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LANDSCAPE CAPACITY FOR ECOSYSTEM SERVICES PROVISION BASED ON EXPERT KNOWLEDGE AND PUBLIC PERCEPTION (CASE STUDY FROM THE NORTH-WEST SLOVAKIA)

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Abstract

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Landscape represents appropriate spatial dimension for a study of ecosystems, especially due to ability to translate scientific knowledge into proper guidance for land use practice and enhancing the inclusion of local stakeholders in decision-making procedures. We tested social preferences method to reach initial and raw overview of the ecosystem services (ES) distribution and their values in the study areas. Perception of experts and local residents about capacities of relevant CORINE land cover (CLC) types to provide various ES was linked with Geographic Information System databases. We quantified the results on the basis of the mean values for each CLC type and the ES groups and these were interpreted also in spatial context. The expectation about perceptible capacities of forest to provide goods and services was fulfilled by responses of the experts, as was the expected difficulty to assess capacities of transitional woodland shrub or complex cultivation patterns. However, additional land cover types in question are meadows and pastures or discontinuous urban fabric. Mostly middle ranking values prevail in responses of local residents and uncertainty in the background is much greater comparing to the experts. On the other hand, rural people may better recognise diversified flow of services due to their everyday close connection to more ES. Large variation in the scores of some valued CLC classes in responses of the local residents and also experts seems resulting from lack of knowledge in the background and differences in viewpoint and appreciation. We understand the gaps in evaluating ES by the experts and resident population as good experience and key challenge for the further steps and fine-tuning of the research methods.

Key words: ecosystem services, land cover types, social preferences, assessment.

Introduction

Ecosystem services (ES) concept originated at the end of 1960s and beginning of the 1970s, significant growth of research interest to this concept and wider public discussions have been

dated since the 1990s (e.g. Costanza et al., 1997; Limburg, Folke, 1999; Daily et al., 2000; de Groot et al., 2002). First complex synthesis of ES, its classification and world assessment is provided by Millenium Ecosystem Assessment (MEA, 2003). According to MEA definition ES "are the benefits that people obtain from ecosystems and these include provisioning, regulating, supporting and cultural services." The latest classification of ES in Europe comes from work of EEA (European Environment Agency) and is known as CICES (The Common International Classification of Ecosystem Services, www.cices.eu). The CICES is being permanently updated on the base of comments of user communities, including experts and is available for the public.

Likewise the ES classifications, there is a growing variety of methods for valuation of ES. In this study, we restrict our attention to evaluation of ES at the landscape level. Landscape represents appropriate spatial dimension for a study of ecosystems, especially due to ability to translate scientific knowledge into proper guidance for land use practice and enhancing the inclusion of local stakeholders in decision-making procedures. As Iverson et al. (2014) stressed most of ES are place-based, landscape integrative approach is the best option to deal with them. Research of Yapp et al. (2010) focuses on analysis of vegetation management at the landscape level and showed that vegetation type and its condition reflects provisioning of ES. The most common methodology to study ES at the landscape level is through the employment of land use/land cover changes. Usually particular classes of the land cover are linked with ES. Value of ES varies on the basis of land cover/land use change (e.g. Ayumi, Chanhda, 2009; Burkhard et al., 2009), scenario development (e.g. Schroter et al., 2005; Metzger et al., 2006) from biotope level (e.g. Seják et al., 2010) to biomes (e.g. Konarska et al., 2002).

Participatory approach used in evaluation of ES is inevitable part of the research that aims to reflect perception of the local people about ES and for improvement of decision-making and planning process. It should be stressed that the most valuable ecological areas for local planning are those providing the most requested ES for local community (Maynard et al., 2010). Preference assessment is a direct consultative method that can be applied for analysing perceptions, knowledge and associated value of ES demand or use. The rating is usually performed by wider public audience to uncover social preferences (e.g. Martín-López et al., 2012) or in combination with experts to understand potential capacity of individual ecosystems to deliver services and goods (e.g. Burkhard et al., 2009, Kopperoinen et al., 2014).

This paper aims to make an initial step in methodological and also in implementation level in the ES assessment. Testing of social preference methods with experts and local residents is the main objective of this paper, alongside with providing the first basic and raw overview of the ES distribution and their values in the study areas.

Study areas

Due to inclusion of two different focus groups in the questionnaire survey, we selected two spatial scales: district of Čadca and cadastral area of Raková village. These study areas were selected on the basis of available information for the research and heterogeneous landscape that includes several different land cover types.

