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Provision of ecosystem services in mountain forests – case study of experts' and stakeholders' perceptions from Slovakia

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ABSTRACT: Forests in the mountain ranges are supposed to meet multiple objectives at the same time. There are different expectations and priorities among stakeholder groups. The object of the research is the case study area in the Goat Backs Mountains in Slovakia (representing Western Carpathians). The stakeholders' panel which included local government officials, landowners, foresters, interest group representatives etc. judged the current and future importance of ecosystem services in a special questionnaire. The context analysis provided main strengths and weaknesses, threats and opportunities that influence mountain forest management and the provision and use of ecosystem services in the case study area were done by involved experts from practice and science. Based on the SWOT results a possible strategy for the provision of ecosystem services was proposed. Some of the key issues that have been identified by experts concerning the balancing of ecosystem service provision are: strengthening the local stakeholder involvement; enhancing regional initiatives; and economic market-oriented instruments and economic incentives.

Keywords: ARANGE project; Western Carpathians; context analysis; participation; societal demands

Mountains are an important source of vital ecosystem services (ESs) and have a significant role in economic development, environmental protection, ecological sustainability, and human wellbeing. The international community recognized the importance of mountains at the United Nations Conference on Environment and Development in Rio de Janeiro, Brazil in 1992 through the adoption of Chapter 13 in Agenda 21. Chapter 13 underscored the role of mountains in global sustainable development (Sitarz 1993).

Mountain regions are fragile ecosystems and an important source of water, energy and biological diversity. They are a source of key resources such as minerals, forest and agricultural products, as well as being landscapes for tourism and recreation. As major ecosystems representing the complex and interrelated ecology of our planet, mountain environments are essential to the survival of the global ecosystem. Occupying about one-fifth of the world's land surface area, mountains provide a direct life-support base for about one-tenth of humankind as well as goods and services to more than half the world's population (Dax 2002).

The results presented in this article are based on the findings from the 7th Framework Programme project "Advanced multifunctional forest management in European mountain ranges" (ARANGE) which evalu-

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ated the changing climate impacts and socio-economic conditions on the provision of ESs in European mountain forests (http://www.arange-project.eu/).

Ecosystems represent the benefits that human populations derive from ecosystems, ecological processes or functions (Costanza et al. 1997; de Groot et al. 2002). There are many classifications and characterizations of ESs (Wallace 2007; de Groot et al. 2010). One of the most common classifications considers four groups of ESs (TEEB 2010): provisioning services (e.g. food, water, fodder, timber), regulating services (e.g. climate regulation, rainfall interception, air quality regulation, erosion control, water purification, pest and disease control), supporting services (e.g. soil formation, photosynthesis, nutrient cycling, natural diversity) and cultural services (e.g. aesthetic landscape, natural area tourism, cultural and environmental heritage). Mountain forests are important for various ecosystem goods and services worldwide. Four main ESs were addressed: (*i*) timber production, (*ii*) protection against gravitational natural hazards, (*iii*) the role of forests in climate change mitigation, via carbon sequestration as well as bioenergy production, (*iv*) nature conservation and the maintenance of biodiversity.

Trade-offs among ESs can generate conflicts in natural resource management, development, and planning. Trade-offs can occur because of inherent constraints of the biological, ecological, and physical system (called "biophysical" hereafter). Conflicts may then arise as a result of divergent preferences held by different service users and other stakeholders (Martín-López et al. 2012).

Forests in the mountain ranges are supposed to meet multiple objectives at the same time. There are different expectations and priorities among stakeholder groups. The participatory approach to the development of multi-objective mountain forest management strategies has to include various stakeholders and interests in the decision-making process (Pukkala 2002; Martins, Borges 2007; Paletto et al. 2016). A participatory approach that involves local stakeholders in the decision-making process is a way to increase social sustainability and an important tool to support sustainable forest management (Kangas et al. 2006; De Meo et al. 2011).

The main aim of this article is to analyse stakeholders' preferences about ESs provision in mountain forests in Slovakia.

