	12,500

1.6. Basic information on the funding of the institute Institutional salary budget and others salary budget

Salary budget	2012	2013	2014	2015	average
Institutional Salary budget [thousands of EUR]	400,498	401,34	390,411	408,941	400,297
Other Salary budget [thousands of EUR]	58,653	239,74	265,851	190,413	188,665

1.7. Mission Statement of the Institute as presented in the Foundation Charter

- The scientific research activities of ILE SAS are oriented toward the development of the theory and methods of research of ecological properties and processes on the systems level. These activities develop the theory and methods of landscape ecology, deal with the problems of ecological processes and the dynamics of the landscape, and produce models for optimum ecological use of the landscape. The Institute studies the material and spatial differentiation of biotopes in relation to landscape biodiversity and looks at the question of resources at the ecosystem level of local and spatial systems.
- ILE SAS develops methods of ecologically-sound landscape planning and special methods for the application and interpretation of ecological and environmental knowledge in the field of nature and landscape protection as well as in environmental management.
- ILE SAS provides consultancy and other expert services in line with the main field of activity of the institute.
- ILE SAS provides PhD opportunities according to national legislation.
- ILE SAS publishes the results of scientific research activity in both the periodical and non-periodical press. Publishing follows the relevant resolutions of the Presidium of the SAS.

1.8. Summary of R&D activity pursued by the institute during the assessment period in both national and international contexts, (recommended 5 pages, max. 10 pages)

The Institute of Landscape Ecology SAS is a centre devoted to basic and applied landscape research on an interdisciplinary basis. The interdisciplinary nature of the institute has to be

preserved and has to be reflected by the structure of the institute: all the expertise and specialisations necessary for complex landscape research have to be present in the institute.

The Institute is a member of an international network of excellence in long-term ecosystem research. It is also Centre of Excellence for landscape utilization and protection of biodiversity and a Centre of Excellence of Castles in Slovakia, which focuses on interdisciplinary cross-sectional study of castles.

ILE SAS focuses its activity on the ecological and environmental sciences in Central Europe and in the European context. The concept, focus and structure of the Institute are based on the fact that:

- The Institute is a research institution;
- The Institute is an educational institution;
- The Institute is a contributory organization.

The primary activities of ILE SAS are grouped into four basic „pillars“, the state of which we will outline for the assessment period.

1st Pillar: Development of basic scientific research

Basic scientific research is the most fundamental of all the Institute's activities. It is achieved by the continual development of methods and methodologies of basic landscape-ecological research, which ensures the unique position of the Institute in the field of research work. ILE SAS (as one of the few institutions of its kind in Slovakia) carries out complex interdisciplinary landscape ecological research.

Basic research has focused on issues concerning research into the landscape, its components, its phenomena and processes running in the landscape at different hierarchical levels. Landscape research has an interdisciplinary basis and is based on the perception of the landscape as a geosystem. The same attention is paid both to analytical research of the individual components of the landscape, on landscape syntheses and the formation of purpose-related properties of the landscape, which are the basis of making optimal and rational use of the landscape and its components. Global changes, including climate changes, sustainable development, and the greening of human activities are the main challenges that have affected and will influence the professional orientation of the Institute, as well as the activities of the Institute during the assessment period. The research activities of the Institute were determined by participation of ILE SAS in various international networks and programs during the assessment period. Between 2012 and 2015 our scientific projects have been focused on the following issues:

- **The implementation of research activities in long-term ecosystem research.** Long-term ecological research and monitoring is a fundamental pillar of obtaining data of high quality useable data permitting the detection, understanding and prediction of climate change. ILE SAS is a member of the ILTER global network, which coordinates long-term ecological research and monitoring and contributes to the understanding of changes in ecosystems and their impact and links to the socio-economic sphere. The aim of ILTER Slovakia, which is coordinated by ILE SAS, is to provide reliable scientific information and predictive understanding of the ecological and socio-economic processes and propose measures to address current and future environmental problems for the scientific community, the managerial sphere and the whole society. Ecosystem research was conducted at selected locations by ILE SAS during the assessment period. Activities focused on ecosystem research in the model localities Báb, Kráľova Hoľa, Salatín and Poloniny during the assessment period. We ran experiments on the impact of nitrogen deposition (Salatín) and combinations of nitrogen deposition and increased temperature (Kráľova Hoľa) in ecosystems of alpine meadows. Decomposition tests and NDVI measurements continued using field spectroscopy. Research of epigeic invertebrates continued on four locations at locality Báb, where we established 5 new sites for vegetation research and did phytosociological relevés. We finished repeated phytosociological relevés

from an evicted area in NP Poloniny. Ecological research has also expanded by adding a socio-economic aspect and creating a network for long-term ecological and socio-ecological research, LTSER. During the assessment period research on LTSER sites focused on tracking and monitoring of ecological and socio-ecological phenomena at two LTSER locations: Poloniny and Trnava region.

- **Observing, monitoring and assessment of mountain flora affected by climate changes.** These activities were carried out within the follow-up activities of the project GLORIA (Global Observation and Research Initiative in Alpine Environments), which aims to create and maintain a monitoring network of research sites for long-term observation of mountain flora. Within the project we are observing the effect of climate change on species composition of vegetation above the tree line. In 2001, the project began with 18 GLORIA target regions in the mountain areas of 13 European countries. In 2008 a second batch of data was collected and comparison of data from 2001 and 2008 showed very interesting results, which were published in the journal *Science*. The "Recent Plant Diversity Changes on Europe's Mountain Summits" study presented essential information confirming that increasing climate change puts a lot of pressure on the flora of European mountain systems. Over recent years the GLORIA network has spread to all continents and overall there are more than one hundred regions with established research sites. Currently, the number of regions is 118 and they are located in the alpine zones of Europe, Asia, North and South America and Oceania. Slovakia conducts research through the ILE SAS in a research site at the top of Hlúpy Vrch hill in the Belianske Tatry Mts. Research is focused on assessment of phylogenetic diversity of higher plant taxa and links with the cushion plants, i.e. clonal plants such as *Silene acaulis* (L.) Jacq., *Minuartia sedoides* (L.) Hiern. The results show that clonal plants play an important role in the climatically harsh environment of the alpine zone, helping other species to colonize this environment and contribute to a direct increase of vegetation diversity. In 2015, re-collection of data was realized and it is now being analysed and evaluated. Continuous monitoring of species will have a major impact on the monitoring of ongoing environmental effects on the diversity of plant life in alpine vegetation zone.
- **Research of landscape changes and land cover, land use change research and assessment of driving forces behind these changes.** Monitoring of landscape changes and land cover was realized within multiple projects, whether national or international, and also in several regions. The most important project from this area was probably the project of the American Space Agency (NASA): *200 years of changes in landscape use and land cover and their driving forces in the Carpathian system*. The Carpathian system is considered as the "backbone" of biodiversity in Europe. In it are preserved large amounts of forests and high mountain habitats, and also cultural landscape habitats. This area, together with the adjacent Pannonian Basin, was the scene of major socio-economic and political changes during the last 200 years, e.g. the disintegration of the Austro-Hungarian monarchy, the impact of two world wars, the division of Europe by the Iron Curtain, the fall of communism, and the integration of some countries into the European Union, Eurozone and Schengen Space. The significance of these changes and their impact on land cover has been studied by a NASA project funded by the *National Aeronautics and Space Administration*. Within the project scientist from ILE SAS drew up an assessment of historical land cover using military maps of the Austro-Hungarian Monarchy, interwar Soviet maps and topographic maps. Maps of second military mapping (19th century) and topographic maps of the 50-ies of the 20th century were selected for the project based on the analysis of the quality and availability of historical maps of the area of interest. A dot distribution map (2x2 km) that is compatible with the European dot network INSPIRE was created, which consists of about 12,265 points for Slovakia and 6705 points for Moravia. Satellite imagery of the LANDSAT system has been added to historical maps. We have also contributed to the project by processing the data for verification of changes in forest cover that were evaluated on the basis of the LANDSAT images, and by processing of socio-economic statistics and preparing data for meta-analysis of local studies of landscape changes.

- Assessment of ecosystems and ecosystem services.** This has been one of the main topics of ILE SAS during the assessment period. Research on ecosystem services was realized through several projects. The main objective of the APVV project *Evaluation of ecosystem functions and services of the cultural landscape* was a comprehensive assessment of ecosystem services based on selected REPGEs units and their detailed research and testing of appropriate indicators in selected model areas for various types of cultural landscapes under the current CICES methodology. The aim of the VEGA project *Approach to assessing ecosystem services in traditionally-utilized agricultural landscape* and the project *Diversity of agricultural landscape and its ecosystem services* was to obtain new quantitative and qualitative data for the assessment of ecosystem services for both science and practice, with an emphasis on the importance of traditionally-utilized agricultural landscapes, which are significantly involved in the performance of many functions and benefits because of their complex structure. The issue of ecosystem services has also been addressed in the project of 7 RP EÚ OpenNESS (Operationalisation of Natural Capital and EcoSystem Services - From Concepts to Real-world Applications). Activities of ILE SAS were focused on assessment of the actual state of implementation of the concept of natural capital and ecosystem services in the Slovak Republic and on the model area and the proposal of methodological tools for landscape and spatial planning, which will allow a better application of the principles of ecosystem assessment and their benefits in the Slovak Republic. Besides the assessment of strategic documents and legislative instruments in terms of the concept of ES, we implemented assessment of ecosystem services for Trnava region. Assessment of ecosystem services was realized by a cascade model which was modified for the conditions of the SR, and different modelling techniques were applied for the assessment and modelling of ecosystem services. The most important were: Spreadsheet, GreenFrame, QuickScan and ESTIMAP.
- Mapping and assessment of traditional agricultural landscape (TAL), including ecosystem services (ES), and the benefits of ecosystems which these historic structures of agricultural landscape provide.** Assessment of ecosystem services of TAL was performed as part of a project supported by the Norwegian Financial Mechanism - *Research and maintaining of biodiversity in traditional agricultural landscape* – which involved mapping TAL of Slovakia and TALdrawing up a catalogue of them. During the assessment period the research concentrated on the evaluation of ecosystem services of TAL in selected study areas, which represent different types of traditional agricultural landscape (TAL): Trnava region and Svätý Jur (vineyard TAL), Liptovská Teplička (permanent coppice TAL with orchards), Lednica (permanent coppice TAL with orchards), Hriňová, Kysuce (TAL of dispersed settlement). We observed and assessed several ecosystem services: *regulatory* (in relation to the protection of soil, water retention in the landscape and the climate regulation, assessment of benefits for biodiversity conservation), *production* (evaluation of the ability to produce food, water and materials for the development of society), and *cultural* (assessment of the visual effects of landscape, the significance of place, recreation and leisure, assessment of cultural and biological values of the area). Within the APVV project *Atlas of landscape archetypes of Slovakia* there was implemented a spatial analysis of the landscape archetypes of Slovakia, and a database was created in the form of a catalogue. Archetypes of the landscape represent historic and long-term formative structures of the landscape, which are the result of historical changes, socio-economic conditions and natural factors of the environment. There is a specific layout of elements in the mosaic of the landscape determined by human activities in the context of the potential of the landscape type. The basic criteria for defining a territory as an archetype are physiognomic characters in the form of specific positional conditions, spatial arrangement of landscape elements and patterns in the structure of the landscape. Using remote sensing and GIS technologies 11 main groups of archetypes of landscape of Slovakia were identified and analysed, from the archetype of plains and bottom lands to the archetype of erosion furrows in the uplands. The basic outcome of the project was publication *Atlas of Landscape archetypes of Slovakia*, which presents areas of unique types that were identified as examples of archetypes of the lowlands and mountain areas in Slovakia.

- The development of an adaptive forecasting system of plant protection in cooperation between border wine regions.** ILE SAS in cooperation with the TEU in Budapest carried out a project focused on solving current problems related to viticulture, specifically those of mould and various other diseases of the grapevine. We together created a new forecasting system to protect the grapevines which models the spread of diseases and pests. The application of the model will contribute to the improvement of management in the vineyards and to reducing consumption of chemicals to protect the grapevine, thus lowering the pressure on the environment and at the same time improving crop protection, which should subsequently also have beneficial socio-economic effects. It is estimated that knowledge of accurate forecasts can save up to 30% of the grapevines damaged by pests and diseases. The results consisted of two parts:

 - Creating a predictive model for protecting the grapevine. The model predicts the development of microclimate parameters for the next few days and on the basis of these forecasts models the possible development of grapevine diseases (mildew, downy mildew, gray and black mould) and then suggests the optimal duration of treatment of the grapevine for local vintners (whether it is appropriate and necessary to spray, when to start spraying etc.). The vintner obtains the information by connecting to the server over the internet.
 - Landscape-ecological typing of vineyard areas. At the core of this part of the project was the micromorphological, pedological and microclimatic typing of selected vineyard areas in the border regions of Slovakia and Hungary. The result of typing was creation of "micro-morpho-pedo-tops", which show the same values of heat-moisture conditions in the area of their occurrence, thus also showing the same conditions for occurrence, development and spread of diseases and therefore for protection of plants against these diseases.
- Assessment of spatial and time trends of accumulation of heavy metals and nitrogen in mosses in Slovakia for 25 years,** which is realized within the European project of biomonitoring. Three samples per year of three species of mosses (*Dicranum* sp. (60%), *Hylocomium splendens* (5%), and *Pleurozium schreberi* (35%)) were assessed on 79 permanent monitoring plots of a pan-European network (16x16 km). We assessed the pollution of Slovakia by heavy metals and other pollutants: cadmium - Cd, copper - Cu, lead - Pb, sulfur - S, nitrogen – N, sodium - Na, magnesium - Mg, aluminum - Al, chlorine - Cl, potassium - K, calcium - Ca, Titanium -Ti, Vanadium - V, Iodine - I and Dysprosium - Dy. This research was run in Slovakia within ICP Vegetation (1990 - 2005), and we have continued it since then. We performed chemical analysis on the content of the accumulated elements and have found the following concentrations (in mg/kg): Nitrogen 20474 ± 5842; Sulfur 1795 ± 538; Cadmium 0.315 ± 0.169; Copper 11.8 ± 7.86 and Lead 1.36 ± 1.24. In 2015 we analysed the following elements (in mg/kg): Sodium 222 ± 170; Magnesium 875 ± 477; Aluminium 1044 ± 972; Chlorine 210 ± 163; Potassium 9145 ± 3069; Calcium 4042 ± 1761; Titanium 82 ± 97; Vanadium 2.05 ± 1.72; Chrome 3.83 ± 3.78; Manganese 398 ± 246 and Iron 867 ± 876. The remaining elements will be analysed in 2016 in cooperation with the Joint Institute for Nuclear Research Frank Laboratory of Neutron Physics in Dubna, Russia. In Slovakia, we found a high gradient of atmospheric burden with heavy metals. The most pollution was found in the Volovské vrchy Mts. (central Spiš), the Kremnické and Štiavnické vrchy Mts. (production of non-ferrous metals and aluminium smelter), and the surroundings of Slanec. In terms of elemental deposition, pollution levels are 2-3 times higher in Slovakia than in Austria and the Czech Republic.
- The involvement of the ILE SAS in the international project INSPIRATION,** where the Institute of Landscape Ecology participates as an expert workplace in carrying out landscape research, can be considered another important contribution. The project focused on assessment of the current state of research in the field of land management and defining the needs for the next period. The project identified societal challenges and research needs related to soil, especially the use and protection of soil, as well as land use

and the use of the other resources of the land. Different approaches to integrated land management were evaluated and current strengths and weaknesses in this area were described. The main outcome of the project was defining proposals to improve the situation, and identification of research needs in integrated landscape management and efficient use of natural resources as a basis for the specification of basic research topics within the program Horizon 2020. Transfer of knowledge gained from this project will help to improve environmental policy and EU research in this area.

- Within the structural project ***Modernization and building of technical infrastructure for research and development of the Institute of Landscape Ecology of the Slovak Academy of Sciences***, top-class facilities were supplied for ILE SAS for further landscape-ecology research. We successfully constructed a laboratory for field measurements, a GIS and remote sensing laboratory, and a UAV laboratory – a contactless platform for hyperspectral, LIDAR and thermal imaging. The completion and consolidation of the GIS laboratory leaves us with a comprehensive GIS and remote sensing laboratory with which high quality research can be carried out with a specific focus on swiftly obtaining nationwide information about the landscape, vegetation and environmental factors. The primary outcome of the laboratory will be explicit time and space data on the conditions of vegetation and water quality, which will serve as the so-called ground segment ("ground truth") in the process of creation of remote sensing algorithms (in connection with the use of UAV platforms or satellite-based remote sensing) to observe indicative spectral, production, ecophysiological and structural properties of vegetation, or optical, biochemical and biological indicators of water quality.

Basic research was carried out in the scope of domestic projects (VEGA, APVV) as well as international projects supported by EU grants (7th FP, Horizont 2020, structural funds of the EU, NASA fund, funds of cross-boundary cooperation etc.). During the assessment period ILE SAS participated in two seven RP EU projects, two HORIZON 2020 projects, four APVV projects, nineteen VEGA projects and many other (20) national and international projects. The international activities of the scientists of ILE SAS have a prominent and abiding position within the institute's activities. The scientific projects 7th Framework programme and HORIZON 2020 created opportunities for permanent contact, cooperation, and mutual exchange of knowledge, methods, data and results. Young ILE SAS scientists are from the very start of their scientific careers exposed to the work, methods and results of excellent scientists from prominent and renowned scientific institutions in the European Union and elsewhere.

2nd Pillar: Development of applied research

The main goal of this pillar is to transfer scientific knowledge into real practise, especially in the field of the elaboration of basic material on and proposals for the process of landscape planning and decision-making and also for the environmental legislation process (landscape planning and land consolidation). The Institute is quite experienced in this field at a domestic as well as an international level (providing materials for the NATURA 2000 international network as well as materials and expertise for new legislation etc.). These activities should continue to be developed in the future too. The study and evaluation of current ecological and environmental problems, the elaboration of proposals for their elimination and prevention, the elaboration of strategies and management plans for the sustainable utilization of the landscape and its elements, the protection of biodiversity, the stability of the landscape and protection of the environment were the main activities of the Institute in the sphere of applied research during the assessment period. During this period, employees of the Institute acted as experts for solving environmental problems, both at the international (EU) and national levels. One of the major activities on the international level was continuing long-term participation (since 2001) of the Institute in the *European Topic Centre for Biological Diversity* (ETC BD). The *European Topic Centre for Biological Diversity* is a professional organization of the European Environmental Agency (EEA) and its activity is controlled by the task plan of the EEA. ETC BD work is currently focused on three main themes: Support for the biodiversity directives (The Habitats Directive, The Birds Directive); Assessment of biodiversity; ETC management. ILE SAS cooperates on each task with other partners of the ETC BD

consortium, which is made up of 12 organizations. The leading organization is Museum of Natural History in Paris. During the assessment period, the activity focused on the implementation of the Habitats and Birds Directives and on the building of a European network of Natura 2000. Employees of ILE SAS carried out the assessment of favourable statuses of species and habitats conservation of European importance on the basis of reports submitted by EU members under Article 17 of The Habitats Directive. The next task was to assess the adequacy of the Natura 2000 network. ILE SAS employees rated the following countries: Czech Republic, Croatia, Hungary, Germany, Poland, Slovakia and Slovenia. The project team of ILE SAS contributed to the assessment of agricultural habitats and species and assessment of forests; these assessments were part of the Environmental Report published by the EEA in 2015. They also participated in the identification of agricultural landscape of high nature value (High Nature Value Farmland Areas), European assessment of ecosystem services (EURECA) and commenting on the reports of the European Environment Agency.

Other activities directly related to the DG Environment are participation of the Institute in the external monitoring team of the LIFE Programme (LIFE Nature project monitoring and LIFE Environment in Slovakia, Czech Republic, Poland, Hungary, Romania, Slovenia and Croatia) and participation in the team preparation and management of the New Biogeographical Process. Task activities for support of the New Biogeographic Process were conducted to evaluate the state and development of habitats across the different biogeographical regions: the Continental, Pannonian, Steppe and the Black Sea regions. They focused on exploring the historical drivers of changes in land use and their impacts on biodiversity and ecosystem services in Europe. ILE SAS also participated in the testing of criteria for the revision of the Habitats Directive annexes, and also participated in the task of mapping and assessing ecosystems.

Also of note are activities for national decision-making bodies – provision of expertise for and membership in advisory committees and expert groups of the Ministry of Environment, Ministry of Education, and the Government Office etc. In 2014 the Minister of Education, Science, Research and Sport commissioned ILE SAS to represent the Slovak Republic in the ESFRI consortium for e-science and technology of European infrastructure for biodiversity and ecosystem research - "LIFEWATCH-ERIC". ILE SAS represents the Agricultural and Veterinary Sciences of SAS in the Commission for space activities of the Slovak Republic. ILE SAS worked on the preparation, evaluation and assessment of several strategic documents at the national, regional and local levels – the Strategy of the Rural Development Programme for the period 2014 - 2020, the Research and Innovation operational programme, Regional integrated territorial development for TTSK and Trnava city, etc. One important application project regarding biodiversity protection was a project focused on determining the social value of endangered Carpathian habitats in Slovakia.

During the assessment period employees of the Institute acted as a members of many expert commissions (Commission for TANAP zonation, Commission for Integrated Landscape Management, Commission for the creation of a new law on the protection of nature and landscape, Slovak Committee for the Ramsar Convention, the Commission for the conservation of biodiversity, the Commission for mapping ecosystems and assessment of their ecosystem services [MAES], the Working Group on preparation of an Action Plan for the implementation of measures resulting from the Updated National Strategy of biodiversity protection up to the year 2020, the Working group on research and development in agriculture and the environment, the RIS3 Council of partnership for the Regional integrated territorial strategy of Trnava region for the years 2014 - 2020, etc.). In the application sphere there have been significant activities of ILE SAS in the area of implementation of the Danube Strategy and the European Landscape Convention in recent years (2012 - 2015). Relevant activities were carried out within the scope of contract projects and provision of expertise with the above-mentioned institutions. The outcomes were provided and presented to authorities working in the field of environmental policy.