The district of Čadca is located in the north-west part of Slovakia on borders with Poland and Czech republic. The area is 761 km^2 and number of inhabitants in 2013 was more than 91

thousand. The territory consists of 20 villages and 3 small towns (Čadca, Turzovka, Krásno nad Kysucou). Rural landscape character of the study area is typical for Slovakia, major part of relief consists of uplands, some marginal parts of the area on east and north-west belong to highlands. The mountains are dissected by small streams with main river Kysuca flowing in the middle part of the district and forming the main basin of the study area. Landscape is covered mainly by combination of forest (ca 60% of the area, www.statistics.sk) and extensive agricultural areas (ca 34%). The majority of the forest is coniferous and grasslands cover about 80% of the agricultural areas. The study area is typical for many complex cultivation patterns, especially mosaics of grasslands and fields with significant proportion of natural vegetation (terraces with trees, shrub, etc.). The landscape of basins along river Kysuca and other streams is mostly built up or covered by larger patches of arable land or intensive grasslands. The area is also typical for dispersed forms of settlements (Petrovič, Muchová, 2013) that are spread in hilly relief and complement mosaic pattern of the rural landscape. About half of the territory overlaps with the national protected area (CHKO Kysuce) – east and west parts, and three NATURA2000 sites (sites of Community importance) are also included in the area.

The cadastral area of Raková is located in middle part of the district of Čadca, bordering with cadastral area of Čadca town on the east. The area is 41 km^2 and number of inhabitants in 2013 was more than 5,300, so that the village belongs to the largest settlements in the territory of the district. The structure of landscape is very similar to the landscape of district of Čadca, i.e. main river basin comprises of central part of village and intensive agricultural fields and more distant mountainous parts are covered by combination of coniferous forest, mosaic of extensive agricultural areas with natural vegetation and dispersed settlements.

Methods

Research methods applied in this study were derived from methodology used by Burkhard et al. (2009). The authors assessed capacities to provide ES using CORINE land cover (CLC) data respectively. They applied experts' judgments and knowledge from literature sources about the capacity of different land cover types to provide various ES. In this research, we set up similar assessment matrix (Table 1) where the same set of ES was provided and grouped to four categories: 1) ecological integrity (supporting services), 2) provisioning services, 3) regulating services and 4) cultural services. In the matrix, we identified those land cover types (in three-level nomenclature) that are relevant to the study area – district of Čadca. In total, 15 land cover types were included, but the results were interpreted only from 14 types (occurrence of natural grasslands is insignificant).

The questionnaire survey was implemented with the selected experts during 2013 to evaluate capacity of listed land cover types in the study area of Čadca. In total, evaluation of ES by 17 experts was included in our research. The experts were selected on the basis of their experience and professional interest, coming mostly from universities and scientific institutes, as well as regional environmental offices.

We also applied the same assessment scale: from 0 (no capacity to provide ES by particular land cover type) to 5 (very high capacity). Interpretation of the results was carried out on the basis of mean values of the individual judgments from the experts (table and map outputs). For the map interpretations, the average relative value for each group of ES category was used (percentage of the maximum value) and the numbers were ranked in a scale of six categories.

Furthermore, we focused on comparison of the assessments provided by the Slovak experts and those expressed in the research of Burkhard et al. (2009), of course considering only the land cover types limited to our case study (Table 2).

At the level of cadastral area of Raková, we simplified our approach due to the fact that assessment was performed by local inhabitants. Therefore, only groups of four categories of ES (mentioned above) were considered in

the questionnaire survey, evaluated across seven land cover types relevant to Raková (Table 3). Perception of land cover types to provide ES was delivered by 114 local inhabitants in years of 2012–2013, representing 2.2% of the permanent residents. Here, the assessment scale for the respondents was identical to the area of Čadca (from 0 to 5), the results in the maps were, however, interpreted through mean values for all ES and classified into eight categories.

In order to express the achieved results in spatial manner, we used GIS (Geographic Information System) that is widely used in landscape-ecological planning (e.g. Hreško et al., 2003). Although CLC categories included sufficient level of detail for the questionnaire surveys, the results of spatial resolution and accuracy of the CLC categories do not reflect diverse landscape structure of our study areas. For this reason, we transformed the information given to CLC categories to the relevant GIS databases that are more detailed and more recent. Combination of datasets was deployed to obtain a picture that is closest to the real status. In particular, we combined information from Land Parcel Information System (used for the implementation of the Common Agricultural Policy in Slovakia, www.podnemapy.sk), the most recent topographical data, information from National Forest Centre, the results of historical agricultural landscape mapping (Špulerová et al., 2013), but also some information from the CLC 2006.

