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ENVIRONMENT, SOCIETY, POLITICS**

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ABSTRACTS

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P R E F A C E

The European Landscape Convention of the European Council entered in force in Georgia in January 1, 2011. Affiliating the Convention and thus undertaken obligation of protection, care, restoration and development of landscape showed the new understanding of the concept of landscape and the need for new approaches to research and education. That is why the collecting and understanding of different scientific concepts of landscape has come up in agenda in the context of the landscapes in the prism of the European Convention view, which considers landscapes as a field that people perceive, and the nature of which is determined by the action and interaction of natural and human factors. Along with the affiliating to the Convention, the country faced a new challenge to create a national strategy of landscapes, which should be unquestionably based on scientific research.

The European Council's almost all member states are affiliated to the European Landscape Convention and at present are at different stages of introduction of the Convention. Among the states that are not affiliated to the Convention, are Germany and Austria, however, they independently have their national policy of landscapes and the relevant regularities and the great experience of research in landscape sciences. International multidisciplinary combined event "Actual Problems of Landscape Sciences: Environment, Society, Politics" to be held on September 9-13, 2019 at the Ivane Javakhishvili Tbilisi State University, Tbilisi, Georgia, recognizes the ideals and values stated in the European Landscape Convention and responds to its challenges, which emerged in Georgia before science, society or country with the accession to the Convention.

This international event combines natural, social, humanitarian and applied directions and includes both, the Conference and Seasonal School.

The event will gather the scientists from the countries accessioned to the European Landscape Convention and also from those countries, which have not ratified the Convention document so far but have a broad experience in landscape studies.

The event objectives are as follows:

–To promote the dialogue on landscape surveys and exchange/share knowledge and experience; to present achievements of Georgian scientists, their integration into the international scientific sphere and to strengthen the cooperation in order to prioritize future research surveys and develop innovative directions;

–To attract young people to science, represent young researchers, popularize the studies carried out by them and promote their professional growth in order to involve them in future international or local research projects;

–To represent the role of multidisciplinary approaches in landscape studies.

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PLENARY SESSION

**PATHWAYS FOR LANDSCAPE VALORIZATION THROUGH
AGRICULTURAL MANAGEMENT**

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Abstract

With an area share of around 50% on the global average, agricultural land use shapes our planet and thus our landscapes like no other form of land use (IPCC 2019). We all are aware of examples on how the type of agricultural land use and its intensity affect landscapes and their functions. The increasing consideration of the concept of ecosystem services and their provision by agriculture, primarily by politics but also increasingly by markets and consumers, has, since about 2005, created a great awareness to take a closer look at the relationship between agricultural production, the demands of society and the natural environment. It also led to increasing support for farmers to optimise this relationship, e.g. in the EU through monetary incentives within the framework of the Common Agricultural Policy.

For a long time, the prevention of dysfunctional landscape conditions through inappropriate agricultural use had been focal perspective. Then the concept of ecosystem services has established the valorisation of landscape functions as a field of research. However, it is difficult for us to describe in a targeted manner the synergistic relationship between agriculture and landscape, especially if we define the concept of landscape more broadly than its specific functions or services.

This contribution aims to reflect on different pathways of landscape valorisation and to compare experiences from European research and rural development examples with what we perceive as promising developments in Georgia.

This paper examines the relationship between agriculture - landscape –and valorisation from the perspective of concepts, strategies and drivers.

First, a conceptual distinction is made as to how "landscape" reference is addressed in the agricultural sector via (i) product and marketing (PDO, PDI) or (ii) production system or social-ecological system (SES). The reference levels of actors, location, policy, land use system are introduced. Exemplary strategies (diversification, sustainable intensification) and the role of drivers e.g. innovation, cooperation, knowledge, civil society will be discussed.

Above all, examples will be presented that allow us to demonstrate that the valorisation of landscape preferably adopts place-based approaches and solutions. Often the combination of drivers, e.g. cooperation and knowledge, or civil society integration, is an important characteristics.

References:

- [1] Häfner, K., Zasada, I., van Zanten, B., Koetse, M., Ungaro, F., Piorr, A. (2018). Assessing Landscape Preferences: A visual choice experiment in the agricultural region of MärkischeSchweiz, Germany. *Landscape Research*, 43, 6, 846-861.

- [2] Rivaroli, S., Ghelfi, R., Bertazzoli, A., **Piorr, A.** (2017). Diversification pathways and farming systems: Insights from the Emilia-Romagna region, Italy. *Outlook on Agriculture* 46, 4, 239-247.
- [3] Schaller, L., Targetti, S., Villanueva, A. J., **Zasada, I.**, Kantelhardt, J., Arriaza, M., Bal, T., Fedrigotti, V. B., Giray, H., **Häfner, K.**, Majewski, E., Malak-Rawlikowska, A., Nikolov, D., Paoli, J.-C., **Piorr, A.**, Rodriguez-Entrena, M., Ungaro, F., Verburg, P. H., Van Zanten, B., Viaggi, D. (2018). Agricultural landscapes, ecosystem services and regional competitiveness - assessing drivers and mechanisms in nine European case study areas. *Land Use Policy* 76, 735-745.
- [4] Schmidt, M., Weißhuhn, P., Augustin, J., Funk, R., Häfner, K., König, H., Loft, L., Merz, Ch., Meyer, C., Piorr, A., Reutter, M., Stachow, U., Stein-Bachinger, K., Matzdorf, B. (2017). Evaluation of the ecosystem services approach in agricultural literature. *One ecosystem*, 2: e11613.
- [5] Ungaro, F., Häfner, K., Zasada, I., Piorr, A. (2016). Mapping cultural ecosystem services: connecting visual landscape quality to cost estimations for enhanced services provision. *Land Use Policy*. 54, 399–412
- [6] Weltin, M., Zasada, I., Franke, C., Piorr, A., Raggi, M. Viaggi, D. (2017). Analysing behavioural differences of farm households: An example of income diversification strategies based on European farm survey data. *Land Use Policy*. 62, 172–184.
- [7] Weltin, M., Zasada, I., Piorr, A., Debolini, M., Geniaux, G., Moreno Perez, O., Scherer, L., Tudela Marco, L., Schulp, C. J. E. (2018). Conceptualising fields of action for sustainable intensification - a systematic literature review and application to regional case studies. *Agriculture, Ecosystems & Environment* 257, 68-80.
- [8] Zasada, I., Häfner, K., Schaller, L., Lefebvre, M., Malak-Rawlikowska, A., Nikolov, D., Rodríguez-Entrena, M., Soledad Manrique Paredes, R., Ungaro, F., van Zanten, B.T., Zavalloni, M., Laurence D., Kantelhardt, J., Piorr, A., Verburg, P.H., Viaggi, D. (2017). A conceptual model to integrate the regional context in landscape policy, management and valorisation: Literature review and European case study evidence. *Geoforum* 82, 1-12.
- [9] Zasada, I., Reutter, M., Piorr, A., Lefebvre, M., Gomez-Y-Paloma, S. (2015). Between Asset Investments and Capacity Building – Development and Application of a novel Conceptual Framework to Analyse the Design of Rural Development Policy in EU Regions. *Land Use Policy* 46,178-188.
- [10] Zasada, I., Weltin, M., Reutter, M., Verburg, P. H., Piorr, A. (2018). EU’s rural development policy at the regional level - are expenditures for natural capital linked with territorial needs? *Land Use Policy* 77, 344-353.

MAINSTREAMING ECOSYSTEM SERVICES IN SUSTAINABLE LANDSCAPE PLANNING AND DEVELOPMENT

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Abstract

Ecosystem services (ES) are meanwhile accepted as a key concept to enhance the understanding of the value of nature for supporting human well-being and as a means to enforce the implementation of societally highly relevant goals, such as the Aichi Targets and particularly the UN-Sustainable Development Goals (UN-SDGs) [1, 2]. However, even if ES reached the policy level as documented very prominently in the Intergovernmental Panel for Biodiversity and Ecosystem Services (IPBES) or EU Biodiversity Strategy Processes, their implementation and use as decision criteria in practical planning is still limited [3, 4, 5, 6].

Reasons for this lack in practical implementation are, on the one side, long-term established and well known concepts, such as sustainability and multi-functionality with their particular relevance for landscape planning and regional development [7]. On the other side, the scientific discussion on the terminology of ES, whether to continue with the term “Ecosystem Services”, call them “Nature’s Contribution to People”, or “Natural Capital”, was contra-productive for creating trust in the scientific reliability of the concept and enhancing its use in practice [8, 9].

Another aspect is, how to mainstream ES most efficiently, so that they become mandatory as reference and theoretical framework for planning. Analyses of planning documents often show an inherent use of the concept without mentioning it explicitly, which might create confusion whether the state of art of implementation [10]. More successful approaches might therefore look at the next upper level of implementation, which in most countries is the Strategic Environmental Assessment (SEA) of policies, plans and programs [11]. Within this framework, ES can be implemented as criteria to judge the quality of the plans and their implications for a well-balanced consideration of provisioning, regulating and cultural services.

Fig. 1 summarizes how ES, here referring to the CICES (Common International Classification of Ecosystem Services [12]) cascade could connect the typical steps along impact assessment with the spatial planning process.

A requirement to enable the implementation of ES as a means for quality assessments of spatial plans is their implementation in model-based scenario simulations that anticipate potential changes in land use and land use pattern and their impacts on ecological functions. Simultaneously, projections how demographic changes, population growth, changed consumption needs and influences of different policy sectors will impact the demand for ES are required to pre-test if the planned regional development will ensure a sufficient and sustainable provision of the services and to assess to which extent potentially services from outside need to be imported [13].

Besides this more practical mainstreaming to make ES fit to the process chains in landscape planning and impact assessment, other pathways are needed to increase its societal perception as a useful reference for sustainable development. One aspect that is so far often neglected is the implementation of ES in curricula of study courses addressing the planning and management of (natural / social-ecological) systems. Key competences how to identify appropriate indicators and combine qualitative and quantitative knowledge sources as well as how to deal with missing knowledge in ES assessments are so far only randomly addressed and not systematically implemented in many environmental study programs.

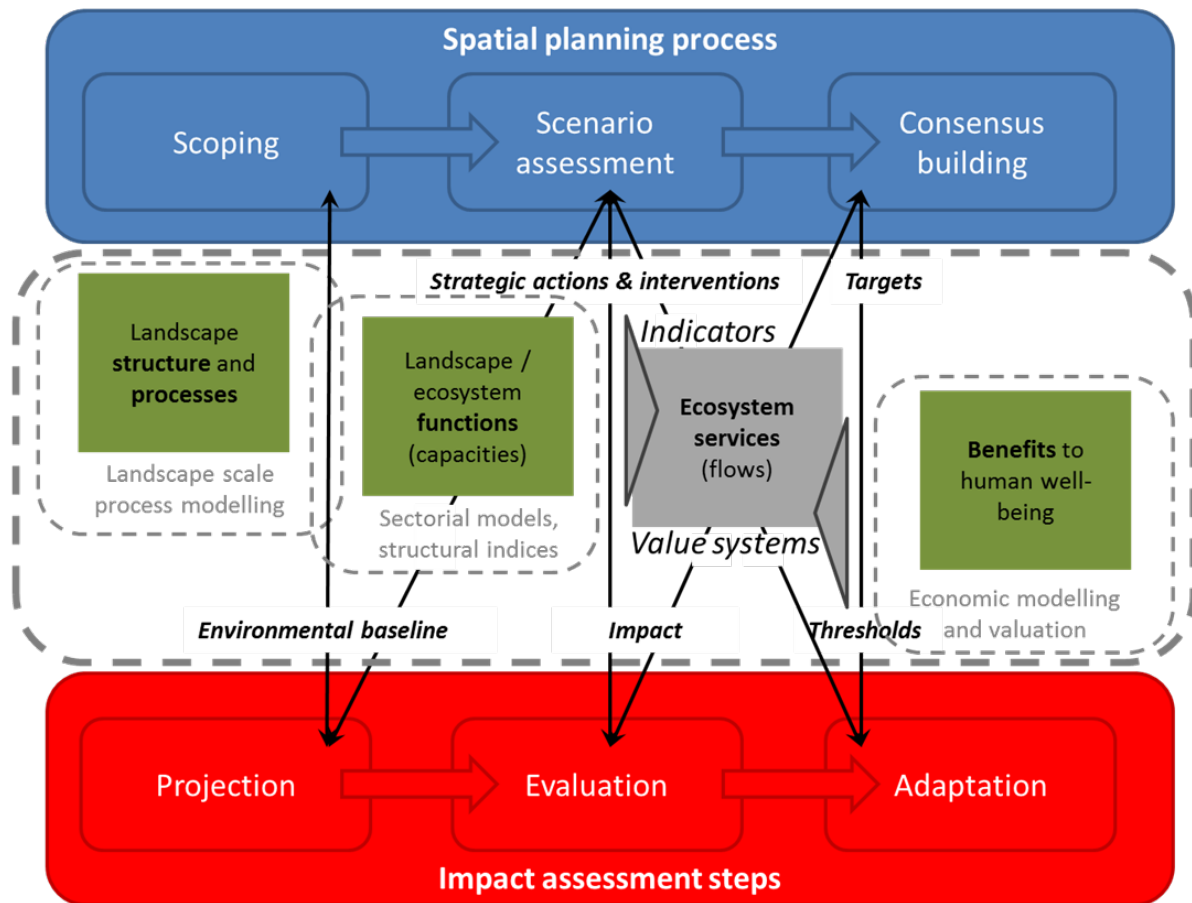


Fig. 1: Conceptual framework for implementing ES in spatial planning and impact assessment.