3rd Pillar: Educational activities

Educational activities were an important component of ILE SAS as well. These activities were carried out at all levels. The Institute collaborates with the Department of Ecology and Environmental Sciences of Natural Sciences Department, Constantine the Philosopher University in Nitra, where the employees of the Institute together with personnel of the Department provide

education of the first to third level of University education. The third level of education is realized in the programme „Environmental Studies“. ILE SAS annually trains about 9 PhD students. Other higher-educational activities involved participation of Institute employees in the educational process at the following universities: Comenius University in Bratislava, The Slovak Technical University in Bratislava, Constantine the Philosopher University in Nitra, the Slovak University of Agriculture in Nitra, The Technical University of Zvolen. Scientific employees of the Institute give various lectures, presentations, study materials, consultations, reviews of diploma works, etc.

Also significant were the activities of the Institute in environmental education for elementary and secondary schools, where we developed a program of education on sustainable development and created the educational film *The landscape and its Sustainable Development*, which is still used as a methodological tool for environmental education in several primary and secondary schools. In the Suchá nad Parnou village there was established an Environmental Natural Laboratory under the auspices of the Institute. This laboratory is not only attended by local students, but a variety of educational programs and excursions take places here. During the assessment period ILE SAS employees organized an international excursion for participants of EuroEnviro 2012 - the 8th European student symposium and also participated in the organization of excursions for delegation of representatives of government and the Moldovan Association of Towns and Communities CALM.

4th Pillar: Popularisation and presentation of results

A very important aspect of the institute's development and its positive role is the presentation of scientific results to the public. Our popularisation strategy during the assessment period was focused on presentation of scientific knowledge to the public with the aim of developing environmental and ecological awareness and improving the level of acceptance and the application of results of scientific projects. Only an educated society is able to successfully understand environmental and landscape-ecological factors in real life. The following activities were deemed necessary to improve environmental knowledge: press conferences, educational films, contributions to the media including the internet, organizing exhibitions, popularisation activities and workshops with active public participation and carrying out common projects. The above-mentioned activities are considered the most important tools for raising public awareness of the need for protection and management of the environment. The Institute and its employees were repeatedly awarded for their popularization activities. In 2012 the Institute was for the second time awarded the Golden Sickie by the Minister of Agriculture and Rural Development of Slovakia for *Model Management of Sustainable Use and Conservation of the Agrarian Landscape* at the exhibition Agrokomplex, in Nitra city.

It should be emphasized that the first pillar, basic scientific research, is considered as the most important, and has the highest priority for the Institute, as it determines the success and future prospects of the ILE.

The Institute has a very prominent position in the field of landscape research not only on the domestic but also on the foreign scene. ILE SAS is a member of almost all major consortia and networks for landscape research and its individual components. Many of our employees are requested as experts in many international organizations, and act as delegates, representatives, experts and evaluators for the EU (especially DG Research, DG Environment, EEA - European Environment Agency, UNESCO, KATERVA and many other organizations). The Institute serves as the secretariat of the Association of Landscape Institutes - Landscape Europe. Landscape Europe is an interdisciplinary network of national research institutions with expertise in landscape assessment, planning, management in the sphere of policy and education and the development of science and art to promote sustainable development of the landscape. This network is made from 20 research institutions from 15 European countries at the time of writing. ILE SAS is very active in building an international network of scientists for Science for the Carpathians, where an employee of ILE SAS held office of Chairman during the evaluation period. The Institute is similarly active in the program UNESCO Man and Biosphere (MAB). On November 12, 2015 scientist from ILE SAS was elected to the prestigious International Coordination Committee for the program "Man and Biosphere" for a period of four years at the General Conference of UNESCO in Paris. ILE SAS is a

member of the international network EUCALAND (European Cultural and Agricultural Landscapes) since 2013 and is devoted to analysis of historical agrarian countries in Europe. Three of our employees are members of the European Academy of Sciences and Arts in Salzburg.

The Institute is the coordinator of the national network for Long Term Ecological Research (LTER) and a representative of Slovakia in LTER Europe and ILTER. ILE SAS implements long-term ecosystem research in the area of Báb, Kráľova Hoľa and Salatín. It also implements long-term ecological and sociological research in two LTSR locations, Trnava region and Poloniny. The Institution has engaged in long-term activities in the European Platform for Biodiversity Research Strategy (EPBRS). It also initiated the establishment of the Slovak Platform on Biodiversity and leads its activities.

The excellent international position of ILE SAS can be demonstrated by the following. At present (2015), ILE SAS cooperates with 148 partners within the EU and non-EU countries and with 11 partners elsewhere (USA, Russia, Ukraine, Norway, Island, Switzerland, and Belarus).

The most important partners in the EU are such leading scientific institutes as:

- ALTERRA, Wageningen, Netherlands
- The Centre for Ecology and Hydrology, Lancaster, United Kingdom
- Leibnitz – The Centre for Agricultural Landscape Research, Munchenberg, Germany
- Instituut voor Natuurbehoed, Brussels, Belgium
- The European Centre for Nature Conservation, Tilburg, Denmark
- The Finisch Environmental Institute, (SYKE), Finland

Significant is also the cooperation among organizations from the V4 countries, within which they solve joint projects aimed at addressing current environmental problems of Visegrad region.

- Budapest University of Technology and Economics
- Mendelian University in Brno
- European Regional Centre for Ecohydrology

Significant is also the editorial activity of ILE SAS. The Institute publishes three scientific journals, including:

- **Ecology (Bratislava)**, which since 1982 has been published in English. The journal Ecology (Bratislava) is an international scientific journal that focuses on publishing the latest research results in the field of landscape ecology, population ecology and ecosystem ecology. It publishes articles on theory, methodology and practical solutions in the field of landscape protection, landscape planning, nature protection and human impact on ecosystems. The journal is indexed in the databases Agricola (National Agricultural Library), Baidu Scholar, Celdes, CNKI Scholar (China National Knowledge Infrastructure), CNPIEC, DOAJ, EBSCO (relevant databases), EBSCO Discovery Service, Elsevier - Scopus, GeoRef, Google Scholar, J -Gate, JournalTOCs, Naviga (Softweco), Primo Central (ExLibris), ReadCube, ResearchGate, SCImago (SJR), Summon (Serials Solutions/ProQuest), TDone (TDNet), and WorldCat (OCLC).
- **Životné prostredie (Environment)**, is peer-reviewed scientific journal that is published since 1967 by Institute of Landscape Ecology in Slovak with English abstract. „Environment - revue on theory and care for the environment“. It is primarily intended for the scientific community on the given topic, but is also for specialists in environmental practice in Slovakia and the Czech Republic. The journal is monothematic.
- **Ekologické štúdie (Ecological Studies)** since 2009 in the Slovak language with English abstract: The journal Ecological studies is a domestic peer-reviewed scientific journal

published by the Institute of Landscape Ecology (ILE SAS) in cooperation with the Slovak ecological society at ILE SAS (SEKOS) and the Department of Ecology and Environmental Sciences of UKF in Nitra. In the journal are published original scientific papers in the field of ecology, landscape ecology, environmental sciences, ecological and environmental education as well as other related disciplines.

The Institute of Landscape Ecology of the Slovak Academy of Sciences in past decades, and especially in the period of 2012 to 2015, has established itself as one of the important scientific organisations in the field of landscape ecology in Slovakia as well as in the European Research Area. The precondition for this was the level of quality in research and expertise of the Institute and its scientists who have participated on the methods widely accepted by the European community of scientists.

2. Partial indicators of main activities:

2.1. Research output

2.1.1. Principal types of research output of the institute: basic research/applied research, international/regional (ratios in percentage)

70 % - basic research

30 % - applied research

2.1.2 List of selected publications documenting the most important results of basic research. The total number of publications listed for the assessment period should not exceed the average number of employees with university degrees engaged in research projects. The principal research outputs (max. 5, including Digital Object Identifier - DOI) should be underlined

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2.1.3 List of monographs/books published abroad

- [1] ŠAUER, Petr - ŠVIHLOVÁ, Dana - DVOŘÁK, Antonín - LISA, Aleš - BITTA, Jan - BUJNOVSKÝ, Radoslav - BULLA, Miklós - DOBROWOLSKI, Jan - DUBSKÝ, Zbyněk - GETZNER, Michael - HOLÁ, Marie - HUDEKOVÁ, Zuzana - HUŽVÁR, Miroslav - JANČÍK, Petr - KESIK, Marta - KESIK, Marta - KOBYLARCZYK, Justyna - KOZOVÁ, Mária - KRÁL', Pavol - MAŇKOVSKÁ, Blanka - NĚMCOVÁ, Ingeborg - PAVLÍKOVÁ, Irena - PONOCNÁ, Tereza - POVAŽAN, Radoslav - PRÁŠEK, Jan - ŠVECOVÁ, Vlasta - ŠRÁM, Radim - SUCHARA, Ivan - SUCHAROVÁ, Julie - SYROVÁTKA, Miroslav - ŠVAJDA, Juraj - VOČADLOVÁ, Klára - ZELENÁKOVÁ, Martina - ZSENI, Anikó - ZVIJÁKOVÁ, Lenka -

2.1.4. List of monographs/books published in Slovakia

- [1] DAVID, Stanislav - MOJSES, Matej - PETROVIČ, František - AMBROS, Michal - BALÁŽ, Ivan - BUGÁR, Gabriel - GAJDOŠ, Peter - GERHÁTOVÁ, Katarína - HREŠKO, Juraj - MAJSKÝ, Jozef - MAJZLAN, Oto - MATUŠICOVÁ, Noémi - POLÁČIKOVÁ, Zuzana - PONECOVÁ, Zuzana - ŠOLOMEKOVÁ, Tatiana. *Vplyv ťažby uhlia na krajinu a biodiverzitu Košských mokradí (Hornonitrianska kotlina)* [Impact of coal mining on the landscape and biodiversity of the Koš wetlands (Upper Nitra Basin)]. Nitra : Ústav krajinnej ekológie SAV, 2013. 154 s. ISBN 978-80-89325-13-9.
- [2] MUCHOVÁ, Zlatica - HRNČIAROVÁ, Tatiana - PETROVIČ, František. *Miestny územný systém ekologickej stability na účely pozemkových úprav* [Local territorial system of ecological stability for the purposes of land consolidation]. Nitra : Slovenská poľnohospodárska univerzita v Nitre, 2013. 138 s. ISBN 978-80-552-1127-5.
- [3] ÁBRAHÁMOVÁ, Anikó - KOLLÁR, Jozef - ŽARNOVIČAN, Hubert. *Vegetácia inundačného územia rieky Váh v úseku Nové Mesto nad Váhom - Šaľa* [Vegetation of the Váh river inundation in the part Nové Mesto nad Váhom - Šaľa]. Bratislava : Univerzita Komenského v Bratislave, 2014. 151 s. ISBN 978-80-223-3675-8.
- [4] DOBROVODSKÁ, Marta. *Krajinnoekologický výskum historickej poľnohospodárskej krajiny v obciach Liptovská Teplička, Osturňa a Malá Franková* [Landscape-ecological research of the historical agricultural landscape in Liptovská Teplička, Osturňa and Malá Franková villages]. Bratislava : Veda, vydavateľstvo SAV, 2014. 149 s. Dostupné na internete: <www.veda.sav.sk>. ISBN 978-80-224-1339-8.
- [5] BUGÁR, Gabriel - DOBROVODSKÁ, Marta - GREŽO, Henrich - HALADOVÁ, Ivana - HREŠKO, Juraj - IZAKOVIČOVÁ, Zita - KRNÁČOVÁ, Zdena - LIŠKOVÁ, Vladimíra - MEDERLY, Peter - MIŠOVIČOVÁ, Regina - MOYZEOVÁ, Milena - PETLUŠ, Peter - PETROVIČ, František - PUCHEROVÁ, Zuzana - ŠATALOVÁ, Barbora - ŠTEFUNKOVÁ, Dagmar - ŤAŽKÝ, Jozef - VLACHOVIČOVÁ, Miriam - ZEMKO, Martin. *Atlas archetypov krajiny Slovenska* [Atlas of Landscape Archetypes in Slovakia]. Nitra : Univerzita Konštantína Filozofa v Nitre, 2015. 114 s. Prírodovedec, 625. ISBN 978-80-558-0931-1.

2.1.5. List of other scientific outputs specifically important for the institute, max. 10 items

- [1] DIRNBOCK, Thomas - BEZÁK, Peter - DULLINGER, Stefan - HABERL, Helmut - LOTZE-CAMPEN, Hermann - MIRTL, Michael - PETERSEIL, Johannes - REDPATH, Steve - SINGH, Simron Jit - TRAVIS, Justin - WIJDEVEN, Sander. Critical scales for long-term socio-ecological biodiversity research. In Long term socio-ecological research : Studies in society-nature interactions across spatial and temporal scales. - Dordrecht : Springer, 2013, p. 123-139. ISBN 978-94-007-1176-1 print.
- [2] JAMNICKÁ, Gabriela - PETRÁŠOVÁ, Viera - PETRÁŠ, Rudolf - MECKO, Julian - OSZLÁNYI, Július. Energy production of poplar clones and their energy use efficiency. In iFOREST - Biogeosciences and Forestry, 2014, vol. 7, p. 150-155. (1.150 - IF2013). (2014 - Current Contents). ISSN 1971-7458. Available online: <www.sisef.it/iforest>.
- [3] DICK, Jan - AL-ASSAF, Amani - ANDREWS, Chris - DÍAZ-DELGADO, Ricardo - GRONER, Elli - HALADA, Ľuboš - IZAKOVIČOVÁ, Zita - KERTÉSZ, Miklós - KHOURY, Fares - KRASIĆ, Dušanka - KRAUZE, Kinga - MATTEUCCI, Giorgio - MELECIS, Viesturs - MIRTL, Michael - ORENSTEIN, Daniel E. - PREDA, Elena - SANTOS-REIS, Margarida - SMITH, Rognvald I. - VADINEANU, Angheluta - VESELIĆ, Sanja - VIHVERAARA, Petteri. Ecosystem services: a rapid assessment method tested at 35 sites of the LTER-Europe network. In Ekológia (Bratislava) : international journal for ecological problems of the biosphere, 2014, vol. 33, no. 3, p. 217-231. (2014 - Agricola, Celdes, CNKI Scholar, CNPIEC, Ebsco, Scopus, GeoRef, Google Scholar, J-Gate, Naviga, Primo Central, SCImago, Summon, TDOne, WorldCat). ISSN 1335-342X.

- [4] IZAKOVIČOVÁ, Zita. Integrated landscape management: Basic tool for successful implementation of sustainable development in real practice. In Sustainability Assessment : method, practice and emerging socio-cultural issues for sustainable development. - Saarbrücken : Südwestdeutscher Verlag für Hochschulschriften, 2012, p. 4-13. ISBN 978-3-8381-3242-6.
- [5] IZAKOVIČOVÁ, Zita - OSZLÁNYI, Július. The landscape of Slovakia, its nature and transformations. In Lost landscapes : Reflections from Central European Border Regions. - Murska Sobota : Regional Development Agency Mura Ltd., 2012, p. 115-131. ISBN 978-961-93442-1-7.
- [6] ANGELSTAM, Per - ELBAKIDZE, Marine - AXELSSON, Robert - ČUPA, Peter - HALADA, Ľuboš - MOLNÁR, Zsolt - PATRU-STUPARIU, Ileana - PERZANOWSKI, Kajetan - ROZULOWICZ, Laurentiu - STANDOVÁR, Tibor - SVOBODA, Miroslav - TÖRNBLOM, Johan. Maintaining cultural and natural biodiversity in the Carpathian Mountain ecoregion: Need for and integrated landscape approach. In The Carpathians: Integrating nature and society towards sustainability. - Berlin : Springer, 2013, p. 393-424. ISBN 978-3-642-12724-3.
- [7] HARMENS, Harry - ILYIN, Ilia - MILLS, Gina - ABOAL, Jesus R. - ALBER, Renate - BLUM, Oleg - COŞKUN, Mahmut - DE TEMMERMAN, Ludwig - FERNÁNDEZ, Ignazio González - FIGUEIRA, Rui - FRONTASYEVA, Marina V. - GODZIK, Barbara - GOLTSOVA, Natasha - JERAN, Zvonka - KORZEKWA, Szymon - KUBIN, Eero - KVIETKUS, Kestutis - LEBLOND, Sébastien - LIIV, Siiri - MAGNÚSSON, Sigurður H. - MAŇKOVSKÁ, Blanka - NIKODEMUS, Olgerts - PESCH, Roland - POIKOLAINEN, Jarmo - RADNOVIĆ, Dragan - RÜHLING, Ake - SANTAMARIA, Jesús Miguel - SCHRÖDER, Winfried - SPIRIC, Zdenko - STAFILOV, Trajče - STEINNES, Eiliv - SUCHARA, Ivan - TABORS, Gavin - THÖNI, Lotti - TURCSÁNYI, Gabor - YURUKOVA, Lilyana - ZECHMEISTER, Harald G. Country-specific correlations across Europe between modelled atmospheric cadmium and lead deposition and concentrations in mosses. In Environmental Pollution, 2012, vol. 166, p. 1-9. (3.746 - IF2011). (2012 - Current Contents). ISSN 0269-7491.
- [8] LICHNER, Ľubomír - CAPULIAK, J. - ZHUKOVA, Natalia - HOLKO, Ladislav - CZACHOR, Henryk - KOLLÁR, Jozef. Pines influence hydrophysical parameters and water flow in a sandy soil. Spoluatori J. Capuliak, N. Zhukova, L. Holko, H. Czachor, J. Kollár. In Biologia : journal of the Slovak Academy of Sciences, 2013, vol. 68, no. 6, p. 1104-1108. (0.506 - IF2012). (2013 - Current Contents). ISSN 0006-3088.
- [9] IZAKOVIČOVÁ, Zita - OSZLÁNYI, Július. The impact of stress factors, landscape loads and human activities: implications for sustainable development. In International Journal of Environment and Waste Management, 2013, vol. 11, no. 2, p. 111-128. (2013 – SCOPUS) ISSN 1478-9876 print.
- [10] ŠTEFUNKOVÁ, Dagmar - ŠPULEROVÁ, Jana - DOBROVODSKÁ, Marta - MOJSES, Matej - PETROVIČ, František. Traditional agricultural landscapes - a model of detailed land use mapping. In Tájökológiai Lapok, 2013, vol. 11, no. 1, p. 1-21 (2013 – SCOPUS). ISSN 1589-4673.

2.1.6. List of patents, patent applications, and other intellectual property rights registered abroad, incl. revenues

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2.1.7. List of patents, patent applications, and other intellectual property rights registered in Slovakia, incl. revenues

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2.1.8. Table of research outputs (as in annual reports).

Papers from international collaborations in large-scale scientific projects (Dwarf team, ALICE Collaboration, ATLAS collaboration, CD Collaboration, H1 Collaboration, HADES Collaboration, and STAR Collaboration) have to be listed separately.

Scientific publications	2012			2013			2014			2015			total			
	number	No. / FTE	No. / salary budget	number	No. / FTE	No. / salary budget	number	No. / FTE	No. / salary budget	number	No. / FTE	No. / salary budget	number	averaged number per year	av. No. / FTE	av. No. / salary budget
Scientific monographs and monographic studies in journals and proceedings published abroad (AAA, ABA)	0,0	0,000	0,000	1,0	0,025	0,002	0,0	0,000	0,000	0,0	0,000	0,000	1,0	0,3	0,006	0,001
Scientific monographs and monographic studies in journals and proceedings published in Slovakia (AAB, ABB)	2,0	0,049	0,005	0,0	0,000	0,000	4,0	0,103	0,010	1,0	0,026	0,002	7,0	1,8	0,044	0,004
Chapters in scientific monographs published abroad (ABC)	1,0	0,025	0,002	7,0	0,174	0,017	2,0	0,051	0,005	1,0	0,026	0,002	11,0	2,8	0,069	0,007
Chapters in scientific monographs published in Slovakia (ABD)	2,0	0,049	0,005	0,0	0,000	0,000	3,0	0,077	0,008	0,0	0,000	0,000	5,0	1,3	0,032	0,003
Scientific papers published in journals registered in Current Contents Connect (ADCA, ADCB, ADDA, ADEB)	8,0	0,197	0,020	9,0	0,223	0,022	9,0	0,231	0,023	10,0	0,259	0,024	36,0	9,0	0,227	0,022
Scientific papers published in journals registered in Web of Science Core Collection and SCOPUS (ADMA, ADMB, ADNA, ADNB)	5,0	0,123	0,012	9,0	0,223	0,022	6,0	0,154	0,015	5,0	0,130	0,012	25,0	6,3	0,158	0,016
Scientific papers published in other foreign journals (not listed above) (ADEA, ADEB)	2,0	0,049	0,005	5,0	0,124	0,012	3,0	0,077	0,008	1,0	0,026	0,002	11,0	2,8	0,069	0,007
Scientific papers published in other domestic journals (not listed above) (ADFA, ADFB)	25,0	0,616	0,062	28,0	0,695	0,070	34,0	0,872	0,087	15,0	0,389	0,037	102,0	25,5	0,644	0,064
Scientific papers published in foreign peer-reviewed proceedings (AEC, AECA)	10,0	0,246	0,025	6,0	0,149	0,015	5,0	0,128	0,013	3,0	0,078	0,007	24,0	6,0	0,151	0,015
Scientific papers published in domestic peer-reviewed proceedings (AED, AEDA)	5,0	0,123	0,012	17,0	0,422	0,042	4,0	0,103	0,010	11,0	0,285	0,027	37,0	9,3	0,233	0,023
Published papers (full text) from foreign and international scientific conferences (AFA, AFC, AFBA, AFDA)	1,0	0,025	0,002	4,0	0,099	0,010	8,0	0,205	0,020	0,0	0,000	0,000	13,0	3,3	0,082	0,008
Published papers (full text) from domestic scientific conferences (AFB, AFD, AFBB, AFDB)	1,0	0,025	0,002	1,0	0,025	0,002	3,0	0,077	0,008	0,0	0,000	0,000	5,0	1,3	0,032	0,003

2.2. Responses to the research outputs (citations, etc.)

2.2.1. Table with citations per annum.

Citations of papers from international collaborations in large-scale scientific projects (Dwarf team, ALICE Collaboration, ATLAS collaboration, CD Collaboration, H1 Collaboration, HADES Collaboration, and STAR Collaboration) have to be listed separately.