Results

Expert judgments (district of Čadca)

The results from the experts evaluation is provided in mean rounded values for particular CLC category per particular ES (Table 1). In general, the forest (broad-leaved, coniferous and mixed) has a greatest capacity to deliver variety of ecosystem goods and services for human wellbeing, having more than 66% of the maximum value for all listed ES. Their benefits are recognised in each group of ES category, and the forest received high ranking in almost all relevant individual ES. The experts agreed on their highest potential that is seen in provision of timber, fuel wood and biomass for energy, and also on their benefits in regulation of the nature. Transitional woodland shrub and natural grassland are land cover types that have high capacity to provide all kinds of ES (provisioning, regulating, supporting and cultural), reaching almost 60% of the maximum value for all listed ES. The experts judged relatively high capacity to water bodies and extensive agricultural areas (52–55%) that consist of significant proportion of natural vegetation and grasslands. Their potential is highlighted especially in provisioning of fish, crops, fodder, etc. Capacity of other CLC classes is of less importance, except benefits of arable land to provide crops and fodder and sport and leisure facilities to deliver cultural services for human wellbeing.

If we look at individual ES, the experts valued as the most beneficial services for human wellbeing are the following ones: biodiversity and biotic waterflows (supporting services), biomass for energy (provisioning services), erosion regulation, flood protection and local climate regulation (regulating services) and recreation and aesthetic values (cultural services). Generally, the cultural services reached the highest value from the maximum (57%), while overall proportion of the provisioning services is around 33% from the maximum.

Comparison to the judgment of Burkhard et al. (2009) (Table 2) show big differences in some CLC classes, especially in capacity to provide cultural services by discontinuous urban fabric and complex cultivation patterns, and to provide regulating services by transitional woodland shrub. Difference in evaluation of these classes is recorded also in case of other ES (e.g. delivery of provisioning and regulating ES by complex cultivation patterns, etc.). Here the experts from our research ranked the potential of these classes to provide

T a b l e 1. Assessment matrix of expert judgements - capacity of different land cover types to provide ES.