Also, ES as term are so far mostly missing in school and non-school environmental education. Mainstreaming of ES for in sustainable landscape planning and development thus should already start with a rigorous training of the younger generation to provide them with the skills to handle this concept either as future non-professional actors, stakeholders or experts in planning processes.

References

- [1] Geijzendorffer, I. R., Cohen-Shacham, E., Cord, A. F., Cramer, W., Guerra, C., & Martín-López, B. (2017). Ecosystem services in global sustainability policies. *Environmental Science & Policy*, 74, 40-48.
- [2] Brooks, T. M., Butchart, S. H., Cox, N. A., Heath, M., Hilton-Taylor, C., Hoffmann, M., Kingston, N., Rodriguez, J.P., Stuart, S.N., Smart, J. (2015). Harnessing biodiversity and conservation knowledge products to track the Aichi Targets and Sustainable Development Goals. *Biodiversity*, 16(2-3), 157-174.
- [3] Spyra, M., Kleemann, J., Cetin, N. I., Navarrete, C. J. V., Albert, C., Palacios-Agundez, I., Ametzaga-Arregi, I., La Rosa, D., Rozas-Vasquez, D., Esmail, B.A., Picchi, P., Geneletti, D., König, H.J., Koo, H., Kopperoinen, L., Fürst, C. (2018). The ecosystem services concept: a new Esperanto to facilitate participatory planning processes?. *Landscape Ecology*, 1-21.

- [4] Larigauderie, A. (2015). The Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES): a call to action. *GAIA-Ecological Perspectives for Science and Society*, 24(2), 73-74.
- [5] Fürst, C., Opdam, P., Inostroza, L., & Luque, S. (2014). Evaluating the role of ecosystem services in participatory land use planning: proposing a balanced score card. *Landscape ecology*, 29(8), 1435-1446.
- [6] Maes, J., Egoh, B., Willemen, L., Liqueste, C., Vihervaara, P., Schägner, J. P., Grizetti, B., Drakou, E.G., La Notte, A., Zulian, G., Bouraoui, F., Paracchini, M.L., Braat, L., Bidoglio, G. (2012). Mapping ecosystem services for policy support and decision making in the European Union. *Ecosystem services*, 1(1), 31-39.
- [7] De Groot, R. S., Alkemade, R., Braat, L., Hein, L., & Willemen, L. (2010). Challenges in integrating the concept of ecosystem services and values in landscape planning, management and decision making. *Ecological complexity*, 7(3), 260-272.
- [8] De Groot, R., Costanza, R., Braat, L., Brander, L., Burkhard, B., Carrascosa, J. L., Crossman, N., Egoh, B., Geneletti, D., Hansjuergens, B., Hein, L., Jacobs, S.J., Kubiszewski, I., Leimona, B., Li, B., Liu, J., Luque, S., Maes, J., Marais, C., Maynard, S., Montanarella, L., Moolenaar, S., Obst, C., Quintero, M., Saito, O., Santos-Martín, F., Sutton, P., van Beukering, P., van Weelden, M., Willemen, L. (2018). Ecosystem Services are Nature's Contributions to People: Response to: Assessing nature's contributions to people. *Science Progress*, 359(6373).
- [9] Díaz, S., Pascual, U., Stenseke, M., Martín-López, B., Watson, R. T., Molnár, Z., Hill, R., Chan, K.M.A., Baste, I.A., Brauman, K.A., Polasky, S., Church, A., Lonsdale, M., Larigauderie, A., Leadley, P.W., van Oudenhoven, A.P.E., van der Plaats, F., Schröter, M., Lavorel, S., Aumeeruddy-Thomas, X., Bukvareva, E., Davies, D., Demissew, S., Erpul, G., Failler, P., Guerra, C.A., Hewitt, C.L., Keune, H., Lindley, S., Shirayama, Y. (2018). Assessing nature's contributions to people. *Science*, 359(6373), 270-272.
- [10] Cortinovis, C., Geneletti, D. (2018). Ecosystem services in urban plans: What is there, and what is still needed for better decisions. *Land use policy*, 70, 298-312.
- [11] Rozas-Vásquez, D., Fürst, C., Geneletti, D., Almendra, O. (2018). Integration of ecosystem services in strategic environmental assessment across spatial planning scales. *Land use policy*, 71, 303-310.
- [12] Potschin, M. B., & Haines-Young, R. H. (2011). Ecosystem services: exploring a geographical perspective. *Progress in Physical Geography*, 35(5), 575-594.
- [13] Larondelle, N., & Lauf, S. (2016). Balancing demand and supply of multiple urban ecosystem services on different spatial scales. *Ecosystem Services*, 22, 18-31.

COMMUNICATING LANDSCAPE FUTURES FOR PARTICIPATION AND DECISION-MAKING

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Abstract

Planners and designers communicate their plans and designs within their own disciplines, to cognate disciplines involved in the relevant projects and also to the wider public and the lay people.

It is typically assumed that the involved parties are able to understand what is communicated by the planning and design experts. However, the 'language' of planners and designers, i.e. plans, requires a certain level of expertise and understanding. There is a broad palette of technologies available to represent landscape futures. In recent years digital landscape representations showing the results of planning and design in perspective view have been widely used. These representations are typically shown as static visualizations or as animations at its best. While they may appear highly realistic, human perception is neither static nor is it fixed to a certain animated sequence. Humans perceive their environment in a dynamic way, and they also perceive the environment beyond the visual sense, including all the senses for a comprehensive sensory experience. There is a strong prospect that this limitation might be overcome by new developments in augmented reality permitting the user to experience landscape futures while on site and in the real multisensory world.

Keywords: Landscape planning, landscape visualization, sensory experiences, public participation, decisionmaking.

INVESTIGATION OF PRECIPITATION DEPENDENCE ON TEMPERATURE UNDER THE GLOBAL WARMING ON THE TERRITORY OF GEORGIA BASED ON HIGH RESOLUTION 1936-2011 GRID DATA SET

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Abstract

Based on 25km resolution grid climatic data for the 1936-2011 period, obtained at the Institute of Hydrometeorology of Georgia, the effect of air temperature on the precipitation change pattern during global warming was investigated.

The relationship between temperature and precipitation change rates under global warming conditions is mostly negative and is well manifested in all seasons of the year and in general for the year, but in the cold period of the year the positive relationship prevails.

It is established that the temperature and precipitation changes nature in the grid nodes is in close connection with the landscape type. The air temperature decline against the background of increasing or decreasing precipitation is noted mainly in humid landscapes, which is explained by the heat outflow on evaporating or melting. In the non-humid landscapes, however, the air temperature mostly rises and precipitation mainly decreases.

Keywords: Temperature, precipitation, global warming, landscape change rate

ANTICIPATED IMPACT OF THE CONSTRUCTION OF ANAKLIA PORT ON THE ADJACENT COASTAL LANDSCAPES

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Abstract

The future development of the marine transport system of Georgia, the necessity of which is undoubted, largely depends on the harboring potential of the Kolkheti seacoast. Among them should be noted the district in front of the Enguri River estuary, which has the most favorable natural conditions for port construction due to the great depths of the Enguri submarine canyon, and it is one of the best in the whole coast for projecting of the future port (Anaklia) here.

Selection of a place for ports in the seashore zone and then designing and building them is a highly responsible task, where a mistake should be excluded. Otherwise, the rebuilding of the already constructed port facilities will be either impossible or too expensive. In this case, irreversible processes are expected that can be expressed in catastrophic changes of seaside landscapes and entire environment. This is particularly about the coasts of accumulation type, where migrations of the beach alluvium during of the sea storms can reach quite large volumes. Therefore, for designing on a high level and proper operating of the future port in Anaklia additional researches and some changes in the port project are needed.

Keywords: Submarine canyon, river sediments, sediment transport

CHALLENGES OF LANDSCAPE SCIENCES IN ENVIRONMENTAL MANAGEMENT AND SOCIETY

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Abstract

Landscape could be defined as a socio-ecological system that consists of natural and/or human-modified ecosystems, and which is influenced by distinct ecological, historical, economic, and socio-cultural processes and activities. Landscapes are increasingly being understood as multifunctional and dynamic entities of social and ecological systems; that is, spatially and/or temporally defined entities where multiple functions and values associated with natural, cultural and societal values are integrated in the interests of both existing and potential land users (Brandt and Vejre 2004, de Groot 2006, Angelstam et al. 2015).

In practice a landscape is often defined by stakeholders at a scale that is small enough to maintain a degree of manageability, but large enough to be able to deliver multiple functions to

stakeholders with different interests. Many critical landscape functions are affected by human interactions with natural processes (Termorshuizen, Opdam 2009), such as climate change mitigation and adaptation, biodiversity, economic productivity, energy security, public health and wellbeing, social cohesion and aesthetic beauty (Bolliger et al. 2010). Consequently, policy-makers, scientists and practitioners have raised arguments for a landscape perspective in land-use planning and management where values, interests and needs are integrated. The development and ratification of the European Landscape Convention is an example in this direction.

At the landscape level, the main challenge is how to decide on the optimal allocation and management of the many different land use options. The sectorial planning paradigm in many European countries has prevailed throughout of the 20th century and resulted in a situation where a mono-functional land use strategy has been adopted as the most economically efficient (Brandt & Vejre 2004). Furthermore, there is often an incoherency in how various sector policies interpret the concept of 'landscape'. Even though sectors such as forestry, agriculture or water management are increasingly including sustainable development objectives in planning, their separate spatial, policy and strategic foci hinders sustainable landscape management across biophysical and jurisdictional borders (Farcy 2004).

Over the past decade, the term, the management and policy approaches underlying importance of landscape approach, are beginning to gain prominence as the limits of narrowly sectoral approaches become more apparent in our interconnected, crowded, resource-constrained and climate-chaotic world. There has been remarkable growth in integrated landscape management activities on the ground and increased support by policymakers, businesses, and leaders to include ILM as a key component of their sustainable development portfolios. Several international organisations (FAO, UN, World Bank etc) and many national governments in Europe, Asia, South-America are recognizing the importance of integrated landscape management for long-term economic, social and ecological sustainability. As momentum builds for landscape thinking, planning and management, clearly articulating core landscape terms and concepts is necessary to advance communication and understanding.

Integrated landscape management (ILM) refers to long-term collaboration among different groups of land managers and stakeholders to achieve the multiple objectives required from the landscape. These typically include agricultural production, provision of ecosystem services (such as water flow regulation and quality, pollination, climate change mitigation and adaptation, cultural values); protection of biodiversity, landscape beauty, identity and recreation value; and local livelihoods, human health and well-being. Stakeholders seek to solve shared problems or capitalize on new opportunities that reduce trade-offs and strengthen synergies among different landscape objectives. Because landscapes are coupled socio-ecological systems, complexity and change are inherent properties that require management.

ILM ensures that by managing the underpinning natural resource base and ecosystem services in a coordinated way, societal needs can be met in the short and long term. Common characteristics of ILM include: generating an agreed vision among stakeholders of landscape goals; adopting practices that achieve multiple objectives; devising strategies to manage spatial and seasonal interactions across different land uses and users; linking institutions and establishing mechanisms for stakeholder dialogue, negotiation and action; and shaping markets, planning frameworks and policies to support desired outcomes.