Citations, reviews	2011		2012		2013		2014		total		
	number	No. / FTE	number	No. / FTE	number	No. / FTE	number	No. / FTE	number	averaged number per year	av. No. / FTE
Citations in Web of Science Core Collection (1.1, 2.1)	85,0	2,094	191,0	4,739	257,0	6,590	409,0	10,596	942,0	235,5	5,943
Citations in SCOPUS (1.2, 2.2) if not listed above	83,0	2,044	80,0	1,985	106,0	2,718	90,0	2,332	359,0	89,8	2,265
Citations in other citation indexes and databases (not listed above) (3.2,4.2,9,10)	4,0	0,099	5,0	0,124	1,0	0,026	0,0	0,000	10,0	2,5	0,063
Other citations (not listed above) (3, 4, 3.1, 4.1)	360,0	8,867	274,0	6,799	294,0	7,538	184,0	4,767	1112,0	278,0	7,016
Reviews (5,6)	0,0	0,000	0,0	0,000	0,0	0,000	0,0	0,000	0,0	0,0	0,000

2.2.2. List of 10 most-cited publications, with number of citations, in the assessment period (2011 – 2014).

- [1] PAILLET, Yoan - BERGÉS, Laurent - HJÄLTÉN, Joakim - ÓDOR, Péter - AVON, Catherine - BERNHARDT-RÖRMERMANN, Markus - BIJLSMA, Rienk-Jan - BRUYN, Luc de - FUHR, Marc - GRANDIN, Ulf - KANKA, Róbert - LUNDIN, Lars - LUQUE, Sandra - MAGURA, Tibor - MATESANZ, Silvia - MÉSZÁROS, Ilona - SEBASTIA, M. Teresa - SCHMIDT, Wolfgang - STANDOVÁR, Tibor - TÓTHMÉRÉSZ, Béla - UOTILA, Anneli - VALLADARES, Fernando - VELLAK, Kai - VIRTANEN, Risto. Biodiversity differences between managed and unmanaged forests: meta-analysis of species richness in Europe. In *Conservation Biology*, 2010, vol. 24, iss. 1, p. 101-112. (4.666 - IF2009). (2010 - Current Contents). ISSN 0888-8892.
- Category: scientific papers published in journals registered in Current Contents Connect (ADCA, ADCB, ADDA, ADDB)
- Citations: 114 (registered in WEB OF SCIENCE CORE COLLECTION or SCOPUS)
- [2] GOTTFRIED, Michael - PAULI, Harald - FUTSCHIK, Andreas - AKHALKATSI, Maia - BARANČOK, Peter - ALONSO, José Luis Benito - COLDEA, Gheorghe - DICK, Jan - ERSCHBAMER, Brigitta - CALZADO, María Rosa Fernández - KAZAKIS, George - KRAJČÍ, Ján - LARSSON, Per - MALLAUN, Martin - MICHELSEN, Ottar - MOISEEV, Dmitry - MOISEEV, Pavel - MOLAU, Ulf - MERZOUKI, Abderrahmane - NAGY, Laszlo - NAKHUTSRISHVILI, George - PEDERSEN, Bard - PELINO, Giovanni - PUSCAS, Mihai - ROSSI, Graziano - STANISCI, Angela - THEURILLAT, Jean-Paul - TOMASELLI, Marcello - VILLAR, Luis - VITTOZ, Pascal - VOGIATZAKIS, Ioannis - GRABHERR, Georg. Continent-wide response of mountain vegetation to climate change. In *Nature climate change* [elektronický zdroj], 2012, no. 2, p. 1-31. (2012 - Current Contents Connect). ISSN 1758-678X.
- Category: scientific papers published in journals registered in Current Contents Connect (ADCA, ADCB, ADDA, ADDB)
- Citations: 107 (registered in WEB OF SCIENCE CORE COLLECTION or SCOPUS)
- [3] PAULI, Harald - GOTTFRIED, Michael - DULLINGER, Stefan - ABDALADZE, Otari - AKHALKATSI, Maia - ALONSO, José Luis Benito - COLDEA, Gheorghe - DICK, Jan - ERSCHBAMER, Brigitta - CALZADO, María Rosa Fernández - GHOSN, Dany - HOLTEN, Jarle I. - KANKA, Róbert - KAZAKIS, George - KOLLÁR, Jozef - LARSSON, Per - MOISEEV, Pavel - MOISEEV, Dmitry - MOLAU, Ulf - MESA, Joaquín Molero - NAGY, Laszlo - PELINO, Giovanni - PUSCAS, Mihai - ROSSI, Graziano - STANISCI, Angela - SYVERHUSET, Anne O. - THEURILLAT, Jean-Paul - TOMASELLI, Marcello - UNTERLUGGAUER, Peter - VILLAR, Luis - VITTOZ, Pascal - GRABHERR, Georg. Recent plant diversity changes on Europe's mountain summits. In *Science*, 2012, vol. 336, p. 353-355. (31.201 - IF2011). (2012 - Current Contents). ISSN 0036-8075.
- Category: scientific papers published in journals registered in Current Contents Connect (ADCA, ADCB, ADDA, ADDB)
- Citations: 93 (registered in WEB OF SCIENCE CORE COLLECTION or SCOPUS)
- [4] BOWMAN, William D. - CLEVELAND, Cory C. - HALADA, Ľuboš - HREŠKO, Juraj - BARON, Jill S. Negative impact of nitrogen deposition on soil buffering capacity. In *Nature geoscience*, 2008, vol. 1, no. 11, p. 767-770. ISSN 1752-0894.

Category: scientific papers published in other foreign journals (not listed above)
ADEA, ADEB

Citations: 45, registered in WEB OF SCIENCE CORE COLLECTION or SCOPUS

- [5] HARMENS, H. - NORRIS, David A. - STEINNES, Eiliv - KUBIN, Eero - PIISPANEN, Juha - ALBER, Renate - ALEKSIAYENAK, Y. V. - BLUM, Oleg - COŞKUN, Mahmut - DAM, M. - DE TEMMERMAN, Ludwig - FERNÁNDEZ, J. A. - FROLOVA, Marina - FRONTASYEVA, M. - GONZÁLEZ-MIQUEO, Laura - GRODZINSKA, K. - JERAN, Zvonka - KORZEKWA, Szymon - KRMAR, M. - KVIETKUS, Kestutis - LEBLOND, Sébastien - LIIV, Siiri - MAGNÚSSON, S. H. - MAŇKOVSKÁ, Blanka - PESCH, Roland - RÜHLING, Ake - SANTAMARIA, J. M. - SCHRÖDER, Winfried - SPIRIC, Zdenko - SUCHARA, I. - THÖNI, Lotti - URUMOV, V. - YURUKOVA, Lilyana - ZECHMEISTER, Harald G. Mosses as biomonitors of atmospheric heavy metal deposition: Spatial patterns and temporal trends in Europe. In *Environmental Pollution*, 2010, vol. 158, no. 10, p. 3144-3156. (3.426 - IF2009). (2010 - Current Contents). ISSN 0269-7491.

Category: scientific papers published in journals registered in Current Contents Connect (ADCA, ADCB, ADDA, ADDB)

Citations: 44 (registered in WEB OF SCIENCE CORE COLLECTION or SCOPUS)

- [6] MEDVECKÁ, Jana - KLIMENT, Ján - MÁJEKOVÁ, Jana - HALADA, Ľuboš - ZALIBEROVÁ, Mária - GOJDIČOVÁ, Ema - FERÁKOVÁ, Viera - JAROLÍMEK, Ivan. Inventory of the alien flora of Slovakia = Přehled nepůvodní flóry Slovenska. In *Preslia : časopis České botanické společnosti*, 2012, vol. 84, no. 2, p. 257-309. (2.521 - IF2011). (2012 - Current Contents). ISSN 0032-7786.

Category: scientific papers published in journals registered in Current Contents Connect (ADCA, ADCB, ADDA, ADDB)

Citations: 43 (registered in WEB OF SCIENCE CORE COLLECTION or SCOPUS and in domestic publications)

- [7] *Atlas krajiny Slovenskej republiky* = Landscape Atlas of the Slovak Republic. Hlavná redaktorka: Tatiana Hrnčiarová. Bratislava : Ministerstvo životného prostredia SR ; Banská Bystrica : Slovenská agentúra životného prostredia, 2002. 342 s. ISBN 80-88833-27-2.

Category: scientific monographs and monographic studies in journals and proceedings published in Slovakia (AAB, ABB)

Citations: 41 (in domestic and foreign publications)

- [8] SOLIVA, Reto - RONNINGEN, Katrina - BELLA, Ioanna - BEZÁK, Peter - COOPER, Tamsin - FLO, Bjorn Egil - PASCAL, P. - POTTER, Clive. Envisioning upland futures: stakeholder responses to scenarios for Europe's mountain landscapes. In *Journal of Rural Studies*, 2008, vol. 24, no. 1, p. 56-71. (1.470 - IF2007). (2008 - Current Contents). ISSN 0743-0167.

Category: scientific papers published in journals registered in Current Contents Connect (ADCA, ADCB, ADDA, ADDB)

Citations: 41 (registered in WEB OF SCIENCE CORE COLLECTION or SCOPUS)

- [9] KARNOSKY, D.F. - ZAK, D.R. - PREGITZER, K.S. - AWMACK, C.S. - BOCKHEIM, J.G. - DICKSON, R.E. - HENDREY, G.R. - HOST, G.E. - KING, J.S. - KOPPER, B.J. - KRUGER, E.L. - KUBISKE, M. - LINDROTH, R.L. -

MATTSON, W.J. - MCDONALD, E.P. - NOORMETS, A. - OKSANEN, E. - PARSONS, W.F.J. - PERCY, K. - PODILA, G.K. - RIEMENSCHNEIDER, D.E. - SHARMA, P. - THAKUR, R. - SOBER, A. - SOBER, J. - JONES, W.S. - ANTONEN, S. - VAPAAVUORI, E. - MAŇKOVSKÁ, Blanka - HEILMAN, W. - ISEBRANDS, J.G. Tropospheric O₃ moderates responses of temperate hardwood forests to elevated CO₂: a synthesis of molecular to ecosystem results from the Aspen FACE project. In *Functional Ecology*, 2003, vol. 17, no. 2, p. 289-304. (2.417 – IF2002). (2003 – Current Contents). ISSN 0269-8463.

Category: scientific papers published in journals registered in Current Contents Connect (ADCA, ADCB, ADDA, ADDB)

Citations: 41 (registered in WEB OF SCIENCE CORE COLLECTION or SCOPUS)

- [10] BUNCE, R.H.G. - METZGER, M.J. - JONGMAN, R.H.G. - BRANDT, Jesper - DE BLUST, J. - ELENA ROSELLO, R. - GROOM, G.B. - HALADA, Ľuboš - HOFER, G. - HOWARD, D.C. - KOVÁŘ, P. - MÜCHER, C.A. - PADOA-SCHIOPPA, E. - PAELINX, D. - PALO, A. - PÉREZ-SOBA, Marta - RAMOS, I.L. - ROCHE, P. - SKANES, H. - WRBKA, T. A standardized procedure for surveillance and monitoring European habitats and provision of spatial data. In *Landscape Ecology*, 2008, vol. 23, p. 11-25. (2.610 - IF2007). (2008 - Current Contents). ISSN 0921-2973.

Category: scientific papers published in journals registered in Current Contents Connect (ADCA, ADCB, ADDA, ADDB)

Citations: 37 (registered in WEB OF SCIENCE CORE COLLECTION or SCOPUS)

2.2.3. List of most-cited authors from the Institute (at most 10 % of the research employees with university degree engaged in research projects) and their number of citations in the assessment period (2011– 2014).

- [1] RNDr. Róbert Kanka, PhD – 344 citations (251 - WEB OF SCIENCE CORE COLLECTION, 55 - SCOPUS)
- [2] RNDr. Ľuboš Halada, CSc. – 315 citations (191 - WEB OF SCIENCE CORE COLLECTION, 42 - SCOPUS)
- [3] RNDr. Peter Barančok, CSc. – 192 citations (111 – WOS, 31 – SCOPUS)

- **Supplementary information and/or comments on responses to the scientific output of the institute.**

The change of publication structure is related to the citation of our papers. While in 2011 we had only 85 citations in Web of Science, in 2014 it was up to 409 citations in Web of Science, which makes a 481% increase. Complex synthetic publications show high citation rating, and they present results of comprehensive landscape surveys comparing several countries or regions. Specifically, papers of this nature accounted for more than 100 citations in Web of Science and Scopus databases.

2.3. Research status of the institute in international and national contexts

- **International/European position of the institute**

2.3.1. List of the most important research activities demonstrating the international relevance of the research performed by the institute, incl. major projects (details of projects should be supplied under Indicator 2.4). Max. 10 items.

- [1] Recent plant diversity changes on Europe's mountain summits. Authors: R. Kanka, J. Kollár, 2012.

GLORIA, the Global Observation Research Initiative in Alpine Environments, aims to establish and maintain a monitoring network of research areas for long-term observation of mountain plants. Comparative analysis of data from 2001 and 2008 showed very interesting results, which were published in the journal Science (Kollár, Kanka In: Pauli et al, 2012^{chapter 2.1.2, No1}). The study provided vital information confirming that accelerating climate change is putting strong pressure on the flora of the mountain systems of Europe. The article includes the results of a detailed survey of 66 mountain peaks ranging from northern Europe to south of the Mediterranean Sea. In the last few years the GLORIA network has expanded on all continents and the number of regions with established research areas is over 100. Continued monitoring of the species examined in this study will have a major impact on the state of the knowledge of ongoing environmental impacts on the biodiversity of montane vegetation.

- [2] New results of and approaches to assessment of biodiversity and phylogenesis and monitoring of climate change in alpine zones across 5 continents. Author: R. Kanka, 2013.

In 2013, this research activity resulted in the preparation and publication of scientific papers which presented new, original results and new approaches to the assessment of biodiversity and phylogenesis as well as to the monitoring of climate change in the alpine zone on 5 continents. The study of Kanka in Butterfield et al. (2013^{chapter 2.1.2, No10}) presents analysis of the results obtained from research on 77 plant communities in alpine zone countries in Europe, Asia, North and South America and Oceania. The Slovak research site was located on the peak named "Hlúpy" in the Belian Tatras. The research was focused on assessment of phylogenetic diversity of higher plant taxa and its links with the so-called cushion plants, i.e. clonal plants such as *Silene acaulis* (L.) Jacq. *Minuartia sedoides* (L.) Hiern.

Long-term ecological research and monitoring is a fundamental pillar of obtaining high-quality, interpretable data which enables the detection, understanding and prediction of climate change. The global network ILTER coordinates long-term ecological research and monitoring, thus contributing to the understanding of changes in ecosystems, and their impact on and links to the socio-economic sphere. Detailed analysis of 107 publications in 211 countries, representing a significant body of long-term ecological research, revealed the need for standardized monitoring schemes and integrated prioritization of research (Kanka In: VIHervaara et al. 2013^{chapter 2.1.2, No 15}).

7RP ENV

- [3] European Biodiversity Observation Network: Design of an Integrated Biodiversity Observing System in Space and Time - EBONE. Investigator: L. Halada (ILE SAS), coordinator: Alterra, Netherland, duration: 2008 – 2012.

EBONE is a partnership of sixteen universities and research institutes in Europe, Israel and South Africa. The aim of the project FP7 EBONE was to design and build a fully integrated biodiversity monitoring system based on key biodiversity indicators and operating in a Europe-wide institutional framework. Within the project we focused on preparing the methods for habitat and landscape monitoring (Bunce et al. 2008^{chapter 2.2.2, No8, 2013 chapter 2.1.2, No12}), on linking field monitoring with remote sensing data, and on using the multitemporal remote sensing data for monitoring of the habitat types and their management. ILE SAS was responsible for the dissemination activities of the project and preparation of two research outputs: "Online publication of the field handbook and web publication of protocols for electronic data gathering", and "CD-ROM summarizing the principal results and the Institutional Framework".

- [4] Operationalisation of Natural Capital and EcoSystem Services: From Concepts to Real-world Applications (OpenNESS). Investigator: Z. Izakovičová, coordinator: SYKE, Finland, duration: 2013 – 2019.

OpenNESS aims to translate the concepts of Natural Capital (NC) and Ecosystem Services (ES) into operational frameworks that provide tested, practical and tailored solutions for integrating ES into land, water and urban management and decision-making. It examines how the concepts link to, and support, wider EU economic, social and environmental policy initiatives, as well as the potential and limitations of the concepts of ES and NC.

In the framework of this project, mapping of the ecosystems of the area was carried out, as well as mapping of habitats in the area of interest and assessment of their relevance. Additionally, a sociological survey was performed to assess the ecosystems and the significance of habitats from the point of view of "stakeholders". These results will be used for the application and testing of other methods developed in the framework of the project - Spreadsheet-type method, the Green Frame method, Bayesian belief networks, ESTIMAP, etc. The project involves 17 countries from Europe, Africa, Asia, and South America.

HORIZON 2020

- [5] INtegrated Spatial PlannIng, land use and soil management Research ActiON – INSPIRATION. Investigator: Z. Izakovičová, coordinator: Umweltbundesamt Germany, duration: 2015-2019

The Institute of Landscape Ecology participates in this project as an expert workplace carrying out landscape research. Investigators from ILE SAS focused on the analysis of the current state of the field of land management research and defining the needs for the next period. The project identified societal challenges and research needs related to land, especially with the land use and land protection. So far, they have evaluated various approaches to integrated land management, and the current strengths and weaknesses in this area have been identified. The main objective of the project is (1) to define proposals to improve the situation, and identification of research needs in integrated landscape management and (2) efficient use of natural resources so as to provide a basis for the specification of basic research topics under the Horizon 2020 strategy. The transfer of knowledge gained within the project contributes to the improvement of environmental policy and EU research in this area.

- [6] European Long-Term Ecosystem and Socio-Ecological Research Infrastructure – eLTER. Investigator: L. Halada, Coordinator: UMWELTBUNDESAMT GMBH (EAA), Austria, duration: 2015 – 2019.

The overall aim of the eLTER project is to develop the European network of Long-Term Ecosystem Research sites and socio-ecological research platforms

so as to provide the highest quality services with respect to the functions of a distributed research infrastructure. The envisaged “LTER Infrastructure” will enable European-scale investigation of major ecosystems and socio-ecological systems, and support knowledge-based decision making at multiple levels. The project involves 21 European countries. <http://www.lter-europe.net/projects/eLTER>.

MULTILATERAL AND BILATERAL PROJECTS

- [7] 200 years of land use and land cover changes and their driving forces in the Carpathian Basin. Investigator: J. Lieskovský, ILE SAS. Coordinator: University of Wisconsin-Madison, USA. Duration: 2012-2015.

The Carpathian region, together with the adjacent Pannonian Basin, experienced several major socio-economic transformations throughout the 19th and 20th centuries: World War I and the demise of the Austro-Hungarian Monarchy, World War II, the rise and fall of socialism, and the eastward expansion of the European Union. The importance of these events and processes and their impact on land cover change has been the subject of a project funded by the Land-Cover / Land Change Program of National Aeronautical and Space Agency (NASA). We mapped and analysed the land-cover data from historical maps (maps of the Austro-Hungarian Monarchy, interwar maps and Soviet topographical maps) and compared them with the LANDSAT satellite images. We also contributed data processing in verifying changes in forest cover evaluated by LANDSAT imagery, processing of socioeconomic statistics, and preparation of data for metaanalysis of local studies of landscape changes.

- [8] Development of an adaptive plant protection forecasting system in a collaboration of border viticultural areas for the purpose of increasing their competitiveness (FORECASTING SYST). Investigator: Z. Izakovičová, coordinator: Budapest University of Technology and Economics, HUSK 1101/121/0287, duration: 2007 - 2013.

ILE SAS, in cooperation with winegrowers, created a new forecasting system for the protection of vines, which models the spread of diseases and pests. Application of the model will contribute to the improvement of management in vineyards, by (1) reducing the need to use chemical means of vine protection, and (2) increasing the fertility of the vineyards without harming the environment. It is estimated that the knowledge provided by accurate forecasts can lead to savings of up to 30% on vine-protection measures.