MATERIAL AND METHODS

In this article a context analysis was used in order to analyse stakeholders' perceptions about mountain forest management. The context analysis is a method to analyse the environment in which a certain issue is handled. One kind of context analysis is the SWOT analysis which allows gaining an insight into the strengths (S) and weaknesses (W) and also the opportunities (O) and threats (T) posed by the external and internal environment. It is an easy-to-use method that provides a transparent initial overview and identifies important problem areas. SWOT analyses are useful for scanning internal strengths and weaknesses of organizations as well as for illuminating the opportunities and risks of a dynamic environment (Rauch 2007). The main goal of a context analysis is to analyse the environment in order to develop a strategic approach to selected issues. Internal strengths and weaknesses as well as external influences which can be opportunities or threats have been analysed in order to derive promising future strategies for ecosystem provision in mountain regions. The output points out what needs to be done and it puts problems into perspective.

According to Lobriser and Abplanalp (1998) and Rauch (2007) a SWOT analysis can be executed with the assistance of a matrix. Initially, there was a blank matrix with four sectors (Table 1).

Table 1. Local SWOT analysis

Ecosystem service	Strength	Weakness	Opportunity	Threat
	questions to be answered			
	What is done well? What are the advantages?	What could be improved? What should be avoided? Bad examples.	What are the chances for success? What are the interesting trends?	What are the aspects that inhibit, harm or threaten the ecosystem services in selected case study?
Timber production				
Protection against gravitational natural hazards				
The role of forests in climate change mitigation				
Nature conservation and the maintenance of biodiversity				

Table 2. Regional experts and stakeholders

Sector	Type	Details
Forestry	local stakeholder	forest owner head of forest enterprise forest manager (responsible for silvicultural activities) forest manager (responsible for cutting activities)
	local expert	licensed forester
	regional expert	Regional Forest Office in Prešov
Other	local stakeholder	Slovak Fishing Association – Poprad local organization HORAL Cycling Sports Club Hunting Association in Bor Spišská Teplica Tourism Club in Spišské Bystré
	international expert	Forest Stewardship Council
	national stakeholder	Administration of Slovenský raj National Park
	local stakeholder	Village Mayor of Spišské Bystré Village Mayor of Spišská Teplica

The aim of the SWOT analysis was to analyse the current situation in the case study area Goat Backs Mountains in order to formulate the future actions.

For mapping out the strategies, the SWOT table has to be searched for logical SWOT combinations which answer the following questions (Lobriser, Abplanalp 1998; Rauch 2007):

(*i*) Which strength fits with which opportunity (SO combination)?
(*ii*) Which strength fits with which threat (ST combination)?
(*iii*) Which weakness fits with which opportunity (WO combination)?
(*iv*) Which weakness fits with which threat (WT combination)?

The formulation of strategies started with finding the combinations. The aim of the strategy formulation is to produce possible and attractive strategies. A general assumption of SWOT analysis is that a good strategy maximises strengths and opportunities and minimises threats and weaknesses (Kohlöffel 2000). Four different strategy types can be considered:

(*i*) SO strategies: internal strength(s) can be used to realise external opportunity(ies) (ideal case;
(*ii*) WO strategies: reduce internal weakness(es) or develop missing strength(s) to realise external opportunities;
(*iii*) ST strategies: internal strength(s) are used to minimise external threats;
(*iv*) WT strategies: reduce internal weakness(es) to avoid external threats (only defensive strategy, worst case scenario).

In order to identify the main strengths, weaknesses, opportunities and threats for ESs in mountain forests, Table 1 was used (several S, W, O, T could be indicated). The experts and stakeholders should (if possible) integrate the following issues: (*i*) the implications of past and present policies, (*ii*) policy networks and stakeholders, (*iii*) socio-economic development, (*iv*) related governance systems, (*v*) potential land use and climate changes, (*vi*) analytic elements, (*vii*) special local conclusions.

The questions should serve as tools to better identify the SWOT matrix components.

Based on individual experts' and stakeholders' SWOTs the common final SWOT was created as a synthetic product during the second workshop, afterwards appropriate strategies were formulated and discussed with experts and stakeholders.

Stakeholders' participation in forestry decision-making, which was not a usual practice in the traditional forestry, might be particularly beneficial by providing regional expertise and increasing the legitimacy to the final outcome (Beckley et al. 2005) and strength interest of diverse stakeholder groups to participate in final strategy (Phalen 2009; O'Brien et al. 2013; Shackelford et al. 2013; Sarvašová et al. 2014; Marzano et al. 2015).