Integrated landscape management offers specific advantages for implementation of the SDGs compared to sector-specific implementation plans:

1. ***Generate solutions that achieve multiple objectives at once.*** Adopting a landscape approach that systematically considers multiple sectors and diverse stakeholder needs enhances overall policy and program coherence and effectiveness.
2. ***Improve inter-sectoral coordination and cost effectiveness at multiple levels.*** Coordinated strategies and plans encourage synergies among national, sub-national,

and local governments, and make best use of scarce financial resources by reducing redundancies.

3. **Empower communities through multi-stakeholder processes.** ILM is an inclusive, participatory process that engages all stakeholders, including women, youth, mobile communities, indigenous peoples, smallholder producers and other marginalized and vulnerable people.
4. **Enhance transboundary and regional cooperation.** An integrated landscape approach considers ecological connectivity, economic cooperation, and labour migration all in one framework.
5. **Contribute to national and regional strategies for addressing climate change.** By bridging science, practice and policy, climate smart landscapes can achieve mitigation, adaptation and agricultural production objectives while ensuring environmental sustainability.

References

- [1] Angelstam P., Andersson K., Axelsson R., Degerman E., Elbakidze M., Sjolander P., Tornblom J. 2015. Barriers and bridges for sustainable forest management: the role of landscape history in Swedish Bergslagen. In: Kirby K.J., Watkins C. (Eds.), *Changing Woods and Forests. From Wildwood to Managed Landscapes*. CABI, Wallingford, p. 290.
- [2] Bolliger J., Bättig M., Gallati J., Kläy A., Stauffacher M., Kienast F. 2010. Landscape multifunctionality: a powerful concept to identify effects of environmental change. *Regional Environmental Change* 11, 203–206.
- [3] Brandt J., Vejre H. 2004. Multifunctional landscapes. Vol. 1, Theory, values and history, *Advances in ecological sciences*, 1369–8273; 14. WIT Press, Southampton.
- [4] de Groot R. 2006. Function-analysis and valuation as a tool to assess land use conflicts in planning for sustainable, multifunctional landscapes. *Landscape and Urban Planning*, 75, 175–186.
- [5] Farcy C. 2004. Forest Planning in Europe: State of the Art, International Debates, Emergent Tools. In: Andersson F., Birot Y., Päivinen R. (Eds.) *In Towards the Sustainable Use of Europe's Forests-Forest Ecosystem and Landscape Research: Scientific Challenges and Opportunities*, 11–20. Joensuu: European Forest Institute.
- [6] Termorshuizen J.W., Opdam P. 2009. Landscape services as a bridge between landscape ecology and sustainable development. *Landscape Ecology*, 24, 1037–1052.

NATIONAL MAPPING OF ECOSYSTEMS, THEIR CONDITIONS AND SERVICES IN GERMANY

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Abstract

The European Biodiversity Strategy 2020 requires to map ecosystems and their services in all member countries. Thus, Germany is assessing and mapping them on its territory. Therefore, a system of national indicators measuring ecosystem conditions and services has been developed. The presentation gives an overview of the ecosystem mapping and shows results of ecosystem

conditions and ecosystem service assessments for Germany. This nation-wide mapping and assessment of ecosystem services is still an ongoing process.

The national classification of ecosystems is based on the Land Cover data scheme of the project “Coordination of Information on the Environment” and considers the “European Nature Information System” systematics. The ecosystem mapping in Germany makes use of topographical geo-data and spatially high resolved space-born land-cover information. Selected ecosystem services have been assessed by use of quantitative indicators that fit into the Europe-wide indicator schemes. The German indicator-based approach measure ecosystem services in their spatial expression and temporal change and compares them with target values. As far as possible, this is carried out according to the demand-supply concept. In most cases, there is a main indicator that captures the essential service of a certain class, supplemented by several side indicators measuring special aspects.

Keywords: Ecosystem services, habitat, biodiversity, accounting, indicators

CHOICE EXPERIMENTS IN LANDSCAPE RESEARCH: A TOOL TO VALUE CHANGES IN LANDSCAPES AND THEIR CONSEQUENCES FOR HUMAN WELLBEING

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Abstract

The European Landscape Convention defines *landscape management* as “*action, from a perspective of sustainable development, to ensure the regular upkeep of a landscape, so as to guide and harmonize changes which are brought about by social, economic and environmental processes*” [1]. A key element of analyzing economic processes related to landscape management could be defined as the objectives to understand better the whole suite of economic values a population can hold for landscape changes or their avoidance. Accordingly, these values reflect peoples’ preferences for preserving a specific landscape in a particular state (e.g., a pristine is conserved) or developing it into a new status (e.g., a remote area is designed for tourism), they provide decision-makers with valuable information concerning the future management of landscapes.

Economic values become especially important when trade-off have to be made. For example, using a landscape for harvesting renewable energy could conflict with conservation objectives. Economic values associated with both options can illustrate which option is more valuable and can thus contribute to solving use conflicts such as the one mentioned. Another important area of application could be setting payments for ecosystem services. Determining the associated economic values can, however, be difficult since landscapes are public goods [2, 3]. In this case, markets often fail, and thus, the economic values cannot, at least not completely, be derived from existing markets. Therefore, values associated with public goods such as landscapes are mainly so-called non-market values, and a conceptual framework to organize the different types of market and non-market values is the total economic value (TEV) [4]. It comprises not only market and non-market values but differentiates at the same time between use and non-use related

economic values. The latter can arise from merely knowing that an endangered species is protected or a landscape managed in a certain way.

Economists have developed various methods for estimating the economic values of environmental changes or their avoidance in monetary terms. They are generally grouped into revealed preference and stated preference methods. Revealed preference methods, such as the Travel Cost Method (TCM), try to infer the value of a non-market good by observing the actual behaviour of individuals on related markets [5]. While relying on observed behavior, at least in theory, revealed preference methods can only capture use values and are therefore likely to underestimate the total economic value. Stated preference methods, on the other hand, do not rely on observed behaviour but are survey-based and aim at directly eliciting peoples' preferences via hypothetical markets. Accordingly, they can also capture non-use values, but due to the hypothetical nature of the market established, they are prone to the so-called hypothetical bias.

In a stated preference survey, using either the Contingent Valuation Method (CVM) or Choice Experiments (CE), respondents are directly asked about their preferences for hypothetical transformation(s) of the considered environmental good [6]. The standard CVM has been widely used in landscape valuation for many years [7, 8]. However, this method cannot provide information about the different attributes that comprise the good as it measures the value of a change generally in its entirety. Since landscapes are complex environmental goods involving several characteristics, recently interest in the applying CEs for landscape valuation has been rising as one of their advantages is that they provide more detailed information concerning potential trade-offs and values associated with different policy designs [9].

A CE typically involves a survey with a series of choice tasks with several mutually exclusive alternatives describing the good in question each time slightly differently. The good, here a landscape, is thus described in terms of attributes (certain characteristics of the scenery, for example) which are in turn varied across a range of levels to define each alternative. The respondent is asked to choose between two or more of the presented options describing different landscapes (One of which may be the status quo, i.e., a landscape on its current development path that could mean further deterioration if no management actions are conducted). Repeated choices on various choice tasks are generally requested from each respondent to generate a substantial data set efficiently.

According to Hoyos [10], there are three main stages when undertaking a DCE. The first stage consists in designing an experiment to generate choice data which involves four steps: (i) definition of attributes, levels of provision and payment vehicle; (ii) experimental design; (iii) questionnaire development; and (iv) sampling strategy. The second stage is devoted to the econometric analysis of the choice data to estimate preferences of the individuals while the third stage obtains welfare measures and policy analysis based on the resulting model from the second stage. The construction of the choice task (Figure 1 shows an example) requires an accurate definition of the landscape change to be valued, the attributes and levels as well as the payment vehicle that would be used. Previous scientific investigation on the characteristics of the landscape in question, interactions with experts and focus groups may facilitate the definition of them. Finally, pilot tests are applied to check for respondents' understanding of the choice context and task, the adequacy of the attributes, levels and payment vehicle, and other factors such as length and timing.

Suitable econometric models next enable to assess the impact of varying attribute levels on peoples' choices. Model estimations, for example, would inform decision-makers given our choice experiment example concerning forest biodiversity whether respondents prefer higher landscape diversity. Subsequently, Willingness to Pay (WTP) estimates for marginal and non-marginal changes can be extracted from the recorded choices. The marginal WTP would tell how much money people would pay for a change from one attribute level to another level (from low to medium landscape diversity, for example), and the non-marginal estimates would give the WTP for

overall landscape changes, i.e., changes in a combination of attributes (increasing both forest age class and landscape diversity from low to high).





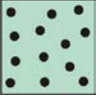










	without forest conversion	Program A	Program B
	40 % broad-leaved	70 % broad-leaved	70 % broad-leaved
Habitat for endangered and protected species	low 	high 	low 
Species diversity	medium 	medium 	medium 
Forest age class	low 	high 	low 
Landscape diversity	low 	high 	high 
Contribution to fund "forest conversion"	0 	35 	20 
I choose <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Fig. 1. Example of a choice task from a CE about forest biodiversity in Germany (Source: Meyerhoff et al. 2009 [11])

The talk will introduce CEs and the underlying theoretical background, briefly present the steps necessary to carry them out and analyse the collected data with a focus on landscape valuation issues, and will give examples of how choice experiments are applied in current landscape research. Examples will include both stated preference surveys as well as choice modelling approaches that used observed data, e.g., recorded geocodes from locations visited for recreation.

Keywords: Choice experiments, landscape valuation, non-market values, stated and revealed preferences

References:

- [1] Council of Europe, 2000. European Landscape Convention, ETS 176 (<https://rm.coe.int/1680080621>, last assessed 4 June 2019).
- [2] Price, C. (2017) Landscape economics. Second edition, Cham, Switzerland.
- [3] Van der Heide, C. M., Heijman, W. J. M. (eds.) (2013). The economic value of landscapes. London.
- [4] OECD (2018). Cost-benefit analysis and the environment. Further developments and policy use. OECD Publishing, Paris.
- [5] Hanley, N., Barbier, E. B. (2009) Pricing nature. Cost-benefit analysis and environmental policy. Cheltenham.

- [6] Bateman, I.J., Carson, R.T., Day, B.H., Hanemann, W.M., Hanley, N., Hett, T. *et al.* (2002). Economic valuation with stated preferences techniques: A manual. Cheltenham.
- [7] Santos, J.M.L. (1998). The economic valuation of landscape change: Theory and policies for landscape conservation. Cheltenham.
- [8] Willis, K.G., Garrod, G.D. (1993). Valuing landscape: A contingent valuation approach. *Journal of Environmental Management* 37, 1–22.
- [9] Campbell, D. (2007). Willingness to pay for rural landscape improvements: Combining mixed logit and random-effects models. *Journal of Agricultural Economics* 58, 467–483.
- [10] Hoyos, D. (2010) The state of the art of environmental valuation with discrete choice experiments. *Ecological Economics* 69, 1595–1603.
- [11] Meyerhoff, J., Liebe, U., Hartje, V. (2009). Benefits of biodiversity enhancement of nature-oriented silviculture: Evidence from two choice experiments in Germany. *Journal of Forest Economics* 15, 37–58.

GEORGIAN LANDSCAPE SCHOOL: HISTORY, METHODOLOGY AND OPPORTUNITIES

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Abstract

Landscape science is not only a fundamental, but also applied science, which studies natural-territorial complexes (NTC), genesis, territorial distribution, development and dynamics. Such researches should become the basis of rational use and effective management of natural resources, territorial planning, estimation, monitoring, forecasting and protection of the environment.

The goal of the study is to show the principal trends in the formation and development of the Georgian school of landscape and approaches and role it has played in the development of landscape studies and geography in general. A very important phase in the development of the landscape studies in Georgia was 1980s, when the concept of spatial and time analysis and synthesis of the natural-territorial complexes was developed at Tbilisi State University under the leadership of Professor N. Beruchashvili. Since then, a number of scientific works of great theoretical and practical value have been written.

The study has revealed the principal stages and trends of the development of the Georgian landscape school, as well as theoretical and practical results. The scientific works of an applied nature have demonstrated that they are based on fundamental studies, and the landscape maps are widely used for this purpose. Besides, at present, the landscape studies have shifted from the phase of inventory to the phase of evaluation and territorial planning.

Keywords: Landscape studies, NTCs, Georgia.