2.3.2. List of international conferences (co)organised by the institute.

2015

- [1] Landscape and Landscape Ecology - 17th International Symposium on Landscape Ecology, Nitra, Slovakia, 2015, organised by ILE SAS (A. Bača)

2014

- [2] Biodiversity and land use of ecosystems in UNESCO Biosphere Reserves, Stará Lesná, Slovakia, 2014, co-organised by ILE SAS (J. Oszlányi)
- [3] Fourth Meeting of the Conference of the Parties to the Framework Convention on the Protection and Sustainable Development of the Carpathians (COP4), Mikulov, Czech Republic, 2014, co-organised by ILE SAS (L. Halada)

- [4] International Conference on Condition of the Arctic Seas and Coastal Areas in the Context of Climate Change, Archangelsk, Russia, 2014, co-organised by ILE SAS (Z. Izakovičová, M. Moyzeová, H. Kalivoda)
- [5] Forum Carpaticum 2014: “Local Response to Global Challenges”, L’viv, Ukraine, co-organised by ILE SAS (L. Halada)
- [6] Global Fair and Workshop on Long-Term Observing Systems of Mountain Social-Ecological Systems, Reno, USA, 2014, co-organised by ILE SAS (L. Halada)

2013

- [7] Collaborative research for the European Landscape Convention - symposium at IALE2013 congress, Manchester, United Kingdom, 2013, co-organised by ILE SAS, Manchester, United Kingdom, co-organised by ILE SAS (P. Bezák)
- [8] Landscape Accessibility - how to enter a world of mystery - session at PECSRL2014 conference, Göteborg, Sweden, 2013, co-organised by ILE SAS (P. Bezák)
- [9] Biodiversity of landscape versus landscape diversity - workshop at INTECOL 2013 Congress, London, United Kingdom, 2013, organised by ILE SAS (L. Halada, Z. Izakovičová)
- [10] Environmental Quality and Land use - International conference. Sučea, Romania, 2013, co-organised by ILE SAS (Z. Izakovičová)
- [11] communities“, Brockville (Ontario), Canada, 2013, co-organised by ILE SAS (J. Oszlányi)
- [12] Forest certification and protection from illegal logging - International and Russia aspect. St. Petersburg, Russia, 2013, co-organised by ILE SAS (Z. Izakovičová, J. Oszlányi)
- [13] Landscape and Imagination, Paris, France, 2013, co-organised by ILE SAS (J. Špulerová, P. Bezák)

2012

- [14] EuroEnviro 2012 - 8th European student symposium, Bratislava, Slovakia, 2012, co-organised by ILE SAS (M. Moyzeová, Z. Izakovičová)
- [15] 3rd European Congress of Conservation Biology; Symposium Alpine ecosystems: platforms for study and conservation of unique habitats and species living in the edge conditions, Glasgow, United Kingdom, 2012, co-organised by ILE SAS (R. Kanka, L. Halada)
- [16] ETC/BD management meeting, Nitra, Slovakia, 2012, organised by ILE SAS (P. Gajdoš)
- [17] Landscape Ecology: From Theory to Practice - 16th International Symposium on Landscape Ecology, Smolenice, Slovakia, 2012, organised by ILE SAS (P. Kenderessy)
- [18] Forum Carpaticum 2012, Stará Lesná, Slovakia, 2012, organised by ILE SAS (A. Bača)

2.3.3. List of edited proceedings from international scientific conferences.

- [1] Forum Carpaticum 2012: from Data to Knowledge, from Knowledge to Action: conference abstracts [e-source]. Editor Martin Boltižiar. Nitra: Institute of Landscape Ecology, Slovak Academy of Sciences, 2012. 214 p. Available online:

<http://uke.sav.sk/fc/fc_2012/Download/FC2012_Conference_Abstracts.pdf>. ISBN 978-80-968901-9-4 (Forum Carpaticum 2012).

- [2] Landscape Ecology: From theory to practice: the book of abstracts, Congress Centre Smolenice SAS, Slovak Republic, September 24 - 27, 2012. Editors Pavol Kenderessy, Miriam Vlachovičová. Bratislava: Institute of Landscape Ecology SAS, 2012. 44 p.
- [3] BOLTÍŽIAR, Martin - BAČA, Andrej (Eds). Landscape and Landscape Ecology: symposium abstracts. Nitra: Institute of Landscape Ecology Slovak Academy of Sciences, 2015. 102 p. Available online: <www.uke.sav.sk>. ISBN 978-80-89325-27-6 (Landscape and Landscape Ecology).

2.3.4. List of journals edited/published by the institute:

2.3.4.1. WOS (IF of journals in each year of the assessment period)

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2.3.4.2. SCOPUS

- [1] Ekológia (Bratislava)

2.3.4.3. other databases

-

2.3.4.4. not included in databases

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- **National position of the institute**

2.3.5. List of selected projects of national importance

APVV

- [1] Atlas of Landscape Archetypes of the Slovakia. Partner: Z. Izakovičová, coordinator: Department of Ecology and Environmental Sciences, Faculty of Natural Sciences, Constantin the Philosopher University, Nitra, duration: 2011 - 2014

The archetypes of the landscape represent long-term shaping historical landscape structures, which are the result of historical changes and the socio-economic conditions and natural factors of the environment. The basic output of the project was the monography "Atlas of landscape archetypes of the Slovakia landscape" chapter 2.1.4, No 22, which presents a unique territories, identified as examples of archetypes in the conditions of the lowland and mountain areas.

- [2] Evaluation of ecosystem functions and services of the cultural landscape. Coordinator: R. Kanka (ILE SAS), partner: Faculty of Natural Sciences, Comenius University in Bratislava, duration: 2013 - 2017,
Main partial results: R. Kanka In: Schindler et al., 2014: Multifunctionality of floodplain landscapes: relating management options to ecosystem services. In Landscape Ecology chapter 2.1.2, No 18, Bezák and Bezáková, 2014: Landscape capacity for ecosystem services provision based on expert knowledge and public perception (case study from the northwest Slovakia). In Ekológia (Bratislava).

VEGA

- [3] Identification of purposive landscape features as the basis of landscape ecological research. Coordinator: T. Hrnčiarová, duration: 2011-2014
One of the important benefits of the project was the evaluation of the impact of erosion processes on various forms of soil exploitation and cultivation in the vineyards by the use of an upgraded micronivelisation method (Lieskovský and Kenderessy, 2014^{chapter 2.1.2, No 6}).
- [4] Socio-ecological research of landscape and biodiversity change in mountain area of the NP Poloniny in context of global changes. Coordinator: P. Bezák, duration: 2011-2014
An important output of the project was to stress the high biological value of nonforest habitats in the area. It was also proven that the specific management of agricultural areas with financial incentives for the users is important not only for preserving biodiversity, but also for integrated landscape protection and for the sustainable development of the region (Bezák, Mitchley 2014^{chapter 2.1.2, No 3}).
- [5] Diversity of the agricultural landscape and its ecosystem services. Coordinator: J. Špulerová, duration: 2014 – 2017
Main partial results: Špulerová et al.: Orchards as traces of traditional agricultural landscape in Slovakia. In Agriculture, Ecosystems and Environment, 2015^{chapter 2.1.2, No 5}
- [6] Phytoindication of soil properties of Western Carpathian forest ecosystems and modelling of plant indication values. Coordinator: J. Kollár, duration: 2012-2014
Main results: Balkovič, Kollár et al.: Plant assemblages respond sensitively to aluminium solubility in acid soils. In Community Ecology, 2014^{chapter 2.1.2, No 25}
- [7] Current utilization of high mountain landscape and its impacts on environmental change, and assessment of carrying capacity of selected national parks of Slovakia. Coordinator: V. Piscová, duration: 2013-2016
Main partial results: Kanka In. VIHervaara et al.: Using long-term ecosystem service and biodiversity data to study the impacts and adaptation options in response to climate change: insights from the globalILTER sites network. In Current Opinion in Environmental Sustainability, 2013,^{chapter 2.1.2, No 15}
- [8] Significance and ecosystem services of historical structures of agricultural landscapes. Coordinator: J. Špulerová, duration: 2011-2013
Main results: LIESKOVSKÝ et al.: Driving forces behind vineyard abandonment in Slovakia following the move to a market-oriented economy. In Land Use Policy, 2013^{chapter 2.1.2, No 2}

2.3.6. Projects of the Slovak Research and Development Agency (APVV)

- [1] New possibilities of use of drainage canal systems with taking into account the protection and use of a landscape. Investigator: H. Kalivoda, coordinator: Water Research Institute, Bratislava, Slovakia, duration: 2015-2019, grant number: APVV-14-0735
- [2] Evaluation of ecosystem functions and services of the cultural landscape. Coordinator: R. Kanka (ILE SAS), partner: Faculty of Natural Sciences of the

Comenius University, Bratislava, Slovakia, duration: 2013-2017, grant number: APVV-0866-12

- [3] Atlas of Landscape Archetypes of the Slovakia. Investigator: Z. Izakovičová (ILE SAS coordinator: Faculty of Natural Sciences of the Constantin the Philosopher University, Nitra), duration: 2012-2015, grant number: APVV-0669-11
- [4] Analyses of soil properties and landscape development for non-regularly overflowed areas. Investigator: M. Boltižiar, coordinator: Plant Production Research Centre Piešťany, duration: 2012-2015, grant number: APVV-0163-11
- [5] Contamination of mining country by toxic elements at selected Cu- deposits and possibilities of its remediation. Investigator: B. Maňková, coordinator: Faculty of Natural Sciences, Matej Bel University, Banská Bystrica, Slovakia, duration: 2011 -2014, grant number: APVV-0663-10

2.3.7. Projects of the Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA)

- [1] Socio-ecological research of landscape and biodiversity change in mountain area of the NP Poloniny in context of global changes. Coordinator: P. Bezák (ILE SAS), duration: 2011-2014, grant number: 2/0184/11
- [2] Functioning of lowland forest ecosystem under pressure of global environmental changes - the Báb Research Site. Coordinator: P. Gajdoš (ILE SAS), duration: 2010 - 2012, grant number: 2/0174/10
- [3] Effect of experimental warming and nitrogen deposition on sensitive alpine meadow ecosystem. Coordinator: A. Halabuk (ILE SAS), duration: 2009 - 2012, grant number: 02/0217/09
- [4] Identification of purposive landscape features as the basis of landscape ecological research. Coordinator: T. Hrnčiarová (ILE SAS), duration: 2010 – 2012, grant number: 2/0114/10
- [5] Phytoindication of soil properties of Western Carpathian forest ecosystems and modelling of plant indication values. Coordinator: J. Kollár (ILE SAS), duration: 2012 – 2014, Grant number: 2/0073/12
- [6] Forest vegetation and changes in soil properties on the former agricultural land. Coordinator: J. Kollár (ILE SAS), duration: 2015 – 2017, grant number: 2/0016/15
- [7] Diversity of agricultural landscape and its ecosystem services. Coordinator: J. Špulerová (ILE SAS), duration: 2014 – 2017, grant number: 2/0158/14
- [8] Spatial and temporal trends in the 25-year accumulation of heavy metals in mosses in Slovakia. Coordinator: B. Maňková, duration: 2010 - 2012, grant number: 2/1027/10
- [9] Evaluation of environmental quality of rural settlements. Coordinator: M. Moyzeová (ILE SAS), duration: 2012 – 2014, grant number: 2/0120/12
- [10] Significance and ecosystem services of historical structures of agricultural landscapes. Coordinator: J. Špulerová (ILE SAS), duration: 2011 – 2013, grant number: 2/0051/11

2.3.8. Projects of SAS Centres of Excellence

- [1] Castles in Slovakia. Investigator: Z. Izakovičová, coordinator: J. Lukačka (Historical Institute of SAS), duration: 2013 – 2017, grant number: Uznesenie PSAV č. 110 z 03.10.2013

2.3.9. National projects supported by EU Structural Funds

- [1] Research, development and application of advanced methods of geoinformatics, remote sensing and methods of parallel computation based on advanced hardware and software instruments. Coordinator: Andrej Halabuk, duration: 2010 – 2014, grant number: 26220220071
- [2] Renovation and construction of technical infrastructure for research and development of the Institute of Landscape Ecology of the Slovak Academy of Sciences. Coordinator: Matej Mojses, duration: 2012 - 2014, grant number: 26210120007
- [3] Construction of "Center for Applied Remote Sensing of the Earth". Coordinator: Matej Mojses, duration: 2015 – 2015, grant number: 26210120045

2.3.10. List of journals (published only in the Slovak language) edited/published by the institute:

2.3.10.1. WOS (IF of journals in each year of the assessment period)

2.3.10.2. SCOPUS

2.3.10.3. Other databases

2.3.10.4. Not included in databases

- [1] *Ekologické štúdie* (Ecological studies)
- [2] *Životné prostredie: revue pre teóriu a starostlivosť o životné prostredie* (The Environment : revue for theory and care of the environment)

• Position of individual researchers in an international context

2.3.11. List of invited/keynote presentations at international conferences, as documented by programme or invitation letter

- [1] HRNČIAROVÁ, T. *Atlas krajiny Slovenskej republiky. 6. kartografický den, seminár o moderním pojetí tematického mapování v geovědních oborech se zaměřením na Kartografie a Krajina* (Landscape Atlas of the Slovak Republic, 6. Cartographic day, seminar on modern concept of thematic mapping geoscientific fields, focusing on Cartography and landscape, Palacký University Olomouc, Czech Republic), ČGS, KS ČR, ČAGI, KGI PříF Univerzity Palackého v Olomouci, Česká Republika, 24 Feb 2012.
- [2] KANKA, R. Alpine habitats in Slovak Carpathians – A platform for study of unique ecosystems exposed to natural and human induced pressures. 3rd European Congress of Conservation Biology, Glasgow, United Kingdom, 28 Aug – 1 Sept 2012.
- [3] OSZLÁNYI, J. – IZAKOVIČOVÁ, Z. Integrated landscape management of the Ipeľ river basin. Interdisciplinarity in Geoscience in the Carpathian Basin. Stefan cel Mare University of Suceava. Suceava, Romania, 17 – 21 Oct 2012.

- [4] OSZLÁNYI, J. Institute of Landscape Ecology of the Slovak Academy of Sciences. Ecology and Geological Changes in Northern Environment. Archangelsk, Russian Federation, 24 – 28 Sept 2012.
- [5] OSZLÁNYI, J. Science in Service of Environment protection in the Western Carpathians. Ecology and Geological Changes in Northern Environment. Archangelsk, Russian Federation, 24 – 28 Sept 2012.
- [6] MOYZEOVÁ, M. The creation of TSES model elements in the village of Suchá nad Parnou. EuroEnviro2012 – Conservation is not Isolation. Suchá nad Parnou, Slovakia, 22 May 2012.
- [7] ŠTEFUNKOVÁ, D. – KANKA, R. et al. Historical vineyard landscape of Small Carpathians Mts. - results of current research. EuroEnviro2012 – Conservation is not Isolation. Modra, Slovakia, 21 May 2012.
- [8] MOYZEOVÁ, M. – IZAKOVIČOVÁ ZITA. The creation of TSES model elements in the village of Suchá nad Parnou. EuroEnviro2012 – Conservation is not Isolation. Suchá nad Parnou, Slovakia, 22 May 2012.
- [9] HALABUK, A. Monitoring of grassland management practices by using multitemporal classification of Landsat & Modis. SCERIN 1 – meeting: Monitoring Land Cover Changes & Forest Condition, Praha, Czech Republic, 17 – 19 June 2013.
- [10] HALADA, Ľ. – LIESKOVSKÝ, J. – BEZÁK, P. Conservation of changed landscape in Slovakia. East meets West: Transferring conservation approaches between Eastern and Western European landscapes, Göttingen, Germany, 13 – 15 Feb 2013.
- [11] HALADA, Ľ. Effects of land cover/land use changes on ecosystem services and climate. FORECOM – Forest cover changes in mountainous regions – drivers, trajectories and implications – conference, Krakow, Poland, 6 – 8 March 2013.
- [12] HALADA, Ľ. – PROTS, B. Science in nature conservation in the Carpathians: the role of S4C. 2-nd conference of the Carpathian Network of Protected Areas, Tatranská Javorina, Slovakia, 23 – 26 Apr 2013.
- [13] HALADA, Ľ. – OSZLÁNYI, J. Studying the biodiversity of changing landscapes. Symposium „Biodiversity change and conservation planning: past and future”, Wageningen, Netherlands, 4 Jul 2013.
- [14] IZAKOVIČOVÁ, Z. Environmental load of the Slovak landscape. International Conference on Pollution and Treatment Technology, Sanya, Hainan Island, China, 2 – 4 Jan 2013.
- [15] IZAKOVIČOVÁ, Z. The territorial system of ecological stability in planning practice in Slovakia. 2nd Scientific GreenNet Conference: How to push the implementation of the European Green Belt by landscape policy instruments? BOKU Wien, Austria, 19 – 20 Feb 2013.
- [16] KANKA, R. – HALADA, Ľ. – HALABUK, A. Some selected results from the long-term ecosystem research in the alpine belt of Slovakia. ALTER-Net Conference 2013 – Science underpinning the EU 2020 Biodiversity Strategy, Ghent, Belgium, 15 – 18 Apr 2013.
- [17] KANKA, R. Climate change monitoring in the alpine belt of the Carpathians - the Slovak GLORIA summits. Conference Faster, Higher, More? – Past, Present and Future Dynamics of Alpine and Arctic Flora under Climate Change, Kurhaus Bergün, Switzerland, 22 – 25 Sept 2013,
- [18] KANKA, R. Some results of research on diversity and functional traits of vascular plants on historical structures of agricultural landscape in south-west Slovakia, Krajinnookologický výskum historických prvkov agrárnej krajiny,

medzinárodná vedecká konferencia, Prírodovedecká fakulta UK, Bratislava, Slovakia, 14 Nov 2013.

- [19] OSZLÁNYI, J. To develop the knowledge society through research, education and information technologies, „Danube Parliamentarian Floating Conference“ Vienna – Bratislava, 22 May 2013.
- [20] SUCHARA, I. – SUCHAROVÁ, J. – MAŇKOVSKÁ, B. Usage of plant indicators for determining air pollution levels and long-range transport of air pollutants in the Visegrad area. International scientific conference – 2013' Visegrad Conference on Common Environmental Problems, The University of Economics in Prague, Czech Republic, 4 – 5 March 2013.
- [21] BEZÁK, P. – IZAKOVIČOVÁ, Z. – MOYZEOVÁ, M. – MEDERLY, P. – BEZÁKOVÁ, M.: Accessibility to natural capital and landscape services (local case studies). In Unraveling the logics of landscape : 26th session of the Permanent European Conference for the Study of the Rural Landscape. Editors Marie Stenseke...[et al.]. – Gothenburg: University of Gothenburg, p. 38-39. Available online: www.pecsrl2014.com, Sweden, 8 Sept 2014.
- [22] HALABUK, A.: Research infrastructure and capabilities for EO based forest, landscape and ecosystem research in Slovakia. Seminar: Current LCLUC challenges in SCERIN: Addressing Ecosystem Function and Processes. Krakow, Poland, 9 – 10 June 2014.
- [23] HALABUK, A.: Validation/verification network for support of current and future LCLUC products. Seminar: Current LCLUC challenges in SCERIN: Addressing Ecosystem Function and Processes. Krakow, Poland, 9 – 10 June 2014.
- [24] IZAKOVIČOVÁ, Z. – OSZLÁNYI, J. – PETRÁŠ, R.: Energy potential of over-ground forest biomass for sustainable environmental development of rural areas. International week. HORIZON 2020. European Brokerage event – Energy and Environment. Lille, France, 9 Oct. 2014.
- [25] KANKA, R. – BARANČOK, P. – KOLLÁR, J.: Some interesting results of the GLORIA project in Slovak Carpathians, Mountain Observatories - A Global Fair and Workshop on Social-Ecological Systems, University of Nevada, Reno, United States, 16 – 19 Jul 2014.
- [26] LIESKOVSKÝ, J. – PISCOVÁ, V.: Physical accessibility to landscape in relation to changes in land cover and landscape identity. Permanent European Conference on the Study of the Rural Landscape 2014, Goteborg, Mariestad, Sweden, 8 Sept 2014.
- [27] PISCOVÁ, V. – KANKA, R.: Experimental trampling as a useful tool for understanding of impacts of tourism in national parks. Mountain Observatories – A Global Fair And Workshop on Social-Ecological Systems, University of Nevada, Reno, United States, 16 – 19 Jul 2014.
- [28] HALADA, L. Good practices in management planning for Natura 2000 sites. – In: „Follow up event of the Natura 2000 seminar for the Pannonian, Black Sea and Steppic Regions“, Arad, Romania, 4 – 6 Nov 2015.
- [29] IZAKOVIČOVÁ, Z. – ŠPULEROVÁ, J. – ŠEDIVÁ, A. – ŠATALOVÁ, B. Geographic and landscape-ecological approach to the typology of landscape in Slovakia. Workshop of the Bulgarian Geography Society. IGG BAV Sofia, Sofia, Bulgaria, 12 May 2015.
- [30] IZAKOVIČOVÁ, Z. – MIKLÓS, L. – OSZLÁNYI, J. Sustainable development in the Slovakia. UNESCO workshop: Sustainability Science in Central and Eastern Europe, Warszawa, Poland,
- [31] 11– 12 Sept 2015.
- [32] KANKA, R. – PISCOVÁ, V. Change in species composition of vascular plants on selected alpine summits in Slovak Carpathians during the last 120 years –

the sUMMITDiv project. Perth III.: Mountains of Our Future Earth, International Conference, Perth, United Kingdom, 4 – 8 Oct 2015.

- [33] ŠPULEROVÁ, J. Diversity of traditional agricultural landscape in Slovakia. Landscape Archetypes – Lessons for the Future, Public Conference / IFLA Europe General Assembly, Lisbon, Portugal, 16 – 17 Oct 2015.