The selection of stakeholders followed the snow ball method. Stakeholders were approached based on their previous cooperation in research projects. They were further asked to identify other experts. In the end 14 experts and stakeholders have been involved in the SWOT analysis and strategy formulation during the two local workshops in 2015 (Table 2).

Case study area – Goat Backs Mts. The Goat Backs Mts. case study area (CSA) (Fig. 1) consists of parts of four mountain ranges located in northern Slovakia. Goat Backs Mts. are a small mountain range separated from the Nízke Tatry Mts. by the Hornad River. The third mountain range in the western part of CSA is called Stratenská hornatina,

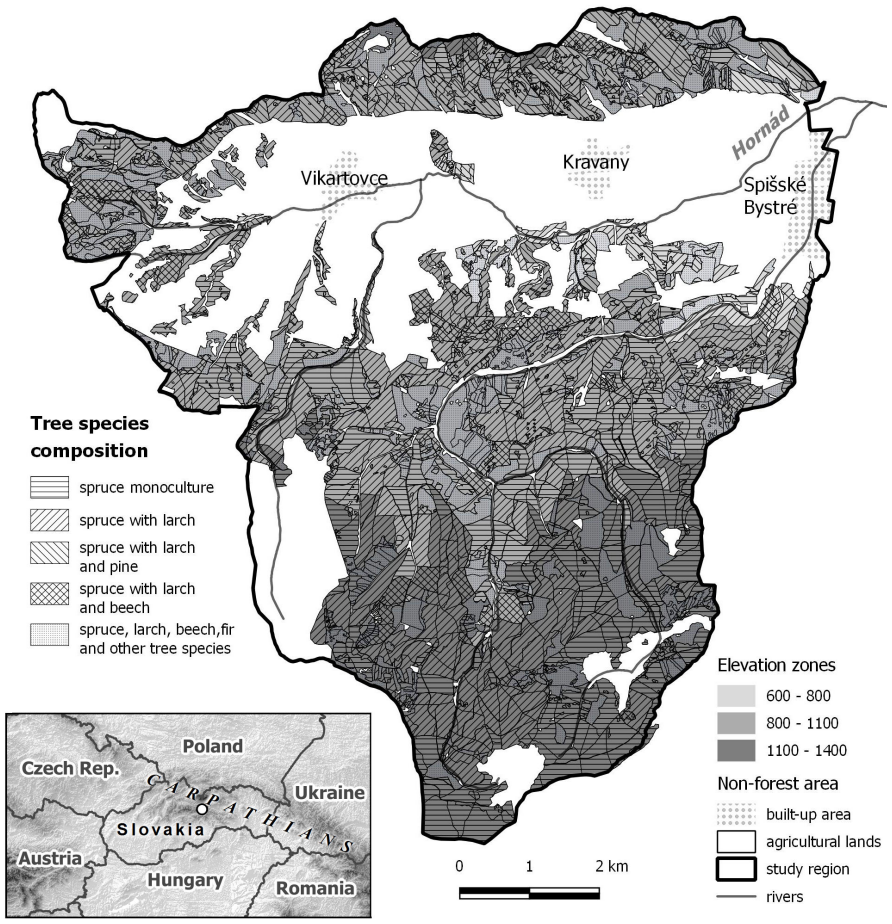

Fig. 1. The Goat Backs Mountains case study area

known also as Slovenský Raj. The eastern part of CSA is secluded from the above-mentioned range and is located in the southern part of the Levočské vrchy mountain range. In Nízke Tatry and Slovenský raj, national parks were established; however, the former of them does not intersect the CSA borders. The Slovenský Raj National Park covers a substantial part of CSA. This national park is quite identical with Natura 2000 Site of Community Importance Slovenský Raj, which was to be designated Natura 2000 Special Area of Conservation in 2013. The national park is buffered by a designated buffer zone, and the park together with this zone overlaps the Natura 2000 Special Protection Area Slovenský Raj. In the northern part of Levočské vrchy, Special Protection Area was designated this year. There are also several strict nature reserves in both parts of CSA, some of them in the national park, some of them outside.