EMERGING ENERGIES, EMERGING LANDSCAPES: EUROPEAN FRAMEWORK

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Abstract

The recent emergence of European Union climate and energy policy has triggered a spectacular growth in renewable energy (RE). Over a decade, decentralized energy infrastructures have spread through rural areas of European countries, transforming their landscapes. This paper provides an insight into process of emergence of renewable energy landscapes in Europe, analyzing the impacts of RE on landscapes. The paper provides a round-up of current research into the landscapes being produced by different forms of renewable energy, in particular hydro-, wind and solar energies.

Keywords: Landscape, energy transition, renewable energies, Europe

BOTTOM-UP APPROACHES IN THE IMPLEMENTATION OF THE ELC: INSIGHTS FROM RESEARCH AND PRACTICE

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Abstract

The European Landscape Convention (ELC) calls signature states to commit themselves, amongst others, to identify and characterize their landscapes, as basis for further action concerning its evaluation, to define landscape quality objectives and, and to integrate landscape into policies and planning, always by establishing procedures ensuring the participation of the public.

Based on the subsidiarity principle no guidelines are provided to steer action, leaving space for adaptation to natural and cultural specificities of the landscapes.

Concerning the identification and characterization of landscapes, approaches have built on previous experiences in European countries and regions on identifying and mapping landscapes. The spectrum of approaches is wide (see for a review [1]), notably according to the conceptualization on landscape in place, and much experience has been drawn from the conceptual framework of Landscape Character Assessment [2]. It is recognized that LC assessment and mapping and is still mainly an expert-based endeavor. Some approaches benefit from refinement by integrating stakeholder perspectives, but there is not a consistent practice of involving stakeholders and even less the general public.

In the LCA process local knowledge is relevant to gaining insights on how landscape 'elements come together to create character in different places, including the aesthetic and perceptual qualities of the landscape as a whole' ([2]:57-59). Existing literature on landscape perception is wide and there is also a wide array of methodological toolboxes on how to capture

perceptive dimensions of the landscape, in large part based on public surveys concerning specific landscapes. Therefore more participatory approaches to landscape mapping should not be necessarily found in a lack of knowledge on how to capture perceptions, but on a deficit of commitment to its integration into the overall process.

Käyhkö and colleagues (2018) [3] have demonstrated the potential of using participatory mapping tools. The integration of landscape into planning and policies as required by the ELC is still a challenge. More frequently than not, in many European countries many references to landscape are found in documents of early stages of the planning process, being dismissed in the final stage of the planning proposal. In this presentation we show the use of participatory mapping in the context of spatial plans at local scale [4, 5], using focus-groups to capture local knowledge from stakeholders.

The concept of landscape character is very much associated with the concept of identity – linked to the ‘the pattern that arises from particular combinations of the different components, can provide a sense of place to our surroundings’ ([2] : 3). The sense of identity of the place goes beyond the landscape elements, their organization of physical elements and meanings, being intrinsically linked with the interaction of a place or an area with people, which is reflected in the material interaction of people creating or shaping the landscape as well as in their mental perception and valuation of that landscape. This mutual interaction forms the fundamental principle of the concept of landscape identity. Landscape identity can refer to either the landscape itself or its features that makes the landscape unique (thus the landscape character), or to the social and personal construction. The interdependency between those two perspectives is conceptualized in the Transactional Model of Landscape Identity [6]. This model refers to the identity or character, uniqueness of the landscape itself as well as how people use landscape to construct their individual or collective identity. In this presentation the Transactional Model is explained as well as its operationalization in the context of spatial planning is discussed.

Planning is a future-oriented exercise. The ELC calls for the integration of landscape into policies and planning and the definition of landscape quality objectives as, ‘for a specific landscape, the formulation by the competent public authorities of the aspirations of the public with regard to the landscape features of their surroundings’. Scenario development provides a methodological framework to capture the aspirations of the public towards the future. In this presentation Exploratory Landscape Scenarios are put forward as a communication tool. It builds on ‘intuitive logics’ focusing on the production of a variety of scenarios that are able to consider alternative drivers of change in the definition of plausible futures capable of triggering discussions amongst stakeholders on desirable futures for their landscape [7, 8].

When dealing with the public in the implementation of the ELC, one of the main challenges is still to define ‘who is the public’ of a landscape and ‘what is geographical distribution of that public’. The public can be manifold and embracing the public in a broad sense may mean not only the actual users but also potential users, calling for the need to define a kind of “sphere of influence” or “attraction” of a specific landscape. The approaches presented focus on the local public as landscape changes at the local level mostly affect local public’s personal living conditions and people are therefore better equipped to motivate the community towards action.

References:

- [1] Fairclough, G., Sarlöv Herlin, I. & Swanwick, C. (2018). Landscape Character approaches in global, disciplinary and policy context: an introduction. In: Graham Fairclough, Ingrid Sarlöv Herlin & Carys Swanwick (Eds.), *Routledge Handbook of Landscape Character Assessment: Current Approaches to Characterization and Assessment*, Routledge, 310 p.

- [2] Swanwick, C. (2002). Landscape Character Assessment: Guidance for England and Scotland. In: Recent practice and the evolution of Landscape Assessment, Topic Paper I. Scottish Natural Heritage and The Countryside Agency. <http://www.snh.org.uk/pdfs/publications/LCA/LCA.pdf>
- [3] Käyhkö, N., Fagerholm, N., Khamis, M., Hadam, S., Juma, M. (2018). The collaborative, participatory process for landscape character mapping for land and forest planning. In: Graham Fairclough, Ingrid Sarlöv Herlin&Carys Swanwick (Eds.), Routledge Handbook of Landscape Character Assessment: Current Approaches to Characterization and Assessment, Routledge, 310 p.
- [4] Loupa-Ramos, I. & Pinto-Correia, T. (2018). Landscape Character Assessment across Scales: Insights from the Portuguese Experience of Policy and Planning. In: Graham Fairclough, Ingrid Sarlöv Herlin&Carys Swanwick (Eds.), Routledge Handbook of Landscape Character Assessment: Current Approaches to Characterization and Assessment, Routledge, 310 p.
- [5] Loupa-Ramos, I, Bianchi, P., Van Eetvelde, V. (2018). Capturing stakeholder knowledge in participatory landscape mapping: Scrutinizing research approaches. *A Paisagem Como Problema: Conhecer para Proteger, Gerir e Ordenar*, Pedro Fidalgo (Coord.), Lisboa: Instituto de História Contemporânea, ISBN: 978-989-98388-7-1
- [6] Loupa-Ramos, I., Bernardo, F., Ribeiro, S.C., Van Eetvelde, V. (2016). Landscape identity: Implications for policy making. *Land Use Policy*, 53, pp. 36-43, ISSN: 0264-8377.
- [7] Loupa-Ramos, I. (2010) 'Exploratory landscape scenarios' in the formulation of 'landscape quality objectives'. *Futures*, 42(7):682-692.
- [8] Loupa-Ramos, I. (2011) 'Landscape Quality Objectives' for remote rural landscapes in Portugal: Addressing experts' and stakeholders' perspectives on future developments. *The European Landscape Convention: Challenges of Participation*. In: Michael Jones & Marie Stenseke (Eds.), *Landscape Series*, Vol. 13, Chapter 10. Springer. ISBN: 978-90-481-9931-0.

CONCEPT OF LANDSCAPE SERVICES AND APPLICATION

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Abstract

During the last years the concept of ecosystem services has become very popular. Recently an additional term has been appeared and is increasingly used: landscape services. For its meaningfulness several arguments are ascertained, e.g. spatial aspects, the more contextual view, the greater role of human-influenced areas, its practical applicability, especially the high relevance for landscape planning and practice. Landscape services are the contributions of landscapes and landscape elements to human well-being. In specific cases we explicitly use the term 'landscape' instead of 'ecosystem' to underline multiple dimensions besides ecological issues.

Keywords: Biomass potential, landscape planning and management, natural potentials

LANDSCAPE AS PALIMPSEST –THE BALANCE BETWEEN LANDSCAPE HISTORY AND MODERN SUSTAINABLE LAND USE

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Abstract

Every landscape has its own history. A historical look back is typically divided in the history of nature and the history of men. But in fact nature and men have had in every period of the past a close relation and influenced each other intensively. Landscapes were formed by natural forces and human activities. Each landscape is a very individual result of its own history. A remain of this specific history can be a geological feature, a prehistoric grave, a medieval fortification or an already medieval formed system of hedges in the landscape. "Landscape as a Palimpsest" is a transfer of ancient ideas and practice in former textual context into a modern Landscape approach. Already in antiquity writers know how to use manuscript pages several times. The old text was scraped or washed off so that the page could be reused for other documents. Every page was a valuable item. Pergamene often was re-used by scraping the previous writing. Geographers have overtaken this intellectual image on their view on landscape. Both in pergamene and landscapes traces of its own history can be discovered. It is high time that also planners and many other involved parties recognize the problems but also the chances to understand landscapes as specific formed individuals and real treasures. A very important part of rural development is the management of historic features on-site. Typically a lot of problems occur in terms of agriculture, new development areas and infrastructure development. But also between nature conservation and management of historic landscape features are sometime overlapping aspects to discover - for instance in designed landscapes, like historic parks and gardens. Sustainable development means also to include aesthetical, ecological and other aspects of historic elements in the management and further development of areas.

Spatial planning, e. g. landscape planning, agricultural planning, forestry planning and other specific planning instruments are based on landscape analysis. Typically the conditions of soils, water, climate and other naturally formed parts of the landscapes are included. But mostly to less the specific history of the landscape is included in such a survey. Every landscape has its own history of nature and human society. In spatial planning two aspects of this history are particularly important. Firstly, the remaining relics of historic developments and events in the landscape today. And secondly the analysis of the dynamics of landscape changes. With that is possible to evaluate changes in the landscape (for instance changes in the structure of land use) and compare these with modern changes. Such an historic part of the landscape analysis should be seen as absolutely necessary. Every specialist in spatial planning and also spatial development should be familiar with the history of the landscape.

I have chosen a case study area in Mecklenburg in Germany, near the Baltic coastline. In this area is a high density of historic relics to find. A broad range of prehistoric and historic elements characterize this landscape. Particularly impressive is a range of megalithic graves, built of massive boulders and still today important landmarks in rural areas near the city of Kühlungsborn. These megaliths are remains from the Neolithic, a time when first a European cultural landscape was formed by farmers. Today these structures are on one hand in danger by land use and land development and on the other hand a typical landmark for the citizens, a part of their homeland.

Also for the tourism in rural areas are such remains, like in many other cases in Europe of importance.

Often locals have overtaken responsibility for the remains. Together with authorities and scientific institutions they maintain their heritage. New approaches in management and development of these features are realistic. It means practical work, but sometimes also animation. Other chosen areas and examples in my lecture are in Germany, Great Britain, the Republic of Ireland and other European areas to demonstrate the different histories, but also the importance to include these specific histories in the modern land development. It embraces a broad range of geological features from different geological periods. On the other hand the view on cultural history starts already with prehistoric features and goes further with the time line to recent time. I will try to explain typical historic landscape features to enable involved parties and stakeholder in spatial planning to understand better the history of landscapes and the importance of such knowledge for every sustainable spatial development.

HISTORY OF MODERN LANDSCAPE DEVELOPMENT OF THE COLCHIS LOWLAND COASTLINE

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Abstract

Greek geographer, philosopher, and historian Strabo (64 or 63 BC– c. AD 24) was the first to mention the existence of a lake in the area of the river Rioni estuary: “The Phasisi (river Rioni) enters the Ponto (Black Sea). At the Phasisi River there is a city of the same name, Colchis commercial port facing a river on one side, a lake on the other and by a sea on the third side”. Greek historian Agathias Scholasticus (ca. 532-580) provides the information about the existence of a lake in the area of the river Rioni mouth as well: “There is a lake there which is called the small sea and which enters the Euxene Pontos ("Póntos Áxeinos"). The lake mentioned in the introduced here information lacks the name, but it could be for certain identified with Lake Paliastomi. Development of lake sediments beyond the Lake Paliastomi contour at 10-20 m depth from the surface has not been confirmed by numerous drilling programs conducted in the area of the River Rioni mouth. As the lake denoting toponym, “Paliastomi” was first mentioned on the portolan charts by Pasqualini (1408), Bianca (1436) and Freducci (1497). The meaning of this toponym derives from Greek language: Palaeo – old; Stoma – pore, hollow.