2.3.12. List of researchers who served as members of the organising and/or programme committees

- | | | |
|------|------------------|--|
| [1] | Babálová, M. | 1x organising committee |
| [2] | Bača, A. | 2x chair of organising committee |
| [3] | Bezák, P. | 2x organising committee, 3x programme committee) |
| [4] | Bolťiziar, M. | 2x organising committee |
| [5] | Borovská, J. | 2x organising committee |
| [6] | Gajdoš, P. | 1x programme committee, 3x organising committee |
| [7] | Gerháťová, K. | 1x organising committee |
| [8] | Halabuk, A. | 1x organising committee, |
| [9] | Halada, Ľ. | 1x chair of programme committee, 2x programme committee, 1x chair of organising committee, 2x organising committee |
| [10] | Hrnčiarová, T. | 1x programme committee |
| [11] | Izakovičová, Z. | 12 x programme committee, 5x organising committee, |
| [12] | Kanka, R. | 2x programme committee, 1x organising committee |
| [13] | Kenderessy, P. | 1x chair of organising committee |
| [14] | Krnáčová, Z. | 1x organising committee |
| [15] | Lieskovský, J. | 1x organising committee |
| [16] | Mojšes, M. | 1x organising committee |
| [17] | Moyzeová, M. | 3x programme committee, 1x organising committee |
| [18] | Oszlányi, J. | 4x programme committee, 2x organising committee |
| [19] | Piscová, V. | 1x organising committee |
| [20] | Ponecová, Z. | 1x organising committee |
| [21] | Šatalová, B. | 1x organising committee |
| [22] | Špulerová, J. | 2x organising committee, 1x programme committee |
| [23] | Štefunková, D. | 1x programme committee |
| [24] | Vlachovičová, M. | 1x organising committee |

- **Position of individual researchers in a national context**

2.3.13. List of invited/keynote presentations at national conferences, as documented by programme or invitation letter

- [1] IZAKOVIČOVÁ, Z.: *Hodnotenie ekosystémových služieb. Týždeň vedy a techniky* (Assessment of ecosystem services. Science and Technology Week). UKF Nitra, Slovakia, 10 Nov 2015.
- [2] IZAKOVIČOVÁ, Z.: *Rastúci tlak na ekosystémy. Valné zhromaždenie Slovenskej Poľnohospodárskej Akadémie* (Increasing pressure on ecosystems. The General Assembly Slovak Academy of Agriculture). Nitra, Slovakia, 2 Dec 2015.

- [3] IZAKOVIČOVÁ, Z. *Koncepcia trvalo udržateľného rozvoja v programe EÚ. Konferencia. Smolenická výzva V. – 20 rokov implementácie TUR.* (The concept of sustainable development in the EU agenda. Conference. Smolenice challenge V. - 20 years of implementation of sustainable development) Smolenice, Slovakia, 11– 12 Apr 2012.
- [4] IZAKOVIČOVÁ, Z. *Trvalo udržateľný rozvoj v SR. Konferencia. Smolenická výzva V. – 20 rokov implementácie TUR.* (Sustainable development in Slovakia. Conference. Smolenice challenge V. - 20 years of implementation of sustainable development. Smolenice) Smolenice, Slovakia, 11– 12 Apr 2012.
- [5] MOYZEOVÁ, M. – IZAKOVIČOVÁ, Z. *Učíme sa navzájom. 3. študentská konferencia Ekológia v regióne* (We are learning from each other. 3rd Ecology student conference in the region). Senica, Slovakia, 5 June 2012.
- [6] MOYZEOVÁ, M. *Krajina a jej trvalo udržateľný rozvoj. Smolenická výzva V. – 20 rokov implementácie TUR* (Landscape and its sustainable development. Smolenice challenge V. - 20 years of implementation of sustainable development). Smolenice, Slovakia, 11– 12 Apr 2012.
- [7] ŠTEFUNKOVÁ, D. a kol. *Ku vybraným metódam a výsledkom aktuálneho výskumu historickej vinohradníckej krajiny na príklade katastrálneho územia Svätý Jur. Konferencia projektu Vital Landscapes: Možnosti identifikácie, zachovania a ďalšieho využitia zvyškov kultúrnej krajiny v Malých Karpatoch a v príľahlej časti Podunajskej nížiny* (Towards selected methods and results of current research on historical wine-growing landscape (case study of Svätý Jur). The conference of the project Vital Landscapes: The possibilities of identification, preservation and further use of cultural landscape remnants in the Little Carpathians and the adjacent part of the Danube plain). Svätý Jur, Slovakia, 7 Nov 2012.
- [8] FERANEC, J. – KOPECKÁ, M. – HALABUK, A. – HALADA, Ľ. Activities of the Slovak Academy of Sciences in Remote Sensing, Slovak & Czech Horizon 2020, Space Information day, Bratislava, Slovakia, 13 Dec 2013.
- [9] IZAKOVIČOVÁ, Z. – MOYZEOVÁ, M. *Veda pre prax. Konferencia O životnom prostredí v Trnavskom samosprávnom kraji*, (Science for praxis. Conference: The Environment of the Trnava Self-governing region). Senica, Slovakia, 23 Apr 2013.
- [10] IZAKOVIČOVÁ, Z. *Ekologické siete Európy. Konferencia SAŽP SR* (Ecological networks of Europe. Conference of the Slovak Environmental Agency). Žilina, Slovakia, 9 Dec 2013.
- [11] IZAKOVIČOVÁ, Z. *Ekosystémové služby v riadiacich dokumentoch samosprávy. Konferencia: Vybrané aspekty integrovaného manažmentu životného prostredia* (Ecosystem services for governmental management documents. Conference: Selected aspects of integrated environmental management), Zvolen, Slovakia, 12 Sept 2013.
- [12] IZAKOVIČOVÁ, Z. *Výskum krajiny na Ústave krajinnej ekológie. Konferencia: Výskum krajiny. Fakulta prírodných vied Univerzity Mateja Bela Banská Bystrica, Inštitút výskumu krajiny a regiónov* (Landscape research in the Institute of Landscape Ecology. Conference: Landscape research. Faculty of Natural Sciences of Matej Bel University in Banská Bystrica, Research Institute of landscape and regions), Banská Bystrica, Slovakia, 29 May 2013.
- [13] OSZLÁNYI, J. *Stratégia Európskej únie pre Dunajský región* (The European Union Strategy for the Danube Region). Danube limes Brand Strategy Conference I., Bratislava, Slovakia, 17 Sept 2013.

- [14] OSZLÁNYI, J. *Vplyv vodného diela Gabčíkovo na životné prostredie* (The impact on the environment of the Gabčíkovo Waterworks). Danube limes Brand Strategy Conference I., Bratislava, Slovakia, 17 Sept 2013.
- [15] ŠPULEROVÁ, J. – DOBROVODSKÁ, M. – ŠTEFUNKOVÁ, D. – KANKA, R. *Mapovanie historických štruktúr poľnohospodárskej krajiny na príklade Malých Karpát. Záverečná konferencia projektu Vital Landscapes – Historická kultúrna krajina podmalokarpatského regiónu – výzva alebo nevyužitá možnosť?* (Mapping the traditional agricultural landscape: a case study in the Little Carpathians. The final conference of the project Vital Landscapes - cultural attractions of the Little Carpathian region - a challenge or unused possibility?) Modra, Slovakia, 27 March 2013.
- [16] ŠPULEROVÁ, J. *Prístup k mapovaniu historických štruktúr poľnohospodárskej krajiny na Slovensku. Krajina – človek – kultúra. Vzťah hodnoty, ochrany a potenciálu rozvoja krajiny. XVII. konferencia konaná pri príležitosti XIX. Medzinárodného festivalu filmov o životnom prostredí Envirofilm 2013* (Access to mapping of historical structures of the agricultural landscape in Slovakia. Conference: Landscape - man - culture. The relationship between values, protection, and development potential of the landscape. XVII. conference held on the occasion of the XIX. International Festival of Environmental Film (Envirofilm 2013)). Banská Bystrica, Slovakia, 4 June 2013.
- [17] IZAKOVIČOVÁ, Z. – MEDERLY, P. – BEZÁK P.: Evaluation of ecosystem services in the research of the Institute of Landscape Ecology. International workshop of the Ministry of Environment and European Environmental Agency, Approaches to the evaluation of ecosystem services, OpenNESS, Bratislava, Slovakia, 22 Oct 2014.
- [18] IZAKOVIČOVÁ, Z. – MOYZEOVÁ, M. – ŠTEFUNKOVÁ, D.: *Ekosystémy – objekt výskumu a vzdelávania. Konferencia: Mladé stromy pre Slovensko* (Ecosystems - objects of research and education. Conference: Young trees for Slovakia.). Záhorské osvetové stredisko, Senica, Slovakia, 23 Apr 2014.
- [19] HALABUK, A. – LIESKOVSKÝ, J. – MOJSES, M.: Use of remote sensing in radiological impact assessment and monitoring. Seminar: Some aspects of nuclear emergency preparedness and response, parallel computation in modelling of radionuclides dispersion, application of remote sensing techniques. Štrbské Pleso, Slovakia, 1 – 3 Apr 2014.
- [20] HREŠKO, J.: *Význam archetypov krajiny Slovenska – II. konferencia s medzinárodnou účasťou: Vybrané aspekty integrovaného manažmentu životného prostredia* (The value of the landscape archetypes of Slovakia - II. Conference with international participation: Selected aspects of integrated environmental management). Zvolen, Slovakia, 20 Nov 2014.
- [21] KANKA, R. – HALADA, Ľ.: LIFEWATCH – ERIC: e-science and technology infrastructure for biodiversity data and observatories. *Informačný deň: Európske výskumné infraštruktúry, Centrum vedecko-technických informácií SR* (Information day: European research infrastructures, Centre of Scientific and Technical Information of the SR). Bratislava, Slovakia, 26 June 2014.
- [22] LIESKOVSKÝ, J. – HALABUK, A.: Remote sensing: Earth observation, satellite data and applications. Workshop: Some aspects of nuclear emergency preparedness and response, parallel computation in modelling of radionuclides dispersion, application of remote sensing techniques. Štrbské Pleso, Slovakia, 1 – 3 Apr 2014.
- [23] OSZLÁNYI, J.: *Program UNESCO Človek a biosféra – bilancia činnosti v r. 1993–2013. X. konferencia o biosférických rezerváciách SR – Biodiverzita a využívanie krajinných ekosystémov v biosférických rezerváciách UNESCO* (UNESCO programme “Man and biosphere” – overview of activities in the years

- 1993 - 2013. X. conference on biosphere reserves of the Slovak republic – Biodiversity and use of landscape ecosystems in the UNESCO biosphere reserves), Stará Lesná, Slovakia, 21 – 22 Oct 2014.
- [24] SMEJKALOVÁ – HALABUK, A.: GMES/Copernicus (European Earth Observation Programme) and its possible use during emergency. Workshop: Some aspects of nuclear emergency preparedness and response, parallel computation in modelling of radionuclides dispersion, application of remote sensing techniques. Štrbské Pleso, Slovakia, 1 – 3 Apr 2014.
- [25] ŠPULEROVÁ, J. – KANKA, R., – IZAKOVIČOVÁ, Z. – BEZÁK, P. – HALADA, L.: *Funkcie a služby ekosystémov kultúrnej krajiny Slovenska – ich percepcia a hodnotenie v rámci slovenských a európskych projektov. Seminár: Ekosystémové služby – ich mapovanie a hodnotenie na Slovensku, organizovaný Ministerstvom životného prostredia SR* (Ecosystem functions and services in the cultural landscape of Slovakia. Workshop: Ecosystem services – their mapping and assessment in Slovakia, organised by the Ministry of the Environment of the Slovak Republic. Bratislava, Slovakia, 14 May 2014.
- [26] DAVID, S. – MOJSES, M. – BOLTÍŽIAR, M.: *"Vážky (Insecta: Odonata) vodných toků Východoslovenské nížiny", XIX. Okresné Dni Vody* (Dragonflies (Insecta: Odonata) of the Eastern lowlands watercourses. XIX. District Water Days). Zemplínska Šírava, Slovakia, 9 – 10 Apr 2015.
- [27] IZAKOVIČOVÁ, Z.: *OpenNESS – príklad úspešného projektu. Infodeň HORIZON 2020* (OpenNESS – an example of a successful project. Info day HORIZON 2020.) Nitra, Slovakia, 12 Feb 2015.
- [28] IZAKOVIČOVÁ, Z.: *Ekosystémové služby a územný systém ekologickej stability. Medzinárodná konferencia: Prepojenie území v prihraničnom regióne prostredníctvom ekologických sietí* (Ecosystem services and the territorial system of ecological stability. Conference: Linking areas in the border region through ecological networks). Organised by Slovak environmental agency. Žilina, Slovakia, 18 Feb 2015.
- [29] KRŇÁČOVÁ, Z.: *Ekologické modely rozvoja cestovného ruchu na báze krajinnoeologických výskumov. Vedecká konferencia, organizovaná Nadáciou Konrada Adenauera. Mojmírovce* (Proposal for an ecological model of tourism development on the basis of landscape-ecological research. Conference organised by the Konrad Adenauer Foundation). Mojmírovce, Slovakia, 20 Apr 2015.
- [30] MIKLÓS, L. – IZAKOVIČOVÁ, Z.: *Teplo-vlhkostné podmienky abiotických komplexov – podklad pre manažment optimálneho využívania zeme. Konferencia ku Svetovému dňu životného prostredia "Voda – bohatstvo nášho kraja"* (Heat-humidity conditions of abiotic complexes - the basis for optimal management of land use. Conference on World Environment Day: Water - the wealth of our region). Trnava, Slovakia, 5 June 2015.
- [31] KENDERESSY, P. – ŠATALOVÁ, B.: *Integrovaný manažment povodia na regionálnej a lokálnej úrovni (na príklade rieky Poprad). III. medzinárodná vedecká konferencia: „Vybrané aspekty integrovaného manažmentu ŽP. Pôda a voda* (Integrated river basin management at the regional and local levels: a case study on the river Poprad. 3rd International scientific conference: Selected aspects of integrated management of the environment. Soil and water). Technical University in Zvolen, Slovakia, 17 Sept 2015.
- [32] MIKLÓSOVÁ, V.: *Ekologické vzdelávanie v prírode pre základné školy. III. medzinárodná konferencia Vybrané aspekty integrovaného manažmentu ŽP. Pôda a voda.* (Ecological education in Nature for elementary schools. 3rd International scientific conference: Selected aspects of integrated management of

the environment. Soil and water). Technical University in Zvolen, Slovakia, 17 Sept 2015.

- [33] ŠTEFUNKOVÁ, D., IZAKOVIČOVÁ, Z., et al.: *Výchova k trvalo udržateľnému rozvoju – integrovaný prístup, konferencia: Vybrané aspekty integrovaného manažmentu ŽP. Pôda a voda* (Education for sustainable development - an integrated approach. 3rd International scientific conference: Selected aspects of integrated management of the environment. Soil and water). Technical University in Zvolen, Slovakia, 17 Sept 2015.

2.3.14. List of researchers who served as members of organising and programme committees of national conferences

[1]	Bezák, P.	2x programme/organising committee
[2]	Gajdoš, P.	3x programme/organising committee
[3]	Izakovičová, Z.	7x programme/organising committee
[4]	Kanka, R.	1x programme/organising committee
[5]	Lieskovský, J.	1x programme/organising committee
[6]	Moyzeová, M.	3x programme/organising committee
[7]	Piscová, V.	1x programme/organising committee
[8]	Šatalová, B.	1x programme/organising committee
[9]	Špulerová, J	1x programme/organising committee
[10]	Vlachovičová, M.	1x programme/organising committee

- **Supplementary information and/or comments documenting the international and national status of the Institute**

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2.4. Tables of project structure, research grants and other funding resources

- International projects and funding**

2.4.1. Major projects within the European Research Area and other important project – Framework Programmes of the EU, ERA-NET, European Science Foundation, NATO, COST, INTAS, etc. (here and in items below please specify: type of project, title, grant number, duration, total funding and funding for the institute, responsible person in the institute and his/her status in the project, e.g. coordinator “C”, work package leader “W”, investigator “I”),

	Project title	Type / Project number	Duration in months	Funding for the Institute (EUR)	Role of the Institute / Responsible person
2012	Operationalisation of Natural Capital and EcoSystem Services: From Concepts to Real-world Applications (OpenNESS)	7RP	12/2012 – 5/2017	0	I/ Z. Izakovičová
	European Biodiversity Observation Network: Design of a Plane for an Integrated Biodiversity Observing System in Space and Time - EBONE	7RP	7/2008 – 1/2012	21194	I/ L. Halada
2013	Operationalisation of Natural Capital and EcoSystem Services: From Concepts to Real-world Applications (OpenNESS)	7RP	-	25143	I/ Z. Izakovičová
2014	Operationalisation of Natural Capital and EcoSystem Services: From Concepts to Real-world Applications (OpenNESS)	7RP	-	45003	I/ Z. Izakovičová
	Forum Carpaticum 2014	International Visegrad Found (IVF)	1/2014 – 1/2015	6043	C/ L. Halada
2015	European Long-Term Ecosystem and Socio-Ecological Research Infrastructure — eLTER	Horizon 2020	6/2015 – 5/2019	3694	I/ L. Halada
	Operationalisation of Natural Capital and EcoSystem Services: From Concepts to Real-world Applications (OpenNESS)	7RP	-	23188	I/ Z. Izakovičová
	INtegrated Spatial Planning, land use and soil management Research ACTION - INSPIRATION	Horizon 2020	3/2015 – 2/2018	2667	I/ Z. Izakovičová
	Forum Carpaticum 2014	International Visegrad Found (IVF)	–	8489	C/ L. Halada

2.4.2. Other international projects, incl. total funding and funding for the institute

	Project title	Type / Project number	Duration in months	Funding for the Institute (EUR)	Role of the Institute / Responsible person
2012	Landscape Europe	multilateral	1/2011 -	6945	C/ P. Bezák
	European Topic Centre for Biological Diversity- ETC/BD 12	bilateral	1/2012 – 12/2012	25868	I/ J. Oszlányi
	200 years of land use and land cover changes and their driving forces in the Carpathian Basin	multilateral	1/2012 – 12/2015	2687	I/ J. Lieskovský
	Assistance and technical support for the tasks related to actions under the LIFE programme (Astrale D)	multilateral	7/2011 – 6/2012	72328	I/ J. Oszlányi
	Assistance and technical support for the tasks related to actions under the LIFE programme (Astrale E)	multilateral	7/2012 – 12/2012	55431	I/ J. Oszlányi
	Forum Carpaticum 2012	multilateral	1/2012 – 7/2012	4000	C/ L. Halada
	New Biogeographical Process (NBP)	multilateral	12/2011 – 12/2014	1914	I/ L. Halada

2013	Landscape Europe	multilateral	-	10671	C/ P. Bezák
	200 years of land use and land cover changes and their driving forces in the Carpathian Basin	multilateral	-	1205	I/ J. Lieskovský
	European Topic Centre for Biological Diversity - ETC/BD - 13	bilateral	1/2013 – 12/2013	23065	I/ J. Ozslányi
	Technical and administrative assistance for tasks related to implementation of projects under the LIFE+ and under the LIFE III programme (Astrale Alpha)	multilateral	1/2013 – 12/2013	179404	I/ J. Ozslányi
	New Biogeographical Process (NBP)	multilateral	-	10327	I/ L. Halada
	Development of the adaptive plant protection forecasting system within a collaboration of border viticultural areas for purpose to increase their competitiveness (FORECASTING SYST)	bilateral	1/2013 – 1/2015	11467	I/ Z. Izakovičová
2014	European Topic Centre on Biological Diversity -ETC BD	bilateral	1/2014 - 12/2018	32493	I/ L. Halada
	Landscape Europe	multilateral	-	14710	C/ P. Bezák
	Development of the adaptive plant protection forecasting system within a collaboration of border viticultural areas for purpose to increase their competitiveness (FORECASTING SYST)	bilateral	-	11467	I/ Z. Izakovičová
	New Biogeographical Process (NBP)	multilateral	-	8984	I/ L. Halada
	200 years of land use and land cover changes and their driving forces in the Carpathian Basin	multilateral	-	14	I/ J. Lieskovský
	ASTRALE GAMMA - Technical and Administrative assistance related to Implementation of Projects under the Life+ and LIFE III (ASTRALE GEIE)	multilateral	1/2014 – 6/2014	209335	I/ J. Ozslányi
	ASTRALE DELTA - Technical and Administrative assistance related to Implementation of Projects under the Life+ and LIFE III (ASTRALE GEIE)	multilateral	7/2014 – 11/2015	123484	I/ J. Ozslányi
2015	European Topic Centre on Biological Diversity -ETC BD	bilateral	-	32493	I/ L. Halada
	Landscape Europe	multilateral	-	5476	C/ P. Bezák
	Monitoring of LIFE projects (action grants and operating grants), communication about the LIFE programme and other linked activities- NEEMO EEIG	multilateral	1/2015 – 12/2018	422674	I/ J. Ozslányi
	Support for the Natura 2000 Biogeographical Process	multilateral	1/2015 – 12/2017	12962	I/ L. Halada
	200 years of land use and land cover changes and their driving forces in the Carpathian Basin	multilateral	-	0	I/ J. Lieskovský
	Development of the adaptive plant protection forecasting system within a collaboration of border viticultural areas for purpose to increase their competitiveness (FORECASTING SYST)	bilateral	-	0	I/ Z. Izakovičová

2.4.3. Other important, international projects and collaborations without direct funding (max. 10 projects)

Project title	Type / Project number	Duration in months	Funding for the Institute (EUR)	Role of the Institute / Responsible person
Synthesis of Studies on Institutional Change and LCLUC Effects on Carbon, Biodiversity, and Agriculture After the Collapse of the Soviet Union	multilateral	1/2013 – 12/2016	0	I/ L. Halada
Exploring historical drivers of land use and environmental history and their impacts on biodiversity and ecosystem services in Europe (Back to future)	multilateral	10/2013 – 12/2014	0	I/ L. Halada
Enhancing the resilience capacity of SENSitive mountain FORest ecosystems under environmental change (SENSFOR)	COST	1/2013 – 11/2016	0	I/J. Kollár

- National projects and their funding**

2.4.4. Projects supported by the Slovak Research and Development Agency (APVV)

Role of the Institute e.g. coordinator "C", investigator "I".