As for the state administration, the CSA belongs to two self-governing regions: Prešov and Košice.

The case study is focused on the forests of one specific owner in the area – PRO POPULO Poprad Ltd. This company was established by the Roman Catholic diocese in the town of Spišské Podhradie, the owner of the properties, in 1991.

Total acreage of the above-mentioned forest properties is 12,450 ha. It was all in state ownership before 1989, the year when a change of the political system occurred. As an aftermath of these changes, the forest properties nationalized in the 1950s have started to be returned into hands of their original private owners. The forests of the study region are managed by 14 forest management plans with various planning periods.

The long-term goal of the PRO POPULO Poprad Ltd. company is to ensure sustainable forest management based on the reasonable use of economic, ecological and social functions of forests. It is interconnected with a further improvement of the quality of life, biological diversity, forest health condition and the effective utilization of wood raw material. The forest managers from the PRO POPULO Poprad Ltd. company meet many of the needs of society (forests properties are situated in the cadastre of 25 municipalities) and cooperate with the representatives from diverse organizations (local communities, tourist clubs, hunting and fishing associations), when it comes to set up for example forest footpaths, nature trails, biking trails, picnic areas or forest shelters, etc. The organisation structure of the PRO POPULO Poprad Ltd. is organised in the form of two-level man-

agement. The first – basic level of management consists of 4 forest districts located in: Spišská Teplica, Spišské Bystré, Spišské Podhradie and Hranovnica. These represent primary organizational units structured directly under the company headquarters which represents the second management level. They carry out only forest production activities, manage forest districts and organize timber sale.

Game management represents a separated production and economic cycle. The company has hunting rights in 4 approved hunting grounds (Kozí Kameň, Smrečiny, Hranovnické Pleso and Orlovec).

The PRO POPULO Poprad Ltd. company is also a member of the Forest Stewardship Council Slovakia certification scheme, which promotes appropriate, socially beneficial, and economically viable management of the world's forests.

RESULTS AND DISCUSSION

Timber production as an ES is primarily recognized in commercial forests. Policy documents (such as National Forest Program – NFP; http://www.forestportal.sk/lesne-hospodarstvo/politika-legislativa/narodna/Documents/nlp_sr.pdf) dealing with timber production are in general focused mainly on the restrictions of the use of this function and promotion of some of close-to-nature forestry principles, use of environmentally friendly technologies, etc. Timber production itself is gradually losing support, for example forest managers are not encouraged to maximise the use of the production potential, quite on the contrary, and some measures encourage them to waste it. There is only one partial exception from this trend – the declared support to the purchase of appropriate machinery and forest road building, which can be considered directly promoting timber production, despite the fact that these measures also pronounce environmental friendliness of the technologies.

Slovak legislation and policies do not operate with the term "gravitational natural hazards", but they acknowledge water, soil and avalanche protective functions. These functions form a substantial part of various policy documents, for example NFP, which promote "maximal functional efficiency" of protective forests by maintaining and enhancing their vitality and stability as well as improvement of methods of identification, quantification and financial evaluation of protective functions of forests. Incidental fellings in (many times overmature) protective forests are becoming a serious problem and thus, measures minimizing them are also promoted.

The issue of climate change mitigation is quite new and thus, in Slovakia, it has not been implemented into practice very comprehensively. Presently, it is rather in the stage of formulation of documents than in the stage of massive promotion of practical measures. These documents include NFP and its Action Plan (www.mpsr.sk/download.php?fID=286), Forest Development Strategy (http://www.forestportal.sk/lesne-hospodarstvo/politika-legislativa/narodna/Pages/strategia-rozvoja-lesnictva.aspx), Conception of the Agricultural Development – part Forestry (http://www.nlcsk.sk/files/1278.pdf), Action Plan on Biomass Utilization (http://www.nlcsk.sk/nlc_sk/papvpdsr/n5ndur/navrh-narodneho-programu-vyuzitia-potencialu-dreva-slovenskej-republiky.aspx), National Program of Wood Potential Utilization (http://www.nlcsk.sk/nlc_sk/papvpdsr/n5ndur/navrh-narodneho-programu-vyuzitia-potencialu-dreva-slovenskej-republiky.aspx), and Rural Development Program (RDP, http://www.mpsr.sk/sk/index.php?navID=47&sID=43&navID2=935) as a financial instrument (mainly support of afforestation of abandoned agricultural land). The prices of energy from renewable resources are subsidised and there are also subsidies for the construction of bioenergy facilities.