The location of Lake Paliastomi (total area - 1. 8 km²; maximum depth – 3. 2 m) along the land part of the coastline and 0. 6 km of the sea coast line is fairly important in terms of the study of the Black Sea level fluctuation problem. Some other factors such as the lake water surface elevation, which is nearly similar to sea level elevation (only 0. 3-0. 4 m higher), minor height of the line of offshore bars (1. 5-2. 5 m) along the coastline which separates the lake from the sea, and the development of coastal-marine facies of silty sandstones with low erosion resistance at 10-12 m depth from this line surface are worth of interest as well. Active hydrological balance of Lake Paliastomi (several rivers enter the lake), its link with the sea via the river Kaparchina (Maltakva) and presence of deep peat bogs in the immediate vicinities of the Northern and South shores of the lake should also be taken into account.

The analysis of abovementioned facts enables to make an assumption that fluctuation regime of the Black Sea level greatly favored the formation and development of Lake Paliastomi along with its active water balance. At minor height of the narrow strip of land which divides the lake from the sea, the river Kaparchina bed which is made up of silty sandstones could be easily eroded and broadened as a result of even several tens of centimeters sea-level rise and accordingly due to intensified influence of breaking waves. In this case, the inlet linking the sea and the lake would have been wider inducing inflow of great amount of saline sea-water into the lake depression and formation of the sea-bay lagoon in place of the lake. The opposite process would take place in case of marine regression. The fall of the sea level below the level of Kaparchina riverbed level would have induced an erosive deepening of the latter followed by emptying the lake and swamp development.

The results of lithological and facial analysis of undertaken in seventies of the twentieth century geological drilling data (nearly eighty 12-15 meters deep drill holes) obtained from the bottom of Lake Paliastomi bottom partly confirm mentioned above supposition. According to these data the mean vertical cross-section of developed under the Lake Paliastomi bottom sediments is following:

0. 0 – 3. 1 m – doughy saprobe (organic matter rich silt and salty sands) made of grey, rarely black clayey ale rites;
3. 1 – 5. 3 m – peat and dark olive green peat-saprobe with sand lenses;
5. 3 – 10. 3 m – grey, relatively dense clay-silt sapropel;
10. 3 – 15. 3 m – coastal-marine and lagoon sands and silty sands with remnants of marine mollusks.

It should be emphasized, that bottom sediments of Lake Paliastomi likewise the peat layers of coastal marshes formed horizontally arranged continuous layers.

Sapropel is fairly expensive natural resource. It is used as organic fertilizer, for the production of combined food and waterproof drainage pipes, as healing mud in medical treatment and etc. The Lake Paliastomi sapropel is fairly rich (15-47%) in organic matter - common for fresh water reservoirs amorphous detritus of plants and animals, decomposed in various degrees relicts of blue, green and brown (diatom) algae and in part of land plants (Embriophya). Shell-remnants of adapted to marine environment diatom algae, forams and mollusks are preserved in the silty-sand horizon developed under the lake bottom sapropel layers.

Matching of the results of litho-facial analysis of Lake Paliastomi bottom sediments with the sea-level regime fluctuation during the modern Black Sea phase/stage of the Black Sea basin development and later enables to suppose following: during the peak of the new-Black Sea transgression (6000-4700 years ago) invasion of the Black Sea bay took place into the land in place of the Lake Paliastomi. The surface of this land along with the lowland in its immediate vicinity was mainly covered by the floodplain wetland forest-meadow landscape. Just at that time formation of swamps took place on the surface of floodplains along a shoreline of the recently generated sea bay. The latter was formed as a result of the sea level fall and impede of the groundwater drainage caused accordingly by the rise of erosion base level. The swamp development initiated the formation and development of Shavtskala, Imnati and Maltakva vast and deep peat bogs along the North, South and East banks of Lake Paliastomi. The beginning of peat accumulation time in these peat bogs was established by means of radiocarbon dating – 5820 ± 210 , 5950 ± 100 , 6480 ± 90 years ago accordingly.

The development history of Lake Paliastomi is closely linked to the development tendency of the lithodynamic processes in the littoral zone to the South of the river Rioni mouth. During the last 6000 years, before the construction of Poti Port (eighties of the XIX century) this part of the littoral zone was characterized by the movement/flow of southbound current saturated with great

amount of beach forming sandy sediments (brought by the river Rioni into the Black Sea) along the coastal line. Due to oversaturation of this current by solid debris the wave braking zone regime could not provide the free movement of full capacity of debris. As a result excess debris was accumulated along the coastal edge. The latter has conditioned continuous formation and development of sandy offshore bars.

Such development conditions of the litho-dynamic processes determined the further fate of the sea bay which was formed as a result of its invasion in place of Lake Paliastomi. After the first peak of the modern Black Sea transgression the southbound process of offshore sandy bars development which took place at the river Rioni mouth initiated gradual silting and narrowing of the sea bay inlet sandbank. Growth of the offshore bars towards the South became more intensive during the early Subboreal regression of the Black Sea (5000-4200 years ago) when the sea level fell below its modern benchmark. At this time the sea bay emplaced at the place of Lake Paliastomi was replaced by the lagoon which was linked to the sea by narrower inlet. Common for slightly saline water reservoirs silty-clayey sapropel was deposited at the bottom of this lagoon. During the second peak of the modern Black Sea transgression (4200-3500 years ago) final formation of the continuous line of offshore bars took place which dammed the lagoon inlet. Since then the history of Paliastomi fresh water reservoir has started. Due to active hydrological balance of the lake outflow of excess water from the lake took place by means of the river Kaparchina. The latter broke through the offshore bars line immediately after its formation and started to flow out several kilometers away along the western bank of the lake (parallel to the sea coast). Hence, inflow of saline seawaters did not take place and Lake Paliastomi has always been the fresh water reservoir since its formation time.

During the Phanagorian regression of the Black Sea (which started 3500 (3600) years ago and finished approximately 2300 (2400) years ago) as a result of sea level fall (average 2 meters) relatively to modern sea-level the river Kaparchina managed to deepen its bed. Accordingly Lake Paliastomi depression partially lost its water resources and swamp formation started. In the areas of swamp development peat layers with sapropel admixtures formed and developed. Swamp formation stage of Lake Paliastomi development was gradually replaced by lacustrine regime since IV-III centuries BC. The latter was induced by the completion of the Phanagorian regression and the beginning of the Nymphaean transgression.

The development regime of freshwater Lake Paliastomi lasted till twentieth of the last century. In 1924 the lake was connected to the sea by the short and straight channel. The channel was designed in order to increase the volume of water outflow into the sea and accelerate the outflow speed. The reason was to avoid the risk of Poti flooding during inundation periods. As a result of the channel construction the river Kaparchina lost its function. The channel opened the way for the saline seawater towards the lake. Before the construction of the channel water salinity in Lake Paliastomi doesn't exceed 1 per mille. However, after the channel construction, during the mild and strong storms in the sea the lake water salinity rises up to 10-14 per mille. In fact since 1924 Paliastomi freshwater lake ceased to exist and artificially created lagoon has formed.

SESSION 1: HUMAN GEOGRAPHY

**TERRITORIAL FRAGMENTATION, NEWLY EMERGED BARRIERS AND
“BORDERSCAPES” IN THE POST-SOVIET SOUTH CAUCASUS**

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Abstract

South Caucasus is a landbridge between the Black and Caspian Seas and a geoeconomic crossroad for the trade of goods and hydrocarbons along the East-West route. At the same time, it is considered a region “at risk”, because of the ethnic conflicts occurred after the collapse of the Soviet Union, that led to the establishment of self-proclaimed Republics backed by Moscow. Furthermore, the lack of economic and political integration among the States of the region has produced a territorial fragmentation that can be observed in a multilayered conflictuality (among States, among States and breakaway entities, among regional organizations, among geopolitical orientations) and in a process of (re)borderisation, which is made visible and tangible by means of military barriers and “iron curtains” along instable ceasefire lines and *de facto* borders. The paper aims at analyzing the difficult regional “borderscapes” and their territorial repercussions, in the context of the ongoing geopolitical and geoeconomic dynamics.

Keywords: South Caucasus, territorial fragmentation, ethnic conflicts, breakaway entities, borderscapes.

**RISK FACTORS FOR THE FORMATION OF AN AGRICULTURAL
ENTERPRISE STRATEGY IN THE DIGITAL ECONOMY**

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Abstract

Developing a digital strategy can be seen as a means of reducing uncertainty in the future activities of an agricultural enterprise. In this paper, the theoretical basis for the formation of the strategy of an agricultural enterprise in the context of the introduction of digital technologies is formulated. Methods for identifying risk factors in the strategic management of an agricultural enterprise are proposed. In this study, the strategy of the organization will be understood as a set of

mutually agreed strategic decisions aimed at realizing its mission, achieving balanced development, preserving the integrity and maintaining stable successful activity. An agricultural enterprise strategy can be developed and implemented on the basis of multilateral platforms or within the framework of socio-economic ecosystems. Modern digital technologies allow effective functional and managerial interactions of commercial enterprises, government agencies and non-profit organizations. These interactions are aimed at solving such strategic tasks of an agricultural enterprise as reducing transaction costs and reducing time spent on finding information about suppliers and buyers, as well as studying markets.

Keywords: Agricultural enterprise, strategy, digital technologies, risk factors, multilateral platform

COMPLEX STUDY OF THE NATURE OF THE CAUCASUS (ON MATERIALS OF THE ACADEMIC "PHYSICAL" EXPEDITIONS OF XVIII CENTURY)

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Abstract

The work is devoted to the historical aspects of the development of geographical research of the Caucasus. The basis for the performance of the work lay down the materials of the XVIII-XX centuries, including archive materials. The main goal of the work is aimed to the compilation and systematization of geographical information about the Caucasus and there analysis. It is shown that the academic "physical" expeditions were the beginning of the complex development of the nature and the population, and also served as the basis for the scientific study of the Caucasus. The latest results on the nature and economy of the Caucasus, as well as other regions of the Russian Empire, contributed to the country's transition to a new level of economic and economic development. It is noted that new information about the nature of Ciscaucasia enriched science, contributed to the development of a number of scientific fields and still have scientific value.

Keywords: Caucasus, academic "physical" expeditions, XVIII century, nature, population, geographical researches

REPRESENTATIVE TYPES OF CULTURAL LANDSCAPE OF SLOVAKIA

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Abstract

In the last period landscape protection, its representative types more and more comes to the limelight. In October 2000 the European Landscape Convention was adopted. Contracting states ought to analyse the landscape types on the whole area of their landscape, to analyse their features, record their changes, specify motive power and pressure forming them Knowledge and identification of single landscape types enable the intensification of care of diversity of single landscape types and landscape biodiversity.

Slovakia signed ELC in 2005 and became an active participant in its implementation. The Institute of the Landscape Ecology of SAS elaborated methodology for specification and evaluation of the representative landscape types of Slovakia (RLTS).

Landscape types of Slovakia were defined by the synthesis of the abiotic landscape structure and land-cover map. Each landscape type represents unique combination of land-use in different abiotic conditions and gives the unique environment for nature development. In the second stage typing rare and unique landscape types of Slovakia have been marked.

Following, all RLTS were evaluated from the point of view nature protection and recent degradation and threats. The final step included preparation of management proposal with aim to maintain all representative landscape types and to secure their sustainable development and protection.

The paper will present methodology of the landscape typization and its application in the Slovakia.

Key words: Landscape typization, Slovakia, unique landscape types, rare landscape types

Acknowledgments: This work was supported by the Scientific Grant Agency of Ministry of Education of the Slovak Republic [No. 2/0078/18 “Research of biocultural values of landscape”].

**SESSION 2: LANDSCAPE MAPPING, LANDSCAPE ECOLOGY
AND BIODIVERSITY**

**THE MOST INCREDIBLE REFUGIAL AREAS IN THE CAUCASUS ECOREGION
– COLCHIS AND HYRCANIA**

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Abstract

Present article is a first attempt to such interdisciplinary investigation. We analyzed patterns of floristic and faunistic richness, endemism, including relict endemics, modern distribution of close relict species in other countries and regions of Northern Hemisphere, specificity of formation of two harbor territories of Tertiary organisms, palaeo-ecological data of the Black Sea coastal and Caspian Sea coastal regions, comparative analyses of the specificity of altitudinal zoning of Colchis and Talysh, at the same time comparing the structure of surviving in mentioned shelters two ancient elements of native flora and fauna – a) tropical-subtropical, b) organisms of the Arcto-Tertiary origination. Finally, critical analyze was dedicated to two refugial centers, which by some botanists are recognized as humid subtropical biocoenosis.