	Project title	Typ / Project number	Duration in months	Funding for the Institute (EUR)	Role of the Institute / Responsible person
2012	Analyses of soil properties and landscape development for non-regularly overflowed areas	APVV-0163-11	7/2012 - 12/2015	5150	I/ M. Boltižiar
	Atlas of the Archetypes of the agricultural landscape of Slovakia	APVV-0669-11	7/2012 - 12/2015	3200	I/Z. Izakovičová
	Contamination of mining country by toxic elements at selected Cu- deposits and possibilities of its remediation	APVV-0663-10	5/2011 - 10/2014	14312	I/ B. Maňkovská
2013	Evaluation of ecosystem functions and services of the cultural landscape	APW-0866-12	10/2013 - 9/2017	1842	C/ R. Kanka
	Analyses of soil properties and landscape development for non-regularly overflowed areas	APVV-0163-11	-	9152	I/ M. Boltižiar
	Atlas of the Archetypes of the agricultural landscape of Slovakia	APVV-0669-11	-	8410	I/ Z. Izakovičová
	Contamination of mining country by toxic elements at selected Cu- deposits and possibilities of its remediation	APVV-0663-10	-	12236	I/ B. Maňkovská
2014	Analyses of soil properties and landscape development for non-regularly overflowed areas	APVV-0163-11	-	8145	I/ M. Boltižiar
	Atlas of the Archetypes of the agricultural landscape of Slovakia	APVV-0669-11	-	5581	I/ Z. Izakovičová
	Contamination of mining country by toxic elements at selected Cu- deposits and possibilities of its remediation	APVV-0663-10	-	9193	I/ B. Maňkovská
	Evaluation of ecosystem functions and services of the cultural landscape	APW-0866-12	-	42898	C/ R. Kanka
2015	New possibilities of use of drainage canal systems with taking into account the protection and use of a landscape	APVV-14-0735	7/2015 - 6/2019	6565	I/ H. Kalivoda
	Analyses of soil properties and landscape development for non-regularly overflowed areas	APVV-0163-11	-	8472	I/ M. Boltižiar
	Atlas of the Archetypes of the agricultural landscape of Slovakia	APVV-0669-11	-	5123	I/ Z. Izakovičová
	Evaluation of ecosystem functions and services of the cultural landscape	APVV-0866-12	-	26052	C/ R. Kanka

2.4.5. Projects supported by the Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA) for each year, and their funding

VEGA	2012	2013	2014	2015
Number	7	7	9	11
Funding in the year (EUR)	56448	70433	71395	66618 ¹

¹ Excluding projects for the popularisation of science

- **Summary of funding from external resources**

2.4.6. List of projects supported by EU Structural Funds

- [1] Research, development and application of advanced methods of geoinformatics, remote sensing and methods of parallel computation based on advanced hardware and software instruments. Coordinator: Andrej Halabuk, duration: 2010 – 2014, grant number: 26220220071.
- [2] Renovation and construction of technical infrastructure for research and development of the Institute of Landscape Ecology of the Slovak Academy of Sciences. Coordinator: Matej Mojses, duration: 1.11.2012 / 30.4.2014, grant number: 26210120007
- [3] Construction of "Center for Applied Remote Sensing of the Earth". Coordinator: Matej Mojses, duration: 2015 – 2015, grant number: 26210120045

2.4.7. Summary of external resources of the EU Structural Funds (ERDF/ESF) Role of the Institute in the project, e.g. coordinator “C”, work package leader “W”, investigator “I”.

Year	Project title	Project number	Duration in months	Funding for the Institute (EUR)	Role of the Institute
2012	Research, development and application of advanced methods of geoinformatics, remote sensing and methods of parallel computation based on advanced hardware and software instruments.	26220220071	6/2010 - 5/2014	8834	C
	Renovation and construction of technical infrastructure for research and development of the Institute of Landscape Ecology of the Slovak Academy of Sciences	26210120007	11/2012 - 5/2015	0	C
2013	Research, development and application of advanced methods of geoinformatics, remote sensing and methods of parallel computation based on advanced hardware and software instruments.	26220220071	-	21825	C
	Renovation and construction of technical infrastructure for research and development of the Institute of Landscape Ecology of the Slovak Academy of Sciences	26210120007	-	1616794	C
2014	Research, development and application of advanced methods of geoinformatics, remote sensing and methods of parallel computation based on advanced hardware and software instruments.	26220220071	-	15277	C
	Renovation and construction of technical infrastructure for research and development of the Institute of Landscape Ecology of the Slovak Academy of Sciences	26210120007	-	697536	C
2015	Renovation and construction of technical infrastructure for research and development of the Institute of Landscape Ecology of the Slovak Academy of Sciences	26210120007	-	3540	C
	Construction of "Center for Applied Remote Sensing of the Earth"	26210120045	11/2015 - 12/2015	3022737	C

External resources	2012	2013	2014	2015	total	average
External resources (millions of EUR)	0,366	4,055	1,508	3,836	9,765	2,441
External resources transferred to cooperating research institute (millions of EUR)	0,000	0,000	0,012	0,018	0,030	0,008

- **Supplementary information and/or comments on research projects and funding sources**

A serious problem of the Institute of Landscape Ecology is a persisting problem with finances, specifically related to the cross-border cooperation project HUSK 0801 / 2.1.2 / 0162 entitled "Creation of a common monitoring system based on spatial information system in the Ipeľ River Basin" with the period of realisation November 1, 2009 – October, 31, 2010. The project was led by a partner in Hungary, and the Institute of landscape Ecology was one of two partners. The project was supposed to be financed by the Structural Funds DG Regio through the leading partner, while the Slovak part should contribute 15% of total costs. A serious problem was that the project was financed through reimbursement (reimbursement) of all costs. Planned costs for the Institute of Landscape Ecology were 119 140 EUR, actual costs were 98 522.91 euros. The inspection body at the Ministry of Agriculture and Rural Development of the Slovak Republic recognized a total sum of eligible costs of 92 753.29 euros. The funds should have been paid to the account of the Institute in three or four months, every time a certificate of eligible costs was provided by the national (Slovak) inspection body; but the Institute of Landscape Ecology has not received any money to this time. All obligations have been met by the employees of ILE SAS, as specified in the contracts of the partnership. Despite a number of direct actions against the superior authority (the National Development Agency, Budapest) by a foreign partner, despite written reminders to the international partner and despite interventions by the Hungarian and Slovak members of the European Parliament, and by former and current ministers of the Hungarian government, officials of the Government Office, the Embassy of the Slovak Republic in Hungary and others, no progress has been made whatsoever. Currently ILE SAS together with the other Slovakian partner – Technical University in Zvolen – has opted for judicial enforcement of the claim. In 2015, we attempted a court settlement, but in the end the Hungarian partner declined even this alternative, so the lawsuit continues. This outstanding debt from a leading partner is causing significant financial problems for the ILE SAS. For now ILE SAS has overcome the problems thanks to a loan from the SAS Presidium.

2.5. PhD studies and educational activities

2.5.1. List of accredited programmes of doctoral studies, period of validity

4.3.1 Landscape protection and landscape utilisation – Environmental studies (as in the recently amended Act on the Universities)

The right to train PhD students in that program was awarded by the Ministry of Education, Science, Research and Sport of the Slovak Republic (document no. MSSR-2010-144 / 279 7-8 071) in the year 2010, and lasts for so long as it is carried out in compliance with the law. Also the qualification structure of scientific researchers establishes conditions in successful implementation of the PhD study in ILE SAS.

2.5.2. Summary table on doctoral studies (number of internal/external PhD students; number of foreign PhD students, number of students who successfully completed their theses, number of PhD students who quit the programme)

PhD study	31.12.2012			31.12.2013			31.12.2014			31.12.2015		
Number of potential PhD supervisors												
PhD students	number	defended thesis	students quitted	number	defended thesis	students quitted	number	defended thesis	students quitted	number	defended thesis	students quitted
Internal	9,0	1,0	0,0	11,0	0,0	0,0	9,0	4,0	0,0	9,0	2,0	0,0
External	1,0	1,0	0,0	1,0	0,0	0,0	1,0	1,0	0,0	0,0	0,0	0,0
Other supervised by the research employees of the institute	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0

The Institute has an even balance in the number of accepted and successfully completed PhD students. In the years 2012 – 2015, 9 PhD students were accepted and 9 PhD students graduated after the defense of their dissertation thesis.

In the period of years 2012 - 2015 several students and PhD students completed an internship at the Institute of Landscape Ecology and one PhD student of ILE SAS completed an internship at the University of Alaska Fairbanks (Alaska, USA).

Internships of foreign students at ILE SAS:

- [1] Mgr. Milan Skoupý, PhD student, Masaryk University, Faculty of Natural Sciences, Brno, Czech Republic, May 2013 (1 month), (supervisor - Z. Izakovičová), The sustainability of landscape ecosystems in context of global changes.
- [2] Judith Van Poel and Sanne Goavert - Master students from Ghent University, Belgium (supervisor - J. Špulerová). An internship was granted by ALTER-Net network research funds and lasted from August 17 to September 3, 2015. The main purpose of their internship was field work on permanent research sites in the High Tatras Mts. and in other locations in Slovakia.

Internships of PhD students of ILE SAS:

- [1] Mgr. Silvia Chasníková - PhD student of ILE SAS - An internship at the University of Alaska Fairbanks (Alaska, USA), from January 9 until June 9, 2015 (5 months). Scholarship was funded by National scholarship programme of the Slovak Republic. During her stay she worked on a project Alaska Arctic Vegetation Archive (AAVA) - Arctic Boreal Vulnerability Experiment (ABOVE) (NASA Grant NNX13AM20G).

2.5.3. Summary table on educational activities

Teaching	2012	2013	2014	2015
Lectures (hours/year)²	120	56	42	31
Practicum courses (hours/year)²	0	0	5	0
Supervised bachelor theses (in total)	5	10	5	2
Supervised diploma theses (in total)	10	25	23	13
Supervised PhD theses (in total)	23	23	20	15
Members in PhD committees (in total)	7	4	8	5
Members in DrSc. committees (in total)	0	1	1	0
Members in university/faculty councils (in total)	10	11	12	7
Members in habilitation/inauguration committees (in total)	1	2	0	0

2

2.5.4. List of published university textbooks

-

2.5.5. Number of published academic course books

-

2.5.6. List of joint research laboratories/facilities with universities

- [1] Joint research laboratory (referred to as the Common Department) with the Department of Ecology and Environmental Sciences at the Faculty of Natural Sciences of Constantine the Philosopher University in Nitra.

The staff of the Institute of Landscape Ecology participates in the pedagogical activities of the department, namely in projects, teaching, consultations for Master and PhD students, supervision of seminars and diploma theses, organizing field courses and in Master and PhD examination committees.

- **Supplementary information and/or comments on doctoral studies and educational activities**

² Do not include time spent with bachelor, diploma or PhD students during their supervising

2.6. Social impact

2.6.1. List of the most important results of applied research projects. Max. 10 items

BILATERAL PROJECTS

- [1] European Topic Centre on Biological Diversity (ETC – BD) - the application of science to the European Nature Conservation Policy. Investigator: Ľ. Halada, Coordinator: National Museum of Natural History – MNHN, France, 2013, 2014 - 2018. Other authors: P. Gajdoš, R. Kanka, K. Gerháťová, H. Kalivoda, J. Špulerová, J. Oszlányi, V. Piscová, J. Lieskovský a kol. Provided to: European Environment Agency.

ILE SAS has long been involved in the activities of the European Environment Agency (EEA) through the ETC-BD project and in the form of a scientific-professional cooperation focusing especially on the tasks related to nature conservation and halting biodiversity decline in Europe. In 2013, these activities were extended to the preparation and publishing of a scientific article (Halada and Gajdoš In. Evans et al., 2013^{chapter 2.1.2., No 5}), which presented original findings and experience from the implementation of the Habitats Directive during the accession process of the newly acceding countries of the European union. In the same year, experts from ILE SAS processed a total of 1487 assessments of conservation statuses of species and habitats of european importance at the level of biogeographical regions. The report was released by the EEA in 2015. Another task was the evaluation of the adequacy of the Natura 2000 network in the 7 countries of the EU. The project team ÚKE SAS contributed to the evaluation of agricultural habitats and species, and assessment of forests. These evaluations will be included in a Report on the environment by the EEA in 2015 (SoER2015). For the new biogeographical process, we have prepared information sheets for the 59 habitat types, focused on the Continental, Pannonian, Steppic, and Black sea biogeographical regions. The team of ILE SAS also participated in the testing of criteria for the revision of the annexes of the Directive on Habitats and the role of Mapping and Assessment of Ecosystems (ROMAO C. et al., 2014, HALADA et al., 2014^{chapter 2.6.2., No 1-2}).

- [2] Professional monitoring of projects under the EU's most important environmental programme LIFE as a contribution to their successful implementation (ASTRALE GEIE, NEEMO EEIG). Coordinator: J. Oszlányi, other authors: Ľ. Halada, P. Gajdoš, P. Bezák, A. Bača. Provided to: European Commission.

LIFE is a financial instrument of the European Union for supporting projects in the fields of environment, nature protection and climate change, which since 1992 has co-financed 4,171 projects with a total budget of approx. 3.4 billion Euros. Since 2005, the Institute of Landscape Ecology has joined the professional monitoring LIFE projects in Slovakia, the Czech Republic, Hungary, Romania, Poland and Slovenia as part of the pan-European consortium ASTRALE. From 2015 Institute continues in this role in the consortium NEEMO. In all phases of the project investigators developed 150 specialized expertises to the European Commission^{chapter 2.6.2., No 3}, i.e. reviews for compliance with the originally stated objectives of the project, the need for changes and the justification for using funds. Investigators from ILE SAS annually visited the project site and operations, they consult technical and financial issues with the project beneficiaries. In the sector of LIFE-NAT they significantly contributed to the implementation of the EU Birds and Habitats Directives, in particular in the development of the areas of the network Natura 2000.

OTHER PROJECTS

- [3] BioREGIO Carpathians, WP3 – Database development: Red Lists of Habitats and Species and List of Alien Invasive Species. Coordinator: P. Barančok, other authors: J. Kollár, M. Barančoková. Partners: State Nature Protection Slovakia, Czech Republic, Poland, Romania, Serbia and Ukraine, duration 2012 – 2015, provided to State Nature Protection of Slovakia.

Main results: Red list of species, habitats and invasive alien species in the Carpathians, methodology for evaluating non-forest biotopes (habitats) of the Carpathians.^{chapter 2.6.2., No 4-5}

- [4] Strategic environmental assessment of document: The Rural Development the programming period 2014 – 2020. Coordinator: Zita Izakovičová, other authors: László Miklós, Viktória Miklósová, Pavol Kenderessy, duration: 2014-2015, provided to Ministry of Environment of the Slovak Republic.
- The basic objective of the project was to assess the strategic document The Rural Development the programming period 2014 – 2020 in terms of its impacts on the environment. RDP 2014-2020 defines a rural development strategy. The strategy responds to the identified problems and needs by selecting specific objectives of the program, program priorities and areas of focus. The strategy contributes to the fulfillment of main objectives of Policies and encouraging an increase in growth (higher added value), maintaining and creating jobs in rural areas, all in accordance with environmental protection. This contributes to the objectives of the CAP and Strategy Europe 2020. In 2015 a public hearing of document was implemented. A strategic review of submitted document was concluded and subsequently, the document was approved by EU.
- [5] Methodology for assessment of Groundwater Dependent Terrestrial Ecosystems. coordinator: Jana Špulerová, other authors: Andrej Halabuk. Duration: 2014-2014, provided to Slovak Hydrometeorological Institute.
- The aim of the project was to develop a methodology for the evaluation of selected Groundwater Dependent Terrestrial Ecosystems (GWDTE). The methodology reflects the requirements of the Water Framework Directive as defined in Annex II, in particular (1) determining the groundwater bodies, which bind GWDTE (2) inventory of significant associates GWDTE with which the groundwater body is dynamically linked. (3) assessment of significant damage GWDTE in the context of poor chemical and quantitative status of associate bodies of groundwater. The output of the project is the proposal a methodology processed in form of the final report (in Slovak): Halabuk, Špulerová ^{chapter 2.6.2., No 7}
- [6] Intensification and modernization of WWTP Vrakuňa - ornithological survey of the WWTP Vrakuňa. Coordinator: H. Kalivoda, other authors: M. Vlachovičová ^{chapter 2.6.2., No 8}, duration: 2012 – 2015. provided to Bratislava Water Company
- [7] Regional territorial system of ecological stability of the districts Špiská Nová Ves, Turčianske Teplice, Žiar nad Hronom. Coordinator: Z. Izakovičová, H. Kalivoda, other authors: R. Kanka, J. Špulerová, M. Dobrovodská, M. Moyzeová, D. Štefunková, B. Šatalová, P. Kenderessy, M. Vlachovičová. The basic goal of the project was preparation of the proposal of ecological network for individual regions and proposal of the eco-stabilizing measures to strengthen ecological stability and efficient use of resources and potentials of the territory.

2.6.2. List of the most important studies commissioned for the decision-making authorities, the government and NGOs, international and foreign institutes

- [1] ROMAO C. et al., 2014: State of nature in the EU. Results from the Reporting under the Nature Directives 2007-2012 – Draft of the EEA Technical report, 183 pp.
- [2] HALADA, Ľ., LIESKOVSKÝ, J., GERHÁTOVÁ, K., BOROVSKÁ, J., 2014: Fact sheets in support of the draft Pre-Scoping Document for the Natura 2000 Seminar at Continental, Pannonian, Steppic, and Black Sea Regions. ETC BD, 123 pp.
- [3] OSZLÁNYI, J., HALADA, Ľ., GAJDOŠ, P., BEZÁK, P., BAČA, A.: 150 evaluation reports for the European Commission (DG-Environment, LIFE Unit) on the status of applications LIFE NAT projects in Poland, the Czech Republic, Slovakia, Hungary, Romania.
- [4] BARANČOK, Peter – KOLLÁR, Jozef – BARANČOKOVÁ, Mária – CHASNÍKOVÁ, Silvia – VOLOSHCHUK, Mykola – SZEWCZYK, Monika – LUSTYK, Pavel. Red list of the

Carpathian non-forest biotopes (habitats) : Report 2014. Red list of species, habitats and invasive alien species in the Carpathians. Banská Bystrica: Štátna ochrana prírody Slovenskej republiky, 2014. 31 p.

- [5] BARANČOK, Peter – KOLLÁR, Jozef – BARANČOKOVÁ, Mária – KRAJČÍ, Ján. Red list of the Carpathian non-forest biotopes (habitats): The methodology for evaluating non-forest biotopes (habitats) of the Carpathians. Red list of species, habitats and invasive alien species in the Carpathians. Banská Bystrica: Štátna ochrana prírody Slovenskej republiky, 2014. 29 p.
- [6] BARANČOK, Peter – BARANČOKOVÁ, Mária – KOLLÁR, Jozef – BABÁLOVÁ, Martina – KABINOVÁ, Barbora – CHASNÍKOVÁ, Silvia. *Analýza dopadov obnoviteľných zdrojov energie na životné prostredie: Posúdenie vplyvov testovacieho laboratória Smart Grid v zmysle Zákona NR SR č. 24/2006 Z. z. o posudzovaní vplyvov na životné prostredie a o zmene a doplnení niektorých zákonov v znení neskorších predpisov* (Analysis of the impacts of renewable energy on the environment: Impact assessment of the test laboratory Smart Grid in terms of Act no. 24/2006 Coll. on the assessment of impacts on the environment and on amendments to certain laws, as amended). Peter Barančok... [et al.]. Bratislava: Technologický inštitút SAV, 2014. 79 s.
- [7] HALABUK, Andrej – ŠPULEROVÁ, Jana. *Metodika hodnotenia vybraných suchozemských ekosystémov závislých od útvarov podzemných vôd*. (The evaluation methodology of selected terrestrial ecosystems dependent on groundwater bodies) Bratislava: Ústav krajinej ekológie SAV, 2014. 35 s.
- [8] VLACHOVIČOVÁ, M., 2015: "Odkanalizovanie podunajskej časti Bratislavského regiónu" - "Intenzifikácia a modernizácia ÚČOV Vrakuňa" - zabezpečenie ornitologického prieskumu v území ÚČOV Vrakuňa a jej blízkom okolí (Sewerage system of the area around the Danube in the Bratislava region" - "Intensification and modernization of the Central waste water treatment plant Vrakuňa" - implementation of an ornithological survey in the territory of the WWTP Vrakuňa and its surroundings) Final report. Ústav krajinej ekológie SAV, 23 pp.

2.6.3. List of contracts and research projects with industrial and other commercial partners, incl. revenues

- [1] Intensification and modernization of the Central waste water treatment plant Vrakuňa - implementation of ornithological survey in the territory of the WWTP Vrakuňa, coordinator: H. Kalivoda, duration: 2014 - 2015 funding (€): 16500, provided to Bratislava Water Company
- [2] Regional territorial system of ecological stability of the districts Spišská Nová Ves, Turčianske Teplice, Žiar nad Hronom. Coordinator: Z. Izakovičová, H. Kalivoda, duration 2012 - 2013, funding (€): 21000, provided to Esprit s.r.o.

2.6.4. List of licences sold abroad and in Slovakia, incl. revenues

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2.6.5. List of most important social discourses under the leadership or with significant participation of the institute (max. 10 items)

ILE SAS made a great contribution to the preparation of several strategic documents:

- [1] Rural Development Programme 2014 – 2020. Rural Development Programme is a key strategic development document of the Ministry of Agriculture and Rural Development of the Slovak Republic for the implementation of agri-environment measures.
 - Employees of ILE SAS carried out a strategic review of the document in terms of environmental impact and led a public discussion of the document. On the basis of

proposals from ILE SAS employees the document was completed and subsequently approved by the European Commission. ILE SAS employees participated in the processing of evaluation criteria of Programme's impacts on the landscape and its components, as well as the environment. Subsequently they ensure the evaluation process of the Programme for the previous and the current period.

- The result of the projects concerning to traditional agricultural landscape (e.g. EEA and Norway Grants project "Research and maintaining of biodiversity in historical structures of agricultural landscape of Slovakia" (2009-2011), and VEGA projects "Significance and ecosystem services of historical structures of agricultural landscapes and ongoing project (2011-2013)" and "Diversity of agricultural landscape and its ecosystem services (2014-2017)" are the basis for determination of "High nature value farmland" on national level, accepted by Ministry of Agriculture and Rural Development of the Slovak Republic. Currently, the employees of ILE SAS are working on ex-post evaluation of impact assessment of Rural development program for Maintenance of high nature value farming (objective environment and countryside).