Biodiversity conservation is a matter of controversy between foresters and nature conservationists, or between two ministries – Ministry of Agriculture and Rural Development and Ministry of the Environment of the Slovak Republic. There was an attempt to merge these ministries, but the process was interrupted. For this reason, policy documents and legislation of both sectors are not sometimes fully compatible. However, forestry legislation refers to nature conservation legislation and vice versa, in general it does not deal with nature conservation. Therefore, the main restrictions in this field are represented by Nature and Landscape Protection Act No. 543/2002 Coll. and related decrees, for example Degree No. 24/2003 Coll. Protected areas themselves are designated via separate legal norms. In the case study area it is for example the Ordinance of the Government of Slovak Republic No. 23/1988 Coll. on the Slovenský Raj National Park. It is necessary to add that in CSA, European directives (Natura 2000 – Birds Directive No. 79/409/EEC, and the Habitats Directive No. 92/43/EEC) play also a very important role. The results of the assessment by experts and stakeholders are presented in Table 3.

Timber production is considered as the most important ES because it is the most profit-making branch of the forest economy and due to existing steady demand for timber. Sustainable forest management in its principles assures the provi-

Table 3. Final SWOT analysis for the case study area of the Goat Backs Mountains

Ecosystem service	Strength	Weakness	Opportunity	Threat
Timber production	main profit-making branch of the forest economy (90%) good technological background	uneven distribution of timber stocks (age and spatial)	steady demand for timber development of new timber harvesting technologies	lack of timber stocks after previous disaster
Protection against gravitational natural hazards	division of forest stands (slopes) by forest roads and outgoing forest communications	unpredictability of natural processes (e.g. local torrential rains)	maintaining the stability of forest stands	disasters
The role of forests in climate change mitigation	young forest stands with mixed tree species composition	the progression of climate change is faster than the ability of forest managers to respond to it properly	utilization of close-to-nature (environmentally friendly) management practices recovery measures after the processing of salvage felling	recovery measures cost much time and money
Nature conservation and the maintenance of biodiversity	close-to-nature (environmentally friendly) management principles	different opinions of professionals, managers and lay public on nature protection and biodiversity conservation	convergence of different opinions using communication and public relations work	change in society priorities, radicalization of interest groups

sion of other ESs which were well provided also in the past. The strategy proposed for the CSA is SO strategy which in our case means supporting timber production and multifunctional management. SO strategy reflects internal strengths of the local SWOT analysis and uses external opportunities. It means that all current advantages will be used to promote timber production and multifunctional forest management.

When supporting this ES, the production of timber could increase along with the climate change which can shorten the rotation period. This would also have positive effects on timber supply, erosion control and carbon sequestration. Allocated resources from timber sales can be invested into tourism and social functions which will meet the societal requirements for forests.

For timber production the main strength lies in its availability thanks to efficient forest management throughout the years. Existing producers (forest owners, enterprises) need to actively promote timber and timber products especially in the local public, although there is a steady demand for timber in this CSA. New innovative products could also promote timber utilization.

Erosion control is one of the forest management goals. Mountain regions are especially vulnerable to gravitational natural hazards, therefore the expectations and sensitivity of the local population are high towards protection and prevention.

The role of forests in climate change mitigation is inalienable. Supporting the timber production in terms of multifunctional forest management could increase the carbon storage capacity of mountain forests.

Nature conservation is of high societal interest. This ES is difficult to balance with timber production. The solution would be the convergence of different opinions using communication and public relations work.