Keywords: Biogeography, refugial areas, Colchis, Hyrcania, comparative analysis

**DESTINATION CHOICE FOR RECREATION AT RIVER SITES –
A SPATIAL ANALYSIS**

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Abstract

River landscapes including rivers, streams and surrounding floodplains are of great importance for local recreation. Especially their high degree of biodiversity and structural diversity result in high recreational and experiential value, classified as cultural ecosystem service. Due to their intangible dimension, the value of cultural ecosystem services is difficult to measure and quantify. One way of assessing the monetary value of non-market goods and services are preference studies, such as discrete choice experiments and willingness-to-pay studies. We conducted a choice experiment, considering four attributes regarding river landscapes in different regions of Germany. Two attributes, namely the “the naturalness of the floodplain” and the “bank

enforcement” are related to environmental qualities, while “infrastructure” and “accessibility” address the suitability of the river for recreation. In total, about 4000 respondents completed the survey. We combine the results of this preference study with information on the chosen recreation destination and the location of residence to assess spatial effects of destination choice, and test for distance decay effects and compare destination choice with possible substitutes.

Keywords: Recreation, Economic Valuation, Discrete Choice Experiment, Rivers Floodplains, Spatial Analysis

LANDSCAPE STABILITY ANALYSIS MORPHOLOGY STRUCTURE OF LACUSTRINE THERMOKARST PLAINS WITH FLUVIAL EROSION IN AN ASYNCHRONOUS START SITUATION

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Abstract

One of the important questions, regarding the thermokarst development, is to find the principles of its distribution and dynamics with the purpose of forecasting environmental changes. Many researchers studied the thermokarst processes, but proper statistical methods regarding these are yet to be developed. In particular, the analysis of quantitative aspects of thermokarst lakes is to be considered. Various researches attempted to determine the age of thermokarst lakes, as well as the time of their occurrence.

The aim of the research is to analyze the complex landscape dynamics of thermokarst plains with fluvial erosion to assess the stability of its morphological pattern. Two opposite trends are facing within this landscape during the whole Anthropocene: the growth and, possibly, the emergence of new thermokarst lakes and the disappearance of thermokarst lakes due to the descent fluvial erosion.

The research results in the mathematical models of the dynamics of the morphological pattern of thermokarst plains with fluvial erosion for uniform natural environment, which were developed on the base of the mathematical morphology of landscape using the theory of random processes. The models are done:

1. For synchronous start of the thermokarst process;
2. For asynchronous start of the thermokarst process.

We performed the model approval for several study areas, which are located in different Arctic regions.

Keywords: Mathematical morphology of landscape, thermokarst lakes, fluvial erosion, remote sensing, cryolithozone

ADVANCES IN DIGITAL SOIL MAPPING (A REVIEW)

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Abstract

Digital mapping of spatial patterns of soil (DSM) types and properties through soil and other auxiliary biophysical data provides merging math and statistic models with field and lab research actively involving Geographic Information Systems (GIS) and Remote Sensing (RS). A number of studies are focused on various directions in DSM. This review paper on DSM reviews 289 issues published in 11 key journals during the calendar years of 2017 and 2018. Papers are grouped by themes to cover 5 subject areas. The themes were chosen by classifying all articles published in a single leading journal for the same period. Themes (in order of number contributing to the total) were: "Data collection and combination"; "Methods and models"; "Mapping scale"; "Uncertainty assessment"; and "Applications of DSM".

Keywords: DSM, Remote Sensing, geostatistics, automated mapping

MAPPING INFORMATION ABOUT THE NORTH CAUCASUS (XVIII-XIX CENTURIES)

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Abstract

Generalized analysis of the cartographic information about the North Caucasus, reflected in questions of the history of geographical explorations of the Caucasus, is presented. It is shown that the most productive period is connected with the creation of new maps and schemes of the Caucasus and its some parts is associated with academic ("physical") expeditions of the 2nd half of the XVIII century. New information about the nature and population of the North Caucasus allowed to make the basis for the preparation and publication of generalized information about the areas of the Russian Empire. In the XIX century cartographic information about the Caucasus was reflected in soil maps of the Russian Empire. Activity with carrying out of soil researches of the Caucasus and construction of soil maps is connected with researches of V. V. Dokuchaev.

THE CONTRIBUTION OF LANDSCAPE SPATIAL PATTERN IN INTER-COMPONENTS RELATIONSHIPS

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Abstract

Spatial pattern of a landscape can be represented in many ways depending on objectives of the study. In landscape ecology and geography among the widely used models of landscape spatial pattern are watershed models, landcover mosaics, structural-genetic models, “matrix-patches-corridors” models etc. Different characteristics of the landscape components (landforms, rocks, soils, vegetation) could form groups of properties that are determined by landscape pattern of a specific type. At the same time, landscape properties may reflect the emergent effects of interactions between landscape patterns of different types and scales. The forecast of changes in landscape properties can be made only for spatial units with relatively strong and stationary inter-components linkages. Thus, the evaluation of contribution of different spatial patterns in landscape properties and identification of effects of interaction between landscape spatial elements are the important tasks for landscape planning and management.

The research goal was to reveal different landscape spatial patterns within the focus region and to identify areas of stationary relations between landscape components. The study area is located in the middle taiga region of North European Russia. Based on field observations, remote sensing data and relief morphometry, statistical models of the interrelationships of landscape components were constructed.

Keywords: Landscape pattern, landscape components, linkages, stationarity, emergent effects

PATTERNS OF THE UNIQUE BIODIVERSITY REPRESENTED IN THE GAREJI HOLLOW – ONE OF THE STRIKING LANDSCAPES IN EASTERN GEORGIA

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Abstract

Gareji Hollow is one of the driest places in eastern Georgia, where almost or true desert habitats are represented, where average annual precipitation varies from 250 to 300 mm [1, 2]

Gareji Hollow today may be viewed as an ecotone with two major landscape units – lower ecotone with desert landscape and upper adjacent ecotone with grasslands and open arid woodlands [3] Lower ecotone is characterized with higher severity of climate, fire frequency and absence of fertile soils. On the other hand, we see high heterogeneity of relief created by numerous

micropatches; each patch patterns favors independent dry tolerant plants and patterns including own webs of life.

Gareji Hollow should be classified as micro-refugium that supports some life forms mostly of Irano-Turanian origin. Within the Gareji Hollow the biodiversity of flora and ecosystems in general consist of xerothermophilous species (e.g., *Salsola nodulosa*, *Artemisia fragrans* and *Gamanthus pilosus*). The most significant feature of vegetation species of local desert flora is a presence of common salttree *Halimodendron halodendron* [4] Gareji Hollow is the rarest site in eastern Georgia, where this species of monotopic genus of legume occurs.

Key words: Gareji Hollow, desert, ecotone, micro-refugium, rarest biodiversity

References:

- [1] Lachashvili N., Khachidze M., Desert Flora and Vegetation of Georgia, Universal, Tbilisi, 2010.
- [2] Lachashvili J., Lachashvili N., Khachidze M., Conspectus of flora of Kiziki (East Georgia), Universal, Tbilisi, 2007.
- [3] Gegechkori A.M., Biomes of the Caucasus: comprehensive review, Nova Science Publishers, Inc. USA (Agreement, 2018) (in press), p. 64-67, 2019.
- [4] Lachashvili N., Eradze N., Khachidze M., Khetsuriani L. (2015) New Data on Some Rare Species of Flora of Georgia, Available from: <http://science.org.ge/old/moambe/9-1/Lachashvili.pdf>

SOME QUESTIONS OF STUDY OF THE BEES (APOIDEA) ACROSS CALCICOLOUS LANDSCAPE, WESTERN GEORGIA

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Abstract

Bees belong to the overclass of insects, order of Hymenoptera. Species diversity of bees is very high on the Earth. In the Caucasus region up to 400 species of bees are known, among of which 300 species are found in Georgia [1]. As a result of investigations on bees, which take place for several years, was successful. For example, it encompassed taxonomical data (species, genera), bioecology and distribution of bees' different ecological groups within various habitats (arid, humid, etc.). At the same time, two new species for Georgia were found. In recent time apidofauna of limestone landscape of western Georgia was permanently research by us. The mentioned landscape is characterized by calcareous relief which comprises incredible biota – flora and fauna, including species and genera of Apoidea. Historically, regarding to changes of palaeogeography and palaeoclimate in the Caucasus, living organisms of different genesis migrated from adjacent territories (allochthonous element), side by side of autochthonous one [2].

The share of the autochthonous element (endemism) thanks to so composed relief of limestone area is high. Disjunct habitats of limestone landscapes cause fragmentation of population of the species within their ranges which as it broadly known is excellent background for speciation (i.e. origin of new taxa).

Keywords: Bees, habitats, limestone landscape

References:

- [1] Skhirtladze I. (1981). Bees of the Caucasus. Tbilisi, Metsniereba.
- [2] Gegechkori A. M. (2008). Biogeography (Part I. The biomes of the Earth). *Tbilisi. Univ. Publ.* Tbilisi, 527 pp.

ON THE EVOLUTION OF KARST CAVES IN THE CONDITIONS OF PLATFORM KARST (ZEMO IMERETI PLATEAU CASE STUDY; GEORGIA)

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Abstract

The actual materials obtained as a result of our studies carried out during years in the Zemo Imereti Plateau, namely, the morphological analysis of karst caves, hydrological-hydrogeological studies, results of tracing (indicator tests) of underground waters, borehole data and others, allow us to prove that the influence of phreatic, vadose and dry epochs has been reflected in the evolution of caves. An important part of karst caves has undergone the phreatic stage of development, though nowadays the traces of pressured flows in most cases have been erased by impact of vadose waters and other processes (corrosion, destruction, formation of speleothems, etc.). It is being also identified that the process of evolution of caves is not similar within the same karst massif that is related to the violation of the normal course of cave development by the influence of tectonic movements or other conditions. In the modern stage of development, the phreatic regime is well expressed in the Ghrudo underground basin, and the traces of both the vadose and dry epochs are well preserved in the higher located caves that went through the cycle of development. The periodic streams play an active role in the next stage of cave development, which, in turn, has been reflected in cyclical nature of sedimentation.

Key words: Hydrogeological studies, indicator tests, cave development cycle.

LANDSCAPE-ECOLOGICAL APPROACH FOR ESTABLISHED OF PROTECTED AREAS ON THE EXAMPLE OF REGION ONI, GEORGIA

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Abstract

The important method of preservation of a biological diversity and landscape diversity is a creation of essence of protected areas. Protected areas can be organized by different ways. But there are two basic ways: the state protection (it is usual at national and local levels) and purchase of the ground by private persons or the ecological organizations. Recently there is an application of a general model, where the partnership between the government of a less developed country and the international ecological organizations, or multinational banks and the governments of the advanced countries is established. At such partnership the ecological organizations carry out financing, training, scientific and organizational examination and helping a developing country to allocate new protected territories. This type of cooperation constantly grows due to improvement of financing on the part of global ecological fund (GEF Global Environment Facility), which has been created by the World Bank and agencies of the United Nations Organization.

In mountainous countries usage of natural resources and their protection should be carried out taking into consideration landscape-ecological aspects and characteristics. This primarily implies identification and study of landscape-ecological carcass of a given territory.

The landscape-ecological approach provides correct planning and sustainable development of this that is extremely important for Georgia. Main purpose of research, carried out in Oni region is the identification of landscape-ecological carcasses, their study and drawing of maps. Then zones shall be established and scientifically well-grounded corresponding recommendations shall be elaborated for established Protected Areas.

Main results of this component are creation of the electronic map of Oni region, landscape-ecological carcass and corresponding geographical information system. Based on the above-mentioned system a great number of other thematic maps were drawn.

Keywords: Biological diversity, landscape diversity, protected territories, landscape-ecological approach

ASSESSMENT OF ANTHROPOGENIC IMPACT ON THE TSKALTUBO (PROMETHEUS) CAVE SYSTEM

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Abstract

Today, in Georgia, more than twenty caves recommended for involvement in tourist routes. However, it should be taken into account that uncontrolled functioning of tourism infrastructure in the cave leads to accelerating the ongoing natural processes in negative terms – the heat released by illumination and visitors transfers to the cave air and speleothems, thus changing the cave climate, which leads to the drying out of cave speleothems, the occurrence of new species of micro and macro-organisms that is often disastrous for the cave.