- [2] Integrated Regional Strategy of the Trnava Region - ILE SAS employees processed a Strategy for integrated regional development of the Trnava region as a basis for implementation of projects, determined the priorities of a development, identified the types of projects and eligible applicants, as well as defined criteria for the selection and evaluation of projects. Employees are also active in the Partnership Council, which will coordinate and monitor the implementation of the program.
- [3] Territorial Development Strategy of the city of Trnava and its functional area - employees in collaboration with the city of Trnava processed urban development strategy of Trnava city and its urban functional area based on an integrated approach, they defined development priorities in the environmental field and processed proposal of integrated project: Revitalization of the lower basin of Parná river flow. Currently, the city is preparing a project documentation for the revitalization of selected river basin area of Parná river.
- [4] The scientist from ILE SAS processed draft plan of building a national platform LIFEWATCH SK for Ministry of Education, Science, Research and Sport of the Slovak Republic.
- [5] European Topic Centre on Biological Diversity (ETC – BD) - the application of science to the European Nature Conservation Policy. ILE SAS has long been involved in the activities of the European Environment Agency (EEA) in the form of a scientific-professional cooperation focusing especially on the tasks related to nature conservation and halting biodiversity decline in Europe. Experts from ILE SAS processed a total of 1487 assessments of conservation statuses of species and habitats of european importance at the level of biogeographical regions. The report was released by the EEA in 2015. Another task was the evaluation of the adequacy of the Natura 2000 network in the 7 countries of the EU. The project team ÚKE SAS contributed to the evaluation of agricultural habitats and species, and assessment of forests. These evaluations will be included in a Report on the environment by the EEA in 2015 (SoER2015). For the new biogeographical process, we have prepared information sheets for the 59 habitat types, focused on the Continental, Pannonian, Steppic, and Black sea biogeographical regions. The team of ILE SAS also participated in the testing of criteria for the revision of the annexes of the Directive on Habitats and the role of Mapping and Assessment of Ecosystems.

2.6.6. Summary of relevant activities, max. 300 words

It is stated in chapter 1.8. – in the part “2. Pillar: Development of applied research“

2.7. Popularisation of Science (outreach activities)

2.7.1. List of the most important popularisation activities, max. 20 items

- [1] Young Trees for Slovakia – This conference, organized by the Trnava self-governing region, took place in the city of Senica on the 24th of March 2014. ILE SAS scientists also this year gave the lectures on ongoing research. The central theme of the lectures was ecosystem services. Reports on tree planting in the landscape and information relevant to the issue were also presented at our info desk in the form of posters, book publications and leaflets.
- [2] Science for everyone – a science popularization event organized by ILE SAS as a part of the Week of Science and Technology that was held on the 7th of November, 2012. The main point of the event was to introduce new conservation strategies that are based on representative geoecosystems (REPGES). The concept of REPGES was developed by the Institute of Landscape Ecology in 2005 and was presented in the form of Atlas of REPGES of Slovakia. Application of the concept of REPGES to the regional level was introduced by the director of the ILE SAS using the the district of Trnava as an example. The event also featured the presentation of the book publication: IZAKOVIČOVÁ, Z., MIKLÓS, L., MOYZEOVÁ, M., et al.: Model of representative geoecosystems on the local level.
- [3] 20 years of SEKOS – April 2012, Smolenice – a conference held to mark the 20th anniversary of the Slovak Ecological Society (SEKOS). The main objective of the conference was to take stock after twenty years of activity of SEKOS and discuss not only the successes of these 20 years, but also the problems, and to define the challenges for the next period (Z. Izakovičová, M. Moyzeová, E. Adamčeková).
- [4] Rio + 20: 20 years of implementation of sustainable development in Slovakia – April 2012, Bratislava. ILE SAS has an ongoing tradition of organizing conferences on the subject of implementing sustainable development in Slovakia. The basic objective of these conferences is to monitor and evaluate activities aimed at implementing sustainable development in the Slovak Republic. The conference was held to mark the 20th anniversary of the Rio Summit and to adopt the strategic development document called Agenda 21, under the patronage of the President of the Slovak Republic Ivan Gašparovič. The main organizer was the European Academy of Sciences and Arts in Salzburg, in cooperation with the Slovak Academy of Sciences and the Institute of Landscape Ecology (Z. Izakovičová, M. Moyzeová, E. Adamčeková, B. Šatalová).

Besides scientific and science popularization events, ILE SAS also organized popular knowledge events aimed at the increase of environmental awareness among pupils and students of primary and secondary schools and the general public:

- [5] I'll teach you what you don't know – Suchá nad Parnou Elementary school, 20th of April, 2012. Students presented the use of environmental projects in education. The program was focused on practical examples of pupils' skills in monitoring and evaluation of landscape processes (Z. Izakovičová, M. Moyzeová, E. Adamčeková, J. Oszlányi, A. Šedivá).
- [6] Green course: An environmental course for younger and older students from selected schools in Senica city that was associated with work in the field (a journey through the Senica – Kunov nature trail), but also learning about plants, animals, and elements of landscape components. 17th of May, 2012 on Kunov dam in Senica. (Co-organisers from ILE SAS: M. Moyzeová, E. Adamčeková, M. Dobrovodská, J. Špulerová and A. Šedivá)
- [7] World Water Day event – in Bratislava, 22nd of March, 2015. A PhD student of ILE SAS, V. Miklósová, gave a lecture on the subject of quality of drinking water in Slovakia. Her lecture

discussed the Žitný ostrov river island as a source of drinking water, protection of water resources, and the history and various approaches to filtering water. Event information was published in the journal Pressburger Zeitung, November 2015.

- [8] Excursions for pupils of nursery and primary school students to the Protected Landscape Area (PLA) of the Danube floodplains. On the Žitný ostrov river island there are hundreds of isles created by a tangle of dead river branches that surrounds the main flow of the Danube river. This ecological system has created a floodplain forest unique in Central Europe. We wanted to encourage students to get to know the mysterious life of the floodplain forests through guided walks. Children learned about trees and bushes, floodplain forests, and the history of the PLA Danube floodplains over the course of a whole day in the countryside. They acquired knowledge in a playful way which inspired a positive attitude towards the environment (V. Miklósová - organizer of 30 excursions in the year 2015).

- [9] Science Festival - European Researchers' Night – We enjoy discovering Nature. Bratislava 25th of September, 2015. As part of the European Researchers' Night 2015, the Institute of Landscape Ecology prepared a practical demonstration of the use and protection of selected natural resources – water and biota as well as samples of different ways of using waste as a secondary raw material. The main theme was “we enjoy discovering nature”, and the program was mostly dedicated to children and students. PhD students and researchers of ILE SAS showed, in an entertaining way, how important the role of natural ecosystems in human life is, and showed them the need for taking care of these ecosystems to preserve all their features. ILE SAS staff also prepared examples of the making of maps in geographical information systems for older visitors. The follow-up discussion „SCIENCE na N-tú” on the topic „Will nature keep on warming us in the future or will we use science effectively to cool it down?” was attended by the director of ILE SAS, Z. Izakovičová.

Earth Day – Scientists and PhD students of the Institute of Landscape Ecology in cooperation with the Slovak Ecological Society organize Earth Day every year. As part of this event ILE SAS and SEKOS organize and attend many events that are focused on the need for environmental protection.

- [10] Save the Earth – Trnava Elementary school, 24th of April, 2012. Employees of ILE SAS organized the event "saving the earth" for elementary school students. Through use of quizzes, competitions and practical demonstrations, ILE employees highlighted the importance of involving the young generation in these activities. The event was designed to make pupils aware that the Earth cannot only be exploited for our needs, but that we must also take care of and protect her (Z. Izakovičová, M. Moyzeová, E. Adamčeková, A. Šedivá, A. Abrahámová, P. Kenderessy, B. Šatalová, V. Hurta, M. Babálová, M. Vlachovičová, B. Fedorková and M. Drábová).

- [11] Earth Day in Suchá nad Parnou Elementary School – Environmental competition between teams of primary school students. The event was held in the Environmental laboratory, which celebrated the 10th anniversary of its establishment this year. The central theme of this year's Earth Day was Water-Soil-Air. The main attraction of this year's celebration was an art and craft competition on the topic of environmental issues. (Co-organisers from ILE SAS: Z. Izakovičová, D. Štefunková)

- [12] Earth Day in Vojka nad Dunajom – Excursion in the protected landscape area (PLA) of the Danube floodplains during European Week Green Week 2015, on 27th of April, 2015. The main mission of these thematic excursions for elementary school students was to discover the secrets of life in floodplain forests. (V. Miklósová)

- [13] Earth Day at the Hungarian - language Elementary and Grammar school on Dunajská ulica in Bratislava – Prof. L. Miklós DrSc. presented a professional lecture entitled "Landscape and Environment".
- [14] World Earth Day – I care about nature - Kindergarten in Bratislava. The main theme was exploring the landscape. We taught children about landforms and their mutual relations through various games and activities, as well as how to use the landscape in an intelligent way to minimize the negative impacts of human activities on the environment. Through games and competitions we wanted to contribute to the increase of knowledge of the world around us and to show children a sensitive approach to nature and animals in our surroundings.
- Institute of Landscape Ecology annually presents its research outputs at the popular public exhibitions AGROKOMPLEX and CONECO.
- [15] CONECO exhibitions (2012 – 2015) – exhibitions focused on: green infrastructure, quality of the environment, implementation of the European Landscape Convention in the Slovak Republic, research and maintenance of biodiversity in traditional agricultural landscape of Slovakia and increasing of environmental consciousness. (M. Moyzeová, E. Adamčeková)
- [16] AGROCOMPLEX exhibitions (2012-2015) – exhibitions focused on: a modern nature protection concept based on the conservation of representative ecosystems (REPGES) and ecosystem services, evaluation of landscape potential and carrying capacity, degradation factors, management of sustainable use and conservation of the agrarian landscape in Slovakia. A management model for sustainable use and conservation of the agrarian landscape, prepared by the Institute, was awarded the Golden Sickle by the Minister of Agriculture and Rural Development of Slovakia for *Model Management of Sustainable Use and Conservation of the Agrarian Landscape* (Z. Izakovičová, M. Dobrovodská, M. Moyzeová, D. Štefunková, E. Adamčeková).

2.7.2. Table of outreach activities according to institute annual reports

Outreach activities	2012	2013	2014	2015	total
Articles in press media/internet popularising results of science, in particular those achieved by the Institute	6	6	6	5	23
Appearances in telecommunication media popularising results of science, in particular those achieved by the Institute	3	2	1	3	9
Public popularisation lectures	23	19	14	39	95

- **Supplementary information and/or comments on popularisation activities, max. 300 words**

In addition to the mentioned activities ILE SAS also organizes press conferences to the actual environmental themes, and at the occasion of environmental anniversaries such as the Year of Biodiversity, the Year the soil etc. Also, we use main print media, ILE SAS web page and Facebook to spread the results of landscape–ecological research among the public.

A suitable form of transfer of knowledge into practice is to invite the policy representatives to scientific events organized by the institute. Our events also in the period of 2015 – 2014 were organized under the auspices of ministers, members of parliament and President of Republic. Also, when dealing with projects, we consult the scientific results and the possibility of incorporating them into practice with the main groups of stakeholders - policy makers on the national and regional level, mayors, representatives of industrial clusters, NGO representatives etc.

2.8. Background and management. Human resources and implementation of recommendations from previous assessment

2.8.1. Summary table of personnel

Personnel	2012	2013	2014	2015
All personnel	58,0	55,0	56,0	53,0
Research employees from Tab. Research staff	36,0	34,0	35,0	34,0
FTE from Tab. Research staff	32,000	30,000	30,000	30,000
Average age of research employees with university degree	44,5	46,2	46,7	47,2

2.8.1.1. Professional qualification structure (as of 31.12. 2015) FEMALE

FEMALE	AGE								
Number of	< 30	31 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	> 65
DrSc. / prof.								0/1	1/0
II.a / Assoc. prof.						1/0	4/0		
Other researchers PhD./CSc.	1/0		4/0	3/0	2/0				
doc. / Assoc. prof.									

2.8.1.2. Professional qualification structure (as of 31.12. 2015) MALE

MALE	AGE								
Number of	< 30	31 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	> 65
DrSc. / prof.				0/1			0/1		1/1
II.a / Assoc. prof.		1/0		4/0		1/0	3/0	1/0	0/1
Other researchers PhD./CSc.			1/0	3/0	1/0				
doc. / Assoc. prof.								1/0	

2.8.2. Postdoctoral and mobility scheme

2.8.2.1. Postdoctoral positions supported by national and international resources

Mgr. Juraj Lieskovský, PhD, research scientist from ILE SAS - Post-doctoral Swiss-slovak scholarship fund (SCIEX) in Switzerland at the host institution Swiss Federal Institute for Forest, Snow and Landscape Research WSL under the guidance of prof. Felix Kienast (Switzerland) and RNDr. Ľuboš Halada, CSc.(Slovakia), from January 1, 2013 to August 31, 2013. Within scholarship

he dealt with his research project "Land use and land cover changes in selected area of the Carpathian Basin"

Mgr. Pavol Kenderessy, PhD, research scientist from ILE SAS - Post-doctoral scholarship program in Austria at the host institution, the University of Vienna, Department of Botany and Biodiversity Research, Division of Conservation Biology, Vegetation Ecology and Landscape Ecology, from September 1, 2014 to March 1, 2015 under the guidance of prof. Thomas Wrba. Scholarship was part of a bilateral program to develop cooperation between Austria and Slovakia in higher education, science and research. The research was targeted on issue of the use of landscape indices in assessing the evolution and dynamics of the landscape.

Study stays of foreign postdocs at ILE SAS:

Dr. Eng. Piotr Krajewski, PhD, supervisor – P. Barančok, October 27 - April 26, 2015 (6 months), Topic: Study of landscape changes in selected suburban area of Bratislava.

Dr. Eng. Iwona Kaczmarek, PhD, supervisor – P. Barančok, June 1 - August 31, 2015 (2 months), Topic: Evaluation of landscape changes using the data in the GIS program.

Postdoctoral stays by virtue of the Agreement about cooperation between the Wroclaw University of Environmental and Life Sciences, Department of Land Management, Wroclaw (Poland) and the Institute of Landscape Ecology SAS.

2.8.2.2. Postdoctoral positions supported by external funding

2.8.2.3. SAS stipends and SASPRO stipends

2.8.2.4. Internal funding - the Slovak Academy of Sciences Supporting Fund of Stefan Schwarz

2.8.3. Important research infrastructure (*max. 2 pages*)

The Institute of Landscape Ecology SAS is an independent legal entity. As a grant organization, it shows long-term positive financial results. The Institute is located in a building in the centre of Bratislava (headquarters) and in the academic part of the City of Nitra (a branch). The seat of the Institute is in Bratislava. The buildings in Bratislava and Nitra are the property of SAS and in both of them there is a library and conference room. Each room in Bratislava and Nitra is equipped with at least one computer, which is connected to an up-to-date local computer network. A high-speed internet connection of 100 Mb/s is provided via a high-speed optical cable from the server at the Computing Centre of SAS (Bratislava) and the Slovak Agricultural University (Nitra).

The main computing power of ILE SAS is provided by our servers: the Oracle server (GIS database administration), two terminal servers, a virtual server domain server, a 19 TB disk array for the terminal server, and two more disk arrays, one sinology (12 TB) and one HP Storeeasy (40 TB). The basic hardware equipment consists of 52 computers/work-stations in use, 36 of which are high-powered work-stations for smooth running of GIS software and complicated graphics output processing. There are also 38 notebooks available, 2 micro-books, 8 A4 scanners, 3A3 scanners, one A2 scanner, one A0 scanner, 8 copy machines, 12 laser colour printers, 23 monochrome printers, 3 data projectors, 14 PDA Trimble Juno SB with Windows Mobile, industrial tablets for the collection and editing of data in the field (4 pcs), industrial notebook (4 pcs), industrial PDAs for collecting and editing data in the field (2 pcs), data projectors (2 pcs), 18 GPS Garmin devices, 1 GPS Glofish device, 4 Dictaphones, a digitizer and a backup generator, 5 digital cameras, 2 faxes, 26 external discs, 2 switches (5 ports), 6 switches (10 ports), 3 switches (20 ports)

Software equipment is determined by the individual needs of employees. All work-stations and notebooks run on an operation system from Microsoft using: Windows 7 Home and Professional, Vista, 8, 8.1, 10. Other software includes Microsoft Office 2003, 2007, 2010. PC security has been solved by the purchase of 68 licenses of ESET Smart Security 8.0. Each employee has an individual e-mail account using Outlook Express, Outlook and Mozilla Thunderbird clients. An important integral part of ILE SAS software equipment are the licenses for specialized GIS software - ArcView 3.1, 3.2, ArcGIS 8.1, 8.3, 9.3, 10.3, IDRISI Kilimanjaro and ERDAS. Employers

of ILE SAS use a wide spectrum of other licensed software, for example: Adobe Creative Suite CS, CS2, CS3, CS4, Corel Draw 9, 11 and 12. For statistical analyses and calculations Statistica CZ, Syntax, CANOCO 4.0, 5.0, Turbowin and SPSS 18 are used.

Four motor-cars are used in field research. A Kia Ceed estate car, Škoda Yeti, Volkswagen Caddy and Toyota RAW4 off-road vehicle for research in difficult terrain have been bought.

In the years 2012-2015 the UKE SAV succeeded, thanks to two infrastructure projects, in significantly modernizing and expanding its computing and instrumentation base necessary for further scientific development and integration into the European Research Area. Four laboratories were established: a GIS and remote sensing laboratory, a UAV laboratory, a laboratory for field ecosystem research, and a laboratory of chemical analyses.

The GIS and remote sensing laboratory, which includes hardware, software and licenses, is capable of managing large datasets arriving at regular intervals on the server, and user-configurable processing, visualization, reporting and publishing, including working with large raster formats and maps to supply data and map services. The laboratory possesses a comprehensive GIS server, desktop GIS, mobile GIS, RDBMS systems, and remote sensing software. For field calibration, dataloggers are used for automatic recording of radiation in different spectral bands, and a portable system for hyperspectral imaging with high resolution spectral data from a ruggedized field-portable spectroradiometer, radiation sensors and spectral reflectance at different spectral bands, and NDVI and PRI sensors.

The UAV (Unmanned Aerial Vehicle) laboratory is a comprehensive system capable of collecting various types of data on the Earth's surface – hyperspectral, thermal imaging and LIDAR. The basic component is the carrier module with capacity for automatic or semi-automatic long-distance navigation in the survey of earth's surface. The system also includes specialized equipment and software for processing imaging data (a basic support module (drone) for UAV imaging, and a hyperspectral scanner, thermal camera, LIDAR and multispectral camera).

The laboratory for field ecosystem research is equipped with a system for evaluation of the course of photosynthesis, a compact device for photo-chemical analysis of plants, a portable instrument for non-destructive measurement of leaf area and other morphometric parameters of plants, a device for determination of chlorophyll fluorescence, a compact device for measurement of stomatal conductance of leaves, a thermal camera for measurement of temperature of leaf surface, and an instrument for measurement of conductivity and magnetic susceptibility of soil. In addition to two complex climatic stations the ILE SAS also uses air and soil temperature sensors, soil moisture sensors, and radiation sensors. For study of bodies of water, the ILE SAS owns a remotely controlled floating platform for monitoring physical, chemical and biological parameters of water bodies.

The laboratory of chemical analyses is equipped with laboratory furniture (3 rooms) and equipment for preparation of samples (drills, weighting machines, dryer, instrument for mineralisation, steriliser, incubator). For analysis there is a UV-VIS spectrophotometer with accessories, multimeters for measurement of pH, ORP (exido-reduction potential), temperature, and soil conductivity, and microscopes.

All laboratory equipment is used within the current and finished ILE SAS research projects. Currently, our institute does not provide these devices for use by other institutes and companies. Laboratory equipment is used e.g.:

- in a long-term ecosystem research (e.g. eLTER project – Ľ. Halada),
- for the assessment of status and dynamics of habitats using combination of modelling and remote sensing (VEGA project – Ľ. Halada),
- in the analysis of forest soil properties on the former agricultural land (VEGA project – J. Kollár),
- for monitoring of long-term changes of selected soil properties and their ecosystem services depending on the different forms and intensity of agricultural land cultivation (VEGA – P. Kenderessy) Within the last mentioned project, the monitoring site in Liptovská Teplička is equipped with the set of 24 Em5b dataloggers (by Decagon devices) each connected to 3 soil moisture sensors. The devices are set to measure high temporal soil moisture

variability of surface part of soil profile. The data are used to assess water retention capacity of the landscape. The monitoring site is also equipped with the automatic meteorological station.

The devices obtained from the last ESF project (Construction of "Center for Applied Remote Sensing of the Earth", 12/2016) are currently being field-tested.

The bulk of the infrastructure improvement of the ILE SAS has been accomplished in 2013 - 2015. In the next period we expect less investment in improving the infrastructure, but significant expenses connected with regular maintenance of hardware (especially information-communication technologies) and upgrade of key licenses of GIS and remote sensing software. Other expected maintenance expenses are linked to operation of instruments and laboratory devices (calibration sets, spare parts, re-calibration of sensors etc.).

Based on the proposed objectives for the institute's development, it is necessary to ensure sufficient funds both for improvement of infrastructure and for maintenance and upgrade of the existing infrastructure. The research projects remain our main source of funding.