In order to achieve the proposed strategy, the following policy instruments are crucial: regulatory, economic and informational (Krott 2005; Šálka 2006). Regulatory instruments are sufficient to ensure the provision of the timber production ES. Forest Act No. 326/2005 Coll. enacts sustainable forest management as its main goal. The Act itself covers a large number of forest issues from the protection of forest resources through main forest management principles tailored to the natural conditions and society requirements, forest protection, state administration of forests, professional forest stewardship to public rights related to forests. Nature and Landscape Protection Act No. 543/2002 Coll. defines the categories of protected areas and levels of their protection, protection of selected species and habitats in unprotected landscape and state administration in the field of nature conservation. This Act is many times considered to be very restrictive to forestry, tourism and development. Some of its provisions are not compliant with the Forest Act.

Support to forest management and nature protection was reported via public financial instru-

ments both on contractual and non-contractual basis. They are mainly measures from the Action Plan of NFP and RDP. There are some compensation mechanisms for management restrictions due to various reasons (nature conservation, recreation, and water protection) but are not often claimed due to high administrative burden. Therefore the introduction of payments for ecosystem services could present a suitable financial instrument for supporting timber production as the main ES provided. As there are not either public-private incentives or private ones to support timber production or other ESs, the possibilities of local or regional companies willing to create new innovative products should be investigated.

Due to different opinions of foresters and nature conservation activists the communication between these two groups should be improved. Informational instruments such as public relations should be promoted. The informational instruments targeted at the professional public and forest owners are sufficient. They are ensured via professional forest managers and public authority (District Forest Office). The opinion of the local public is very sensitive to forest management. There is a need to strengthen the public relations towards lay public (e.g. forest pedagogics, forestry days, etc.) and environmental groups (e.g. seminars, conferences, etc.). Interest groups such as Forestry Chamber, Forest Owners Associations have an important role in information provision. As confirmed by other research there is a strong need to further develop the communication between the forestry sector and the general public in order to establish mutually acceptable relations (Lichý 2013).

From the forestry point of view forest management plan (FMP) is regarded as a significant informational instrument which could also serve as a basis for conflict resolution between forestry and nature conservation, which is the case in western European countries (e.g. Kangas et al. 2008; Brukas, Sallnäs 2011).

As regards governance systems, all experts and stakeholders from this CSA stated that intersectoral cooperation is either minimal or not established at all. Forest management plans are an important governance instrument and could serve as a basis for cooperation of different actors. Public participation in FMP elaboration is relatively low in this CSA, but current legislation changes could lead to improvement because they gave forest owners more freedom to decide on management options (Kulla et al. 2010; Sedmák et al. 2013).

CONCLUSIONS

Mountain forests belong to the most preserved ecosystem in Europe, and as such they are an object of nature conservation in many cases. However, timber production still remains the main ES also in mountain regions, partly resulting from a high forest cover. This is evident from the results in the CSA.

Our results have shown that the soil and biodiversity protection is considered equally important in mountain regions. This implies that timber production and protection (water, soil, biodiversity, etc.) should not be opposing or conflicting in the implementation of multifunctional forest management.

References

Beckley T., Parkins J., Sheppard S. (2005): Public Participation in Sustainable Forest Management: A Reference Guide. Edmonton, Sustainable Forest Management Network: 60.

Brukas V., Sallnäs O. (2011): Forest management plan as a policy instrument: Carrot, stick or sermon? Land Use Policy, 29: 605–613.

Costanza R., d'Arge R., de Groot R.S., Farber S., Grasso M., Hannon B., Limburg K., Naeem S., O'Neill R.V., Paruelo J., Raskin R.G., Suttonkk P., van den Belt M. (1997): The value of the world's ecosystem services and natural capital. Nature, 387: 253–260.

Dax T. (2002): Research on Mountain Development in Europe: Overview of Issues and Priorities. Manuscript. Vienna, Federal Institute for Less-Favoured and Mountainous Areas: 15.

de Groot R.S., Wilson M.A., Boumans R.M.J. (2002): A typology for the classification, description and valuation of ecosystem functions, goods and services. Ecological Economics, 41: 393–408.

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: 260–272.

De Meo I., Cantiani M.G., Ferretti F., Paletto A. (2011): Stakeholders' perception as support for forest landscape planning. International Journal of Ecology, 1: 1–8.

Kangas A., Kangas J., Kurttila M. (2008): Decision Support for Forest Management. Berlin, Springer-Verlag: 222.