The research object is Tskaltubo ("Prometheus") cave; the goal of the research is to determine the degree of anthropogenic interference in the cave and constant control of the cave micro-climate, the air composition and other data of the cave to maintain the natural climate parameters of the cave.

The research identifies, analyzes and ranks the factors that determine the intensity and direction of the mentioned processes. To achieve this, the cave air discharge, temperature, relative and absolute humidity and barometric pressure course were studied both in the cave and on the surface according to daily, weekly, monthly and seasonally. Air movement velocity, direction, radioactivity and gas composition were also studied. The study used thermophysical, thermodynamic and aerodynamic research methods.

Keywords: Air, cave, humidity, speleology, tourism

SOME ISSUES OF SPATIAL IDENTIFICATION, ALLOCATION AND MAPPING CULTURAL NATURAL-TERRITORIAL COMPLEXES (CASE STUDY OF FOOTHILLS' LANDSCAPES OF THE SAGURAMO-IALNO RANGE)

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Abstract

On the basis of the **European Landscape Convention** of the Council of Europe, the landscape became one of the most important key research objects into geographic scientific research. UNESCO's World Heritage Convention as of 1992 and **European Landscape Convention** of the Council of Europe as of 2000 discusses the concept of "landscape" and "cultural landscape" as " an area perceived by people ", the common creature of nature and human ". The

new approach is dramatically different from the traditional approach, and many scientists have recently shared it. Therefore, a new approach is to be developed for landscape mapping.

We believe that the legend of landscape-cultural map should reflect the landscape organization as a process, the outcome of assimilation and conceptualization of the territory by that or this culture(s) including both as modern and hereditary features. By doing so it coincides with differentiation of natural units of the territory but not by its copying.

The report refers to the peculiarities of Spatial Identification, Allocation and mapping of cultural natural-territorial complexes and in the case of foothills' landscapes of Saguramo-Ialno mountain range, based on the mentioned conventions and the experience of professors N. Beruchashvili and the famous scientists.

Keywords: Cultural landscape, Landscape Convention, natural-territorial complexes

ANTHROPOGENIC FACTORS CONTRIBUTING TO THE ECOLOGICAL CONDITION LANDSCAPES IN THE MINING ZONES OF IMERETI AND RACHA

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Abstract

A comprehensive landscape study was carried out in the coal mining area of Tkibuli-Shaori and the teschenite mining area in Kursebi. The article describes changes in the landscape, soil and vegetation and their specific ecological properties in the mentioned areas. A large scale map (1: 50 000) of Tkibuli Municipality has been designed with GIS by drawing on literature, expedition materials, satellite and aerial images and topographical maps. Zones of ecological stress have been revealed. Significant transformation of relief, intensification of geodynamic processes (landslides and mudflows) and groundwater contamination were identified as top risks related to coal mining. Open cast teschenite mining in Kursebi results in a high number of technogenic pits deprived of soil and vegetation and in low quality anthropogenic landscapes. The following anthropogenic impact zones can be distinguished: 1. A severe impact zone where vegetation and soil are completely destroyed and changes in micro-relief, and consequently in climate, trigger landscape transformation. 2. A zone adjacent to a mining site. 3. A transitional zone between post-mined and natural landscapes which is partially destroyed and altered.

Keywords: Anthropogenic factor, ecological condition, landscape, mining zone.

**SESSION 3: LANDSCAPE DYNAMICS, CLIMATE CHANGES AND
EXTREME PROCESSES IN ENVIRONMENT**

**IMPACT OF WEATHER AND CLIMATE EXTREMES ON LANDSCAPES IN
GEORGIA**

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Abstract

Landscapes are dynamic and subject to continuous change. Global climatic variations are the main drivers and controls of these processes. Extreme events matter around the whole globe. Hazards related to environmental change include floods, drought, heatwaves, storms and others. They have devastating effects for local populations; others have large-scale impacts via economic and cultural dependencies. Precipitation extremes are leading worldwide to disastrous landslides and floods. Understanding landscape change requires a better recognition of the driving forces. To understand the effects of climate change on biodiversity and human society, it must be taken into account both climate related changes in the abiotic environment, effects of other drivers such as land use, potential interactions and etc. The frequency and intensity of extreme weather events rises. Aim of European Landscape Convention is to achieve sustainable development based on a balanced and harmonious relationship between social needs, economic activity and the environment.

For the better understanding of the impact of weather and climatic extremes on landscape transformation long-term (1970-2017) meteorological observation data have been used. It includes extreme temperature, precipitation and wind data evaluation. The results were used for agroclimatic zoning of Georgia's territory and recommendations for adaptation and mitigation measures.

Keywords: Weather and climate extremes, landscape transformation, disastrous events, European Landscape Convention, adaptation and mitigation measures.

THE LONG-TERM CHANGES OF INTENSITY AND FREQUENCY OF HEAT WAVES IN THE CONTEXT OF CLIMATE CHANGE (CASE STUDY IS THE ARARAT VALLEY)

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Abstract

The long-term daily air temperature data have been studied, investigated, analyzed and evaluated for surveying the intensity of heat waves and their long-term frequency range observed in the context of climate change. The main studies have been done for the Ararat valley, as the intensity of heat waves is typically defined here. Daily maximum temperatures of 5 meteorological stations (Ararat, Artashat, Merdzavan, Armavir and Arabkir) are observed. We have analyzed and calculated the absolute maximum air temperature, the number of days with absolute maximum temperatures above 38°C and the number of observed heat waves (5 days and more observed absolute maximum temperatures above 38°C) for 1960-2016 period. The synoptic conditions of the formation of heat waves, their frequency and intensity, and duration have been analyzed. A number of features and patterns have been revealed. In the region and particularly in the Ararat Valley, the intensity of the thermal waves and the frequency increase has been observed especially after 2000.

Keywords: Heat wave, frequency and intensity, absolute maximum temperature, climate change

DYNAMICS OF LANDSLIDE AND GRAVITATIONAL EVENTS IN GEORGIA AND RISK FACTORS OF THEIR DEVELOPMENT (CASE STUDY OF IMERETI)

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Abstract

Georgia is one of the most distinguished countries among mountainous regions in terms of the scale of natural disaster development, vulnerability, natural disaster frequency and their impact on the population and economy. Nowadays in Georgia approximately 53 thousand landslide bodies, 3000 cell transforming erosional rivers, more than 5000 avalanche prone territories and 1500 abrasion zones are registered. In total 70% of the territory of the country and approximately 3000 settlements are under the danger of natural disasters.

The most devastating and dangerous natural disasters in Georgia are landslide-gravitational processes. These processes can be met in every climatic-geomorphological zone and can cause large scale damage.

In recent decades the activation of landslide-gravitational processes is caused by different factors, such as: high intensity earthquakes in Caucasian region; increased human pressure on geocological environment and the disruption of its balance; and of course, increased number of meteorological events (rainfall, humidity) because of global climate change.

Keywords: Tecto-seismo-gravitational, technogenic, climatogenic (consistent), landslide.

NUMBER OF BLIZZARD DAYS ON THE TERRITORY OF GEORGIA

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Abstract

Most of the territory of Georgia occupies mountain landscape and the development of mountain regions has high value for country. For the development of mountain health resorts it is important to liquidate in proper time the negative consequences of different dangerous weather phenomena, including blizzard. Also, it is important to introduce effective measures to eliminate the consequences of the blizzard for the smooth operation of Georgia as a regional transport hub. In the present study the number of days with a blizzard has been investigated. There are presented geoinformation maps of average and maximum blizzard days for Georgia. The number of blizzard days has been studied according to the materials of observations made at 86 meteorological stations of Georgia within the period of 1966 - 2017. Obtained results will be used to carry out preliminary measures to minimize damage caused by blizzard.

Keywords: Blizzard, climate, dangerous meteorological phenomena, geoinformation map.

SESSION 4: ENVIRONMENT DEGRADATION AND POLLUTION

**ON THE INFLUENCE OF LANDSCAPE ON THE CONTENT OF LIGHT
AEROIONS IN DIFFERENT REGIONS OF GEORGIA**

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Abstract

The importance of study of the light ions content in the atmosphere is well known. The content of light ions in the atmosphere plays important role in molding of the physiological state of population.

In this work some results of studies of the influence of landscape on the ionizing state of air environment in different regions of Georgia in recent years carried out. The data about the content of aeroions in Tbilisi and some locations of Western Georgia with different types of landscape (urban, forest, park, gorge, waterfalls, the coast of rivers, etc.) are represented. In particular, it is shown that even in the limits of the strongly contaminated city the landscape has vital importance for creating the medium ecologically favorable for human health (Tbilisi National Botanical Garden, territory of Tbilisi Sea, etc.). The results of work can find practical application for the development of health resort- tourist industry in Georgia.

Keywords: Light ions, landscape, bioclimate, ecology, health resorts and tourism

**IMPACT OF HIGH MOUNTAINOUS RURAL REGIONS (ILLEGAL DUMPSITES
AND LATRINES) OF GEORGIA ON CLIMATE CHANGE**

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Abstract

The part of Georgian population living on the rural territory is approximately 46%, and 66% of the territory of Georgia consists of high mountainous regions inhabited by 6.5% of the country's population. The high mountainous regions of Georgia are characterized by relatively structural weaknesses: non-diversified economy, outmigration, extreme poverty, underdeveloped infrastructure, limited access to health care and other public services such as waste management and sewerage. All these lead to increased formation of illegal dumpsites and latrines, which in turn impact on climate change. The aim of the research was to determine impact of illegal dumpsite and latrines on climate change using IPCC methodology and experimental data about quantity and

morphological composition of municipal solid waste and statistical data of amount of latrines in High Mountainous Rural Regions of Georgia.

The results of illegal dumpsites and latrines study shows that methane emissions from illegal dumpsites generated by high-mountainous rural regions of Georgia is 0.01% of emissions from the waste sector, while methane emissions from latrines amount is 0.01% of emissions from all sectors of Georgia.

Keywords: High Mountainous Rural Regions, illegal landfills, waste, latrine, climate change.

THE ASSESSMENT OF DEGRADATION AND ANALYSIS OF PEDOLOGICAL VARIABILITY IN ARAGATS MASSIF

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Abstract

The main purpose of the study is to explore and evaluate the pedological variability in Aragats massif at altitude. As a result of processing the laboratory samples, which were 49 from 10 soil profiles, a number of soil property changes have been characterized by depth. One of the major problems was to find out the degree of soil degradation on the southern slopes of the Aragats massif.

By 2002, 81.9 % of the soils of the Republic of Armenia (RA) were influenced by various forms of degradation. The studies have shown that the main reason of the soil degradation on the southern slope of Aragats is overgrazing. It is more obvious that a few centimeters of the upper layer of the soil are compressed. On the slopes of Aragats overgrazing was and still is the main reason for erosion and soil degradation as the semi-nomadic lifestyle is still active. As a result, most of the atmospheric precipitation becomes a surface flow, because of the high compression of upper horizons, the volume of absorbing water decreases, which, in its turn, increases the intensity of erosion processes.

Keywords: Massif Aragats, pedological variability, soil profiles, soil degradation

STUDY OF THE POLLUTION OF RIVERS AND SOILS IN THE ADJACENT AREAS OF MADNEULI IN BOLNISI MUNICIPALITY

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Abstract

The Madneuli factory operating in the Bolnisi municipality is a risk factor for the ecosystems of the region. Environmental chemical contamination is a particular threat to human health - increase of heavy metal content in environmental objects. The first expedition was carried out in February 2019, sampling on the river and artesian waters near Madneuli enterprise and their physical-chemical, hydrochemical and microbiological characteristics were identified. The results are presented in conclusions. The rivers and artesian waters contaminated by various ingredients have been identified. Soil samples were also taken from background and contaminated areas from 0-10 and 10-20 cm depth. The results are presented in conclusions. The rivers and artesian waters contaminated by various ingredients have been identified, as well as soil polluted by heavy metals – copper, zinc, cadmium, chromium and arsenic.

Keywords: Pollution, natural waters, heavy metals, soils.

NUMERICAL MODELING OF CONVECTIVE DUST DISSIPATION INTO THE ATMOSPHERE EMITTED FROM TWO STATIONARY SOURCES

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Abstract

The numerical model of dust propagation emitted into the atmosphere is developed on the basis of three-dimensional non-linear non-quasistatic equation of thermal convection in the atmosphere. F. Shuman's explicit numerical scheme and implicit numerical scheme of splitting according to processes and coordinates, developed by G. Marchuk, are used for equations integration. The model is implemented on the numerical grid with high resolution ability.