We plan to improve the infrastructure, instrumentation and technical equipment of the Institute in these areas particularly:

- Improvement of the infrastructure in the research station Východná – reconstruction of both buildings, restoration of the laboratory for basic processing of field samples, improvement of the conference room and its equipment, and renovation of the on-site accommodation.
- Car fleet renovation (2 of the 4 currently used cars are old with expected operational life of a maximum of 2 more years),
- Modernisation of hardware and software equipment for all scientific employees, and provision of training for employees, both internally and externally
- Instrumentation improvement in the LTER sites run by the Institute
- Gradual renovation of the laboratories, expansion of the equipment base for analysis of environmental variables,
- Minor upgrades of the equipment for field measurements.

2.8.4. Description of how the results and suggestions of the previous assessment were taken into account

As ILE SAS is a Contributory Organization, it concentrates its efforts on gaining projects of a kind whose preparation, including planning, elaboration of proposal, and permanent workload, are very demanding and exhausting. Our success rate in obtaining projects is complicated by factors in the wider society; compared to the previous period the percentage of successful project proposals decreased from 80% to 30%. This led to a redoubling of effort in preparation and gaining of projects. ILE SAS strategy is to focus on larger and longer-term projects. Topics are selected through discussions with the academics of the Institute, and subsequently the topics are modified and approved by the scientific council and the directors' advisory board. We focus on topics of present importance to society corresponding to the specialization of the Institute and expertise and approaches of our employees. We are trying to reduce the high burden on our scientists by use of highly-qualified technical staff that is able to handle all of the technical and administrative work. At the same time we are also trying to make use of external companies for some of the administrative work.

On the other hand, these projects, mainly the EU-funded projects, have enabled our scientists to work in numerous landscape-ecological projects of a fundamental character in close cooperation with top scientific institutes in Europe or under their coordination. The strongly competitive environment is good for establishing young scientists especially in the European Research Area.

Collaboration in international teams creates good possibilities for publishing papers in high quality periodic journals.

ILE SAS has been trying to change our publishing strategy, which was previously evaluated negatively. We shifted the focus from publishing the results of scientific work in monographs to publications in high-quality periodic journals (scientific journals registered in *Current Contents* and Scopus databases). Within the Institute we annually publish 15-20 publications in journals registered in the *Current Contents* and Scopus databases. The results of our research were also published in such prestigious journals as *Science* (31.201 - IF2011), *Conservation Biology* (4.666 - IF2009) etc. Our results are also published in the international monographs that are published by the prestigious publisher Springer. We continue to publish very popular and attractive atlases. The landscape archetype catalogue for Slovakia has been published in this assessment period.

This change of approach to publication has been reflected in the citation of our papers. While in 2011 we had only 85 citations in Web of Science, in 2014 this increased to 409, a 481% increase. In particular, we achieved high citation ratings for complex collaborative publications presenting results of comprehensive landscape surveys comparing several countries or regions. Papers of this nature accounted for more than 100 citations in the Web of Science and Scopus databases.

The Institute of Landscape Ecology seeks to continuously improve the qualification level of employees. During the assessment period 3 employees gained rank II.a, one employee was awarded the title of professor, one employee is preparing for habilitation and one is preparing his thesis for gaining the title DrSc. A complicated bureaucracy hampers us in obtaining the prof. and DrSc. titles because of the continuously shifting criteria for DrSc. titles. Currently, there is no commission for landscape ecology in our landscape, so our employees must apply for a degree within related fields, which is not very favourable to employees of ILE SAS, where the team is assembled on an interdisciplinary basis. This factor significantly limits our success in this area.

Compared to the previous period, there is visible improvement in pedagogical activities of ILE SAS. The proportion of PhD students completing their doctoral studies is balanced. During the assessment period 9 students started PhD study at our Institute, and 9 PhD students completed their studies. We noticed increased interest in study stay by foreign students. During the assessment period we accepted two postdocs from Poland, one PhD student from the Czech Republic, and two Master students from Belgium. We noticed this increased interest again this year.

- **Supplementary information and/or comments on management, research infrastructure, and trends in personnel development**

The Institute of Landscape Ecology has long-term problems with maintenance and operation of research stations in the Východná village. Lack of funds for maintenance have led to rain water leaks and wetting the interior walls of the building, which in turn can lead to distortions of material throughout the building. The problem is the dilapidated windows and doors, whose poor functionality poses a risk of break-ins. Several such attempts have already been recorded in the last year. At the same time the limited functionality of windows and doors increases the demand for heating in the building. We are not able to cover such expenditure from our budget. We were already trying to get funding for the reconstruction of the building from the Structural Funds; unfortunately we have not found an appropriate grant scheme within which we could implement something like this. We have submitted a project proposal *Research of the methods of assimilation of environmental modelling in the process of landscape ecological planning and integrated management of land*, which could at least partially solve these problems. In this project we propose to reconstruct the research station in Východná village and renovate the laboratory for research on the mountain landscape.

Social conditions in Slovakia are not favourable for the development of science and we regularly face budget cuts and lack of funding for development of the Institute. We are trying to cover these

cuts through funding *via* contracting projects, which significantly decreases the capacity for scientific development of our Institute. We have received top-quality equipment through the Structural Funds, but the operation of this requires highly qualified staff, of technicians as well as scientists. However, the budget of ILE SAS is not sufficient to ensure this. We also have to seek additional funds through various grant schemes to cover staff costs, which is not easy and does little to ensure stability and continuity of personnel. This is one of the biggest and most important challenges which ILE SAS is facing in the future.

3. Research strategy and future development of the institute for the next five years (2016-2020) (Recommended 3 pages, max. 5 pages)

3.1. Present state of the art in both the national and the international contexts

Landscape research is a complicated issue because the landscape is a very complex system which has numerous abiotic, biotic and socio-economic aspects. Landscape ecology as a science has only been established in recent decades. ILE SAS is proud to declare that a high standard of landscape ecology in Slovakia has been achieved, thanks mainly to the scientific activities of its researchers and scientists. Renowned methodologies such as LANDEP, a broad spectrum of scientific activities, and excellent scientific results have influenced environmental policy decisions. In recent years, the results of scientific projects have become broadly utilized in solving many problems connected with landscape planning, intelligent use of natural resources, and nature protection.

European and world-wide research trends are increasingly emphasizing theories and concepts which regard the sustainable development of society as only possible through consideration of scientific knowledge gained through basic ecological and landscape-ecological research. The concept of sustainable development generally accepted in the developed world has also influenced landscape ecology in Slovakia in three areas - environmental, social, and economic. These have become the basis for the environmental program of development for the new Millennium, which was declared and accepted at the UN Conference on the Environment and Development at the Earth Summit in Rio de Janeiro (1992), and later endorsed by the Summit in Johannesburg (2004). Despite the fact that the concept of sustainable development has been widely accepted for several years, however, the obstacles identified at the time cannot be said to have been solved.

Not only in Slovakia, but also globally, we can see a range of environmental problems that show society is not developing in a sustainable direction. In terms of ensuring sustainable development it is necessary to address these problems urgently and unconditionally. The European Union has defined 11 fundamental megatrends, which urgently require addressing to ensure sustainable development. These global megatrends (GMT) are widely-discussed issues, and not only in scientific and political circles – they have also got the attention of the general public, due not only to their direct impact on human society, but also to their effects on the diversity of plants, animals, fungi and microorganisms in the ecosystem. The effects of the GMTs are not well-understood, as many have only begun to show up in recent years. The relationships between the GMTs are also still unknown, and there are also many shortcomings in our knowledge of their impact on the Slovak landscape and its components, elements, phenomena and ecosystem processes. However, many of the consequences of the GMTs are increasing in severity. If we want to address these of GMTs we need to pay careful attention to monitoring and researching them.

This reality is the driving force for landscape-ecological research at present and in the foreseeable future. Besides GMT, the study of the landscape is and will be focused on the possibilities of sustainable utilization and development of the landscape, sustainable use of ecosystems and their services, intelligent use of nature and natural resources, protection of the environment, landscape stability, biodiversity conservation, and adaptation to and mitigation of global change effects. This research must be implemented on an interdisciplinary basis.

The main factors, which have an influence on (or are demanded by) the development of landscape-ecological research at both a national and global level, are:

- *Constant pressure on ecosystems. Loss of biodiversity and lack of knowledge about species and ecosystem diversity, and landscape diversity, particularly its spatial distribution and representativeness* – The lack of knowledge of biota development, depending on the characteristics of the environment (particularly of abiotic factors), and constant threat to ecosystems posed by the impact of human activities will be the main issue for research to address going forward. Ecosystems are being constantly threatened and degraded despite their irreplaceable importance in the landscape. According to information from FAO, up to 60% of the world's ecosystems are degraded and used unsustainably, and since

1990 up to 75% genetically important crops in the world have disappeared. In the EU only 17% of habitats and 11% of key ecosystems and species protected by European legislation show a favourable condition. In 2001 measures were taken to fight against biodiversity loss, but the pressure on Europe's biodiversity continues to grow. We can consider the main pressures and negative impacts on biodiversity change to be land-use change, over-exploitation of ecosystems and their components, the spread of invasive species, and pollution of environmental components (GMT 10), particularly air pollution. Another important factor is climate change (GMT 9). A number of indirect factors play a role within the whole complex, such as population growth (GMT 1), lack of environmental awareness regarding biodiversity and its importance, and others. The situation in Slovakia is similarly unfavourable. According to the Ministry of Environment of the Slovak Republic (2014), vulnerability of non-vascular plants in Slovakia is currently 17.6% (including fungi), endangerment of vascular plants is 42.6%, vulnerability of invertebrates in Slovakia is currently about 8.4%, and endangerment of vertebrates is up to 59%.

- *The influence of negative, so-called stress factors resulting from the impact of particular socio-economic activities on the landscape and its individual components* - although today we can see some positive trends in the decline of pollutants, mainly due to the implementation of new technologies in industry and agriculture, there are ongoing effects of contaminants on the environment. Primary problems are the growth of CO₂ due to increased traffic, and the build-up of toxic substances - biphenyls, volatile organic compounds (VOC) etc. A significant environmental problem facing Slovakia in the next decade will be the persistent negative effect of foreign substances in the soil, geological substrate, and groundwater, as a result of old environmental burdens. Another problem which persists from past times to the present day is a predominance industrial companies which are highly demanding with regards to energy and resources. In the aftermath of the end of Communism, some positive changes did occur in terms of the impact of agriculture on biodiversity – including decrease in the use of chemicals and machinery and in the intensive exploitation of permanent grasslands– but the gradual abandonment and synanthropisation of agricultural land are slowly damaging the biodiversity. The significant growth of tourism is also a problem, as it puts pressure on locations noted for biodiversity, and large-scale events and thriving tourist resorts can have various negative impacts on nearby ecosystems.
- *Impact of climate change* – climate change, along with increased occurrence of natural disasters (landslides, erosion processes, floods, fires etc.), increasing droughts etc., negatively affect biota and human health, and can cause ecosystem collapse; they also pose a threat to many sectors of the economy, particularly agriculture, forestry and water management, and recreation and tourism. The increasing problems associated with climate change will necessarily call for: continuous monitoring and evaluation of the major macroclimatic and hydrological parameters in relation to the biota and ecosystems; appropriate environmental regulations in a range of policy sectors – agriculture, water management, forestry, urbanization, and others; and the creation of an integrated system of prevention or mitigation of the consequences of natural disasters. Constructing such a system will require a systematic and integrated approach to research and management of land use.
- *Constantly-increasing pressure on and exploitation of resources* – investment pressure on ecologically vulnerable areas etc. Economic areas tend to use more resources as they are growing, mainly renewable resources but also non-renewable reserves of minerals, metals and fossil fuels. Industrial development and changing consumption patterns are contributing to the increased demand for and pressure on resources. Unrestrained capital development which does not respect the limits required by natural conditions, stability, vulnerability, ecological sustainability and biodiversity conservation, nor consider the effects of increased fragmentation and isolation of ecosystems as a result of investment projects (building highways, industrial parks, etc.) may pose a high risk to the functional properties of landscape systems and can cause serious environmental problems.
- *The obligations and requirements resulting from international conventions and agreements ratified by Slovakia, obligations and requirements arising from the accession of Slovakia to the European and world structures (NATO, OCED and EU)* – the SR is bound by a large

number of major international conventions, a set of international agreements, treaties, charts related to issues of biodiversity conservation and stability. Their implementation can significantly affect research in the environmental field.

3.2. Research strategy of the institute in the national and the international contexts, objectives and methods

The research strategy of the Institute of Landscape Ecology of the Slovak Academy of Sciences (ILE SAS) for the upcoming time period fully respects 1) the development of landscape ecology 2) the current state of landscape ecology as a science on the European and global scales as well as 3) the visions and ideas of its future development.

The basic objective of the scientific research of ILE SAS is to develop further the scientific fundamentals of landscape ecology and its practical applications in response to environmental and societal challenges that we are facing currently and expect in the future. The Institution's activities will build on its previous successful outcomes and will be implemented in accordance with the development of the theory and methods of landscape ecology. Research on the landscape, its elements and processes, and phenomena occurring in the landscape at different hierarchical levels remains one of the main tasks of the Institute.

Landscape-ecological research has to be based on an interdisciplinary foundation. The landscape has to be understood as a geo-system, i.e. in terms of elements of the landscape and the relationships between them. The analyses of individual landscape elements as well as the landscape-ecological synthesis form the basis for the elaboration of proposals for the optimal rational utilization of the landscape and its elements. Integrated management of the landscape, as an invaluable tool in the implementation of sustainable development, should be among the core activities of the Institute.

One of the most pressing research topics that ILE SAS is focused on is global megatrends research and their impact on the landscape. Research will be focused on mapping, spatial modelling of GMT and assessment of GMT influences on the landscape structure, its individual components, and on the phenomena and processes occurring in the landscape. These changes will also be investigated in relation to decision-making processes, particularly in relation to integrated land management and the spatial planning process, especially regarding whether current decision-making tools are able to respond to ongoing changes in the structure of the landscape due to climate change, as well as regarding whether scientific methods are sufficiently developed to provide appropriate information for integrated landscape management in the changing conditions. The results will be formulated into measures and rules for spatial planning processes (regional, local and landscape-ecological planning) and to ensure the sustainable use of the resources and potentials of the area. This complex issue is at levels – national, European and international – driven mainly by the need to ensure sustainable development and is a very pressing issue due to its significant social impact. The selection of additional research topics is closely linked to research in the previous period and will continue. It focuses mainly on the following topics:

- **Mapping of ecosystems and assessment of ecosystem services** - this is a very relevant and highly prioritized topic not only in Slovakia but also in the territory of EU. Leading scientific and research institutions in the EU and around the world are dealing with this concept and the issue is addressed at the European level and within the EU framework programs. We focus on the elaboration of methods for mapping ecosystems and evaluation of their ecosystem services at different hierarchical levels (national, regional and local), and defining development trends and changes in ecosystems, landscapes and regions due to global megatrends. We focus also on the definition of changes in biodiversity in order to propose the integral use of ecosystem services at different hierarchical levels in the interest of maintaining biodiversity and ecological stability
- **Research and innovative methods of landscape planning** – researching and developing innovative methods of efficient use of resources and potential of an area, together with an economic assessment of the benefits derived from its geosystems based on integrated landscape research, will make it possible to convert the most modern methods of modelling

environmental processes into a basic methodological framework, which will lead to eliminating the major deficiencies and anachronisms of current methods and will ultimately increase the accuracy and objectivity of research outcomes.

- **Spatial-temporal integrated modelling of response and adaptability of ecosystems to climate changes and extreme weather events** – this consists of: designing models for operational determining of the spatial extent and intensity of the impact of sudden climatic and geodynamic situations or other catastrophic events related to climate change, especially floods, droughts, excessive drainage, water and wind erosion, landslides and their impacts on ecosystems; the establishment of a framework of proposals for measures on adaptation and sustainable use of natural resources; development of web portals for users; and temporo-spatial modelling of response and adaptability of ecosystems to climate change and extreme weather events using remote sensing and GIS. This comprehensive topic is very relevant because of its significant social impact at the national, European and international levels, particularly with regards to ensuring food safety and food quality.
- **Long-term ecosystem research in the European LTER network** - Modelling of ecosystem changes and the services they provide as a result of global change, modelling of the impact of global change on the quality of ecosystems, preferably at sites of the international network for long-term ecosystem research (LTER), including proposals for the management and efficient use of ecosystem services, the creation of research databases for areas included in LTER network.

The Institute will continue the following activities which have been undertaken in the previous period and whose continuation involves international obligations:

- **Mapping and assessment of traditional agrarian landscapes (TAL), including ecosystem services (ES)**, or benefits of ecosystems, which these TAL provide - TAL research is one of the main long-term research purposes of ILE SAS. ILE SAS intends to act as an expert workplace monitoring TAL for the Ministry of Agriculture and Rural Development of the Slovak Republic, as ILE SAS is already expected to assess the effectiveness of agri-environmental schemes and will also participate in the creation of a methodology for assessment of the Rural Development Programme for the previous and upcoming programme period.
- **Observation, monitoring and assessment of mountain flora influenced by climate change:** This research is carried out within the framework of the follow-up activities of the project GLORIA (Global Observation Research Initiative in Alpine Environments). Collection and evaluation of data is conducted at regular time intervals.
- **Assessment of spatial and temporal trends of accumulation of heavy metals and nitrogen in mosses in Slovakia for 25 years**, which is realized within ICP Vegetation (the OSN Convention program on long-range transboundary air pollution). Data collection and evaluation are conducted regularly every three years.

ILE SAS is a center of excellence for biodiversity and landscape and has newly-built infrastructure from the Structural Funds. This consists of GIS and remote sensing laboratories, UAV laboratory and field laboratories for ecosystem research. This system supports the full cycle of work with spatial data: from the preparation of research and data collection (field work, remote sensing, published sources), through analysis, synthesis and interpretation, to the preparation of proposals for landscape-planning and landscape management. These laboratories are used mainly for research activities aimed at mapping, monitoring and spatial modelling of environmental parameters, land cover and habitats. Currently, we are preparing completion and consolidation of the existing remote sensing and UAV laboratories to create a comprehensive Centre of Applied Remote Sensing (CA-DPZ) allowing a nationwide synthesis of information on the state of the Earth's surface, vegetation, environmental monitoring and water quality monitoring, including the possibility of predictive modelling of their development and response to climate anomalies. In connection with this we are also engaging in the development of **innovative ICT products, applications and services** using nationwide spatial information on the Earth's surface based on remote sensing and GIS. The state of nationwide information about the landscape, vegetation, aquatic ecosystems and the Earth's surface significantly determines the quality of decision making processes in the field of landscape planning,

agriculture, water management and risk management. The field of ICT should involve the development of innovative technologies based on GIS and RS based on the creation of algorithms to indicate the condition of the landscape, agri-ecosystems and aquatic ecosystems using advanced technical knowledge of artificial intelligence and transfer of knowledge base (ie. knowledge transfer approaches) as well as development of techniques of spatialtemporal modelling, including the creation of predictive models.

The concept of the Institute will be implemented through scientific projects including funding from national and international grants. The goal of the Institute is to maintain successful participation in international projects, especially in projects in the Horizon 2020 programme. It is necessary to continue the state of broad international cooperation achieved in the previous period. This can be accomplished by the continual participation of the Institute in international research projects and networks such as ALTER-Net, Landscape Europe, Science for Carpathians etc. as well as the support of long-term research on ILTER localities. Horizon 2020 projects are very important. Participation in these projects enables employees to join international research teams and solve important world-wide problems. ILE SAS is a subsidiary organization, i.e. it participates in contract projects arising from public demand. The selection of projects will be approved jointly with the scientific board of the Institute. Appropriate personal, equipment and financing for long-term landscape ecological research is necessary for the implementation of this concept. We will prefer thematically oriented projects, financially lucrative and with a longer time horizon for their completion, as are projects from the Structural Funds. Currently, we have submitted a project focused on research into possibilities of assimilation methods for environmental modelling in the process of landscape-ecological planning and integrated landscape management, and in the near future we are planning to submit two projects, one focused on the assessment of ecosystems and ecosystem services and the other focused on the use of remote sensing for precision farming.

Concerning Human Resources, management of the Institute will focus on improving employee qualifications, particularly the DrSc. level degree, which will guarantee PhD study. Two employees should gain a DrSc. degree by 2020.

The publication strategy of the Institute has been changed due to the evaluation criteria of scientific institutions. Publishing should focus on publications included in world databases, and less on publications published in proceedings. The Institute will support the publishing of representative scientific monographs which represent research outcomes. Publication activities are still the most significant indices of an employee's evaluation. The main goal of the Institute is at least two contributions a year per employee published in CC journals.

ILE SAS will continue with its editorial activities (journals Ecology (Bratislava), Environment, Ecological Studies and monographs) and make a profound effort to have Ecology (Bratislava) included in Current Contents (by 2019) and the journal Environment in the SCOPUS database (by 2019).

ILE SAS will also continue organizing traditional international symposia (the 18th International landscape-ecological will be in September 2018) and periodical conferences – for example, Implementation of Sustainable Development (2017, 2020).

Regarding public acceptance, ILE SAS has to improve its contact and cooperation with governmental as well as non-governmental organisations, regional governments and municipalities, i.e. with all the organisations utilizing the scientific output of our Institute (2015 – 2019).

ILE SAS will support cooperation with scientific societies and networks, especially with the Slovak Ecological Society (associated with the Institute) and the Slovak Association of Landscape Ecology (IALE-SK).

ILE SAS will also support international cooperation. Positive interaction and cooperation with international institutions must be one of the fundamental elements of the institute's activities. Maintaining contacts and cooperation will be especially necessary with the European Environmental Agency, The Ecological Department of the head office of UNESCO, the European Council and the European Centre of Nature Protection. Partnership within landscape-

ecological oriented institutions of the V4 countries should also play a significant role. ILE SAS will support participation in landscape-ecological, ecological and environmental projects within the Danube Strategy program and Science for Carpathians network.

Project proposals submitted to 7RP or H2020	2012	2013	2014	2015
Institute as coordinator	1	0	2	0
Institute as participant	2	2	2	3

4. Other information relevant for the assessment

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Bratislava, 3 July 2016

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