Kangas A., Laukkanen S., Kangas J. (2006): Social choice theory and its applications in sustainable forest management – a review. Forest Policy and Economics, 9: 77–92.

Kohlöffel K.M. (2000): Strategisches Management. München, Carl Hanser Verlag: 262.

Krott M. (2005): Forest Policy Analysis. Dordrecht, Springer-Verlag: 323.

Kulla L., Bošela M., Burgan K. (2010): Potreba a možnosti inovácie rámcového plánovania HÚL na Slovensku. In:

Bortel S., Bavlšík J. (eds): Súčasnosť a budúcnosť hospodárskej úpravy lesov na Slovensku. Zvolen, Národné lesnícke centrum: 42–49.

Lichý J. (2013): Proposal of model of forest enterprise media communication. Lesnícky časopis – Forestry Journal, 59: 276–283.

Lobriser R., Abplanalp P.A. (1998): Strategisches Management, Visionen entwickeln, Strategien umsetzen, Erfolgspotentiale aufbauen. Zürich, Versus: 468.

Martins H., Borges J.G. (2007): Addressing collaborative planning methods and tools in forest management. Forest Ecology and Management, 248: 107–118.

Martín-López B., Iniesta-Arandia I., García-Llorente M., Palomo I., Casado-Arzuaga I., García Del Amo D., Gómez-Baggethun E., Oteros-Rozas E., Palacios-Agundez I., Willaarts B., González J.A., Santos-Martín F., Onaindia M., López-Santiago C., Montes C. (2012): Uncovering ecosystem service bundles through social preferences. PLoS ONE, 7: e38970.

Marzano M., Dandy N., Bayliss H.R., Porth E., Potter C. (2015): Part of the solution? Stakeholder awareness, information and engagement in tree health issues. Biological Invasions, 17: 1961–1977.

O'Brien L., Marzano M., White R.M. (2013): 'Participatory interdisciplinarity': Towards the integration of disciplinary diversity with stakeholder engagement for new models of knowledge production. Science and Public Policy, 40: 51–61.

Paletto A., Balest J., De Meo I., Giacovelli G., Grilli G. (2016): Power of forest stakeholders in the participatory decision making process: A case study in northern Italy. Acta Silvatica et Lignaria Hungarica, 12: 9–22.

Phalen K.B. (2009): An invitation for public participation in ecological restoration: The reasonable person model. Ecological Restoration, 27: 178–186.

Pukkala T. (2002): Multi-objective forest planning. Dordrecht, Kluwer Academic Publishers: 207.

Rauch P. (2007): SWOT analyses and SWOT strategy formulation for forest owner cooperations in Austria. European Journal of Forest Research, 126: 413–420.

Sarvašová Z., Dobšinská Z., Šálka J. (2014): Public participation in sustainable forestry: The case of forest planning in Slovakia. iForest – Biogeosciences and Forestry, 7: 414–422.

Sedmák R., Fabrika M., Bahýl J., Pôbiš I., Tuček J. (2013): Application of simulation and optimization tools for developing forest management plans in the Slovak natural and management conditions. In: Tuček J., Smreček R., Majlingová A., Garcia-Gonzalo J. (eds): Implementation of DSS Tools into the Forestry Practice. Zvolen, Technical University in Zvolen: 139–152.

Shackelford N., Hobbs R.J., Burgar J.M., Erickson T.E., Fontaine J.B., Laliberté Ramalho C.E., Perring M.P., Standish R.J. (2013): Primed for change: Developing ecological restoration for the 21st century. Restoration Ecology, 21: 297–304.

Sitarz D. (1993): Agenda 21: The earth summit strategy to save our planet. Available at https://sustainabledevelopment.un.org/content/documents/Agenda21.pdf (accessed Jan 15, 2016).

Šálka J. (2006): Analýza verejnej politiky v lesníctve. Zvolen, Technická Univerzita vo Zvolene: 64.

TEEB (2010): The Economics of Ecosystems and Biodiversity: Ecological and Economic Foundations. London, Washington, Earthscan: 456.

Wallace K.J. (2007): Classification of ecosystem services: Problems and solutions. Biological Conservation, 139: 235–246.

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