The distribution kinematics of 10 μ size dust particles emitted into the atmosphere from two high sources is studied using the numerical modelling. Two meteorological situations – calm air and background north-west wind are considered.

It is obtained by means of modelling that the distribution kinematics of dust emitted into the atmosphere substantially differs from each other in cases of calm air and background motions. Spatial dust distribution occurs as a result of both ordered horizontal and vertical streams, and small-scale whirling and diffusive motions. Advective, convective and turbulent dust diffusion under the influence of background motions forms a vertical inclined fume-like zone of dust pollution. There is no whirling motion in the obtained zone.

Keywords: Atmosphere dust, numerical modelling, stationary sources, convective diffusion.

**SESSION 5. LANDSCAPE PLANNING, ECOSYSTEM SERVICES,
AGROLANDSCAPES**

**CULTURAL HERITAGE CAN SUPPORT SUSTAINABLE LANDSCAPE
DEVELOPMENT – A STUDY FROM THE TREBON BASIN, CZECH REPUBLIC**

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Abstract

The European Landscape Convention, which is widely adopted by governments, refers to the role of landscape – defined as “an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors” – and sustainable development in regards to the sustainable use, protection, management, and/or planning of landscapes [1]. In this paper, we explore if and how the cultural heritage in the Trebon Basin, i.e. the artificial fishponds and lakes that were mainly built in the 15th – 16th century, is contributing toward sustainable landscape development. Tracing the historical development of the area we argue that this phenomenally engineered large-scale system of ponds is uniquely adapted to the local landscape conditions and may have survived into the 21st century due to its economic production value from aquaculture but also due to the recreational opportunities, biodiversity and aesthetic values this landscape provides to the present day. Current threats to the landscape and potential remedies for sustainable landscape development are discussed.

Keywords: Vernacular landscape, cultural landscape, rural livelihoods, multifunctional landscape, cultural sustainability, rural sustainability

References:

- [1] Council of Europe, European Landscape Convention,
<https://www.coe.int/en/web/landscape2000> (accessed March 28, 2019).

**DRIVERS OF DISAPPEARANCE AND PRESERVATION OF
HAY MAKING STRUCTURES IN EUROPE**

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Abstract

Hay making structures are part of the agricultural landscape of meadows and pastures. Hay meadows are still used and found all over Europe, but their distribution patterns depend on

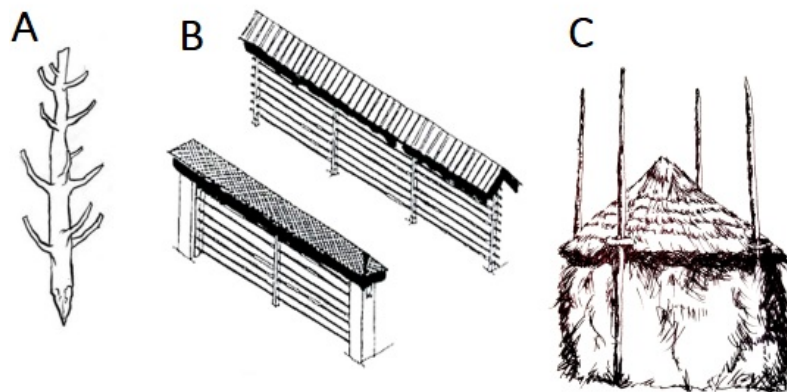
geographical area (mountain or plane), climate, culture, and intensity of agriculture [1]. Intensively used hay meadows are most dominant, using heavy machinery to store hay mostly as rounded or square bales. Traditional hay making structures represent structures or constructions used to quickly dry freshly cut fodder and to protect it from the wet environment. These “ancient” forms of traditional hay making structures are becoming relic, due to mechanization and the use of new technologies. Both the need for drying hay and the traditional methods for doing so were similar across Europe. Regarding the construction and use of hay making structures, we have distinguished three different types related to natural and regional conditions: (1) temporary hay racks of various shapes; (2) different types of permanent construction and buildings for drying and storing hay and (3) hay barracks, a special type of shelters for drying hay (Fig. 1) [2, 3].

Hay making structures have mostly been preserved in connection with traditional agricultural landscape and are maintained as characteristic landscape structures.

Keywords: Traditional agricultural landscape, Carpathian, Alps.

Acknowledgements

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Figures: A -Examples of temporary hay racks; B - permanent construction and buildings for drying and storing hay; and C - Hay barracks.

References:

- [1] Tresemer D., Vido P., (2001). *The Scythe Book: Mowing Hay, Cutting Weeds, and Harvesting Small Grains with Hand Tools*, 2nd ed., Pa: Alan C Hood & Company, Chambersburg,
- [2] Podolák J. (1965). *Pestovanie poľnohospodárskych plodín a chovu poľnohospodárskych zvieratna Slovensku od polovice 19. dopolovice 20. storočia*. *Agrikultúra* 4, 29–77,
- [3] Juvanec B., Kozolec. *Fakultetazaarhitekturo*, Ljubljana (2007).

MAIN FACTORS OF SPATIAL LANDSCAPE PLANNING IN SAMTSKHE-JAVAKHETI REGION

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Abstract

The paper presents Spatial-Territorial Planning issues of Tourism and Recreation Cluster of Samtskhe-Javakheti region, one of the most outstanding regions in South of Georgia. This region include 6 protected areas, 14 resorts and 13 resort places; numerous cultural heritage monuments, including cultural landscape; the wide part of the territory is covered by coniferous forests; and is crossed by the highways of international and national significance. The paper aims to define the role of the regional landscape in the spatial-territorial planning process.

Despite all above-mentioned advantages, Samtskhe-Javakheti region is one of the economically weak regions of Georgia. The main objective is to define spatial planning tools, which will contribute to the social, economic, environmental and cultural components of the sustainable development, including intangible cultural heritage as a new approach to protection system of cultural heritage as a whole.

Regional landscapes were investigated using methods of cluster analysis, GIS-analysis, defining spatial layers and prospective recreation areas. Based on the previous researches, recommendations for the strategic vision of the regional development from the point of view of the spatial-territorial planning were elaborated.

One of the main recommendations is to consider the traditional Meskhetian Know-How of terraced arrangement of the landscape, used in agriculture and construction, under contemporary conditions. Terraced arrangement method of the landscaping can be defined as intangible heritage monument.

Keywords: landscape planning, intangible cultural heritage; tourism and recreation cluster, spatial-territorial planning, regional development, ecology.

INFLUENCE OF CLIMATE ON THE BORDER OF SOILS (ON EXAMPLE OF CINNAMONIC AND BROWN FOREST SOILS OF GEORGIA)

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Abstract

Author has studied the impacts of climate change on the soil in recent years, namely, on their area and the current state on the border of the cinnamonic and brown forest soils. This issue has been studied in the vicinity of Tbilisi. Here used to be the border between the two soils.

The cinnamonic soils are carbonated soils, and brown forest soils are acidic soils. Author explored the 15-year old borderline data between these soils - that is, between cinnamonic and brown forest soils at 1150-1210 meters above sea level. Thus, below this altitude the soil was cinnamonic (carbonated), and above this altitude - brown forest soils (acidic).

Author studied the present borderline between these two soils and found out that it had moved 50-100 meters higher. Presently, the border passes at an altitude of 1200-1310 meters above sea level.

This means that below this altitude the soil is now cinnamonic (carbonated), and above it the soil is brown forest soil (acidic). If such tendency persists, this will result in the disruption of ecological balance of these soils and it will become necessary to review the existing agricultural and forestry approaches and take effective measures.

Keywords: Cinnamonic soil, brown forest soil, border, carbonate, acid reaction, alkaline reaction.

ASSESSMENT OF LANDSCAPE FUNCTIONS IN URBAN AREAS: TWO CASE STUDIES FROM A CITY AND A SMALL TOWN

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Abstract

The same approach to landscape functions assessment was applied in research of a small residential town Tarusa and city of Tyumen (Russia). The approach consisted in allocating, mapping and parameterization of homogeneous urban geographical systems, which formed urban pattern of selected places. Geographical integrity and homogeneity of urban systems were recognized both by natural environment – relief, soil parent material and moisture, vegetation, and by human development - buildings type, density and function. We used field observations and sampling as well as remote sensing data for the research.

To address the needs of urban management and planning we focused on assessment of certain regulating functions, which were crucial for the place. In Tyumen we studied contribution of different urban geosystems in air quality and local climate regulation. Low-rise and poorly paved Tarusa more likely needs protection from natural destructive processes – erosion, water logging, flooding, etc. Therefore, in Tarusa we studied erosion and flood control functions.

Indicators of cultural functions of urban geosystems in both cases were aesthetic attractiveness and recreation value.

The study showed that allocated urban geosystems perfectly served as spatial units for urban landscape assessment and planning regardless of the size of the research object.

Keywords: Urban geosystems, urban planning, landscape functions

THE IMPLEMENTATION OF THE EUROPEAN LANDSCAPE CONVENTION IN CATALONIA. A KEY REFERENCE FOR GEORGIA: RECOMMENDATIONS AND CHALLENGES

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Abstract

The implementation of the European Landscape Convention (ELC) in Georgia should be developed taking as a key reference the success experiences at European level and subsequently adapting its practical application to the reality of the country.

First of all, the paper explains the process followed by the practical application of the Convention in Catalonia (Spain). A procedure that began with the entry in force of the ELC by the agreement of the Parliament of Catalonia (2000) and the approval of a landscape law (2005) that resulted in the creation of the Landscape Observatory (www.catpaisatge.net), which has been the key organism for the development of landscape policies in collaboration with universities and research centers. The main objectives of the landscape policies are their recognition, protection and management in order to preserve their natural and cultural heritage, their social values and also to make urban and economic improvement compatible with the quality of the environment in a context of sustainable development. The key instruments are: landscape catalogs, landscape charts, studies and reports on landscape integration, educational programs and research and dissemination projects, and finally the fund for the protection, management and improvement of the landscape.

Secondly, in connection with the experience described in the specific case of Catalonia, a series of recommendations are made to promote the proper implementation of the Convention in Georgia and also it is remarked the main challenges and opportunities of the ELC for the country.

Keywords: European Landscape Convention, Landscape Observatory of Catalonia, landscape policies, landscape catalog, landscape chart.

DEVELOPMENT OF RIVER LANDSCAPES – FARMERS’ PREFERENCES IN THE CONTEXT OF AGRICULTURAL PRODUCTION AND NATURE CONSERVATION

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Abstract

Natural, semi-natural floodplains as well as watercourses provide a variety of ecosystem services that are associated with benefits for society, such as habitat for flora and fauna, water purification or carbon storage. However, two thirds of the (near) natural floodplains have already been lost. One reason is the intensive agricultural use of the mostly very fertile alluvial areas. To combine the objectives of nature, water and flood protection on the one hand and the use and interest of agricultural actors on the other hand, long-term and practical strategies and instruments for the nature-friendly and economically viable agricultural use of floodplains have to be designed. We therefore conduct an online survey among farmers using a discrete choice experiment to assess farmers’ preferences regarding different designs of agri-environmental schemes targeted at sustainable agricultural use of river floodplains. Different restrictions of land use, but also aspects of governance mechanisms and level of compensation payments are considered. The results will help to tailor site specific and result-oriented schemes with better acceptance among farmers.

Keywords: River Floodplains, Agri-Environmental Scheme, Sustainable Land Use, Discrete Choice Experiment, Governance

AGRO-LANDSCAPE ZONING OF ACHARA-GURIA REGION

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Abstract

The landscape-genetic (complex) method of determining their agro-resource potential is the rational layer of citrus cultures of the Achara-Guria humid subtropical zone and agricultural use of territories. The emphasis has been made on the components that have been substantially impacted (climate, soils, relief) the citrus growth in development and yield. Agro-landscape zoning, which originates in natural geographical zones, implies the allocation of regional agro-geocomplexes of taxonomic ranges that are more or less different from each other: spatial distribution of agro-landscape, hypsometric location, geo-ecological condition, and scale and shape of anthropogenic

impact, the level of agricultural use and the nature of agricultural land and the agricultural production is the most important agro-climatic characteristics: SAT, HTC, temperature regime, soil physical-chemical properties and relief conditions (inclination, dismemberment, aspect).

Keywords: Agro-landscape, ranking, potential, zoning, agro-climatic characteristics

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