CLC classes / Ecosystem services	Ecological integrity (% from max.)	Abiotic heterogenity	Biodiversity	Biotic waterflows	Metabolic efficiency	Exergy capture (Radiation)	Reduction of nutrient loss	Storage capacity	Provisioning services (% from max.)	Crops	Livestock	Fodder	Capture fisheries	Aquaculture	Wild foods	Timber	Wood fuel	Energy (Biomass)	Biochemicals/Medicine	Freshwater	Regulating services (% from max.)	Local climate regulation	Global climate regulation	Flood protection	Groundwater recharge	Air quality regulation	Erosion regulation	Nutrient regulation	Water purification	Pollination	Cultural services (% from max.)	Recreation&Aesthetic values	Intrinsic value of biodiversity	All services (% from max)
Discontinuous fabric	27	1.6	2	1.4	0.9	1.1	1.2	1.2	22	1.5	1.5	1.2	0.4	0.6	1.3	1	0.9	1.5	1	1.4	29	1.6	0.6	1.8	1.5	1.3	2.3	1.2	1.5	1.2	43	2.5	1.8	26.8
Industrial or commercial units	10	1.1	0.5	0.2	0.5	0.5	0.4	0.5	9	0.1	0.1	0.2	0.3	0.3	0.1	0.6	0.8	0.8	0.6	1.2	14	1	0.5	0.9	0.4	0.5	1	0.2	1.3	0.4	11	0.6	0.5	11.1
Roads and rail networks	15	1.5	0.9	0.5	0.6	0.5	0.5	0.6	9	0.4	0.4	0.4	0.3	0.2	0.4	0.7	0.6	0.6	0.4	0.5	13	0.5	0.2	1.5	0.9	0.5	1.5	0.2	0.3	0.2	17	1.2	0.6	12.1
Construction sites	11	1.4	0.4	0.4	0.3	0.3	0.5	0.4	5	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.4	0.2	0.8	9	0.6	0.2	0.7	0.6	0.5	0.7	0.1	0.6	0.1	7	0.4	0.4	7.8
Sport and leisure facilities	25	2.1	1.4	1.1	1.1	1.1	1.2	1.1	14	0.2	0.3	0.5	1.3	1.4	0.6	0.6	0.4	0.7	0.6	0.9	22	1.6	0.8	1.2	1.2	1	1.3	0.8	1.2	0.9	51	3.6	1.4	21.7
Non-irrigated arable land	38	1.5	2	1.9	2.1	1.7	2.1	2.1	32	3.8	2.4	3.7	0.3	0.5	1.4	0.3	0.3	2.4	1.5	0.9	30	1.6	1	1.6	1.7	1	1.6	1.9	1.4	1.6	29	1.4	1.5	32.5
Meadows and pastures	59	2.1	3.7	3.3	3	2.4	3.1	3	46	3.2	4.5	4.5	0.4	0.6	3.1	0.5	0.6	3.1	2.6	1.8	55	2.5	2	2.6	2.4	2.5	3.6	2.7	2.6	3.8	61	3	3.1	52.8
Complex cultivation patterns	60	2.4	4.1	3.3	3	2.3	3.1	2.9	45	3.9	4	4.3	0.2	0.5	2.9	0.9	0.9	3	2.5	1.8	58	2.6	2.2	2.9	2.7	2.5	3.4	2.9	2.8	3.8	72	3.6	3.6	54.6
Agriculture&natural vegetation	61	2.3	3.8	3.5	3	2.6	3.2	3	47	3.7	3.8	3.8	0.3	0.6	3.2	1.7	1.7	2.9	2.3	1.8	59	2.9	2.4	3	2.8	2.5	3.5	2.9	2.8	3.6	64	3.2	3.2	55.1
Broad-leaved forest	72	2.5	3.9	4.1	3.7	3.7	3.6	3.8	50	1.8	1.1	1.5	0.2	0.4	2.8	4.8	4.7	4.8	2.4	3.2	77	4.2	3.6	4.2	3.8	4	4.3	3.6	3.7	3.1	83	4.2	4.1	66.0
Coniferous forest	71	2.4	3.8	4	3.6	3.7	3.5	3.8	49	1.7	0.9	1.3	0.1	0.2	2.8	4.9	4.9	4.7	2.5	3.3	79	4.3	3.6	4.4	3.9	4.1	4.5	3.6	3.8	3.2	85	4.4	4.2	66.3
Mixed forest	77	2.8	4.5	4.2	3.8	3.9	3.8	4.1	50	1.9	1.1	1.4	0	0.1	3.1	4.7	4.5	4.8	2.6	3.4	81	4.4	3.7	4.4	3.9	4.2	4.5	3.8	3.9	3.4	90	4.5	4.4	68.6
Natural grassland	67	2.4	4.5	4	3.2	2.9	3.4	3.1	45	2.9	4.1	3.9	0.1	0.4	3.6	0.5	0.6	3	3.1	2.5	65	3.3	2.7	3.4	3.1	2.9	3.5	3.2	3.2	4.1	88	4.4	4.4	59.6
Transitional woodland shrub	69	2.6	4.2	4	3.6	3	3.5	3.4	42	2	2.2	2.2	0.1	0.3	3.1	2.5	2.5	3.1	2.5	2.5	68	3.3	2.6	3.8	3.3	3.4	3.9	3.2	3.4	3.9	78	3.8	4.1	59.2
Water bodies	60	2.4	3.6	4	3.1	2.4	2.5	2.9	39	1.4	0.6	1	0	0.1	1.4	0.5	0.5	1.4	1.3	1.1	58	4.2	3.6	3.5	3.8	2.3	1.5	2.8	3.8	0.8	80	4.1	3.9	52.4
Sum		31	43	40	36	32	36	36		29	27	30	8.8	11	30	25	24	37	26	30		39	30	40	36	33	41	33	36	34		45	41	

T a b l e 2. Comparison of the assessments provided by the Slovak experts and those expressed in the research of Burkhard et al. (2009).

CLC classes / ES categories	Supporting ES			Provisioning ES			Regulating ES			Cultural ES		
	Experts-SK	*Burkhard*	*difference*	*Experts-SK*	*Burkhard*	*difference*	*Experts-SK*	*Burkhard*	*difference*	*Experts-SK*	*Burkhard*	*difference*
Discontinuous fabric	2	1	1	2	1	1	2	0	2	3	0	3
Industrial or commercial units	1	1	0	1	0	1	1	0	1	1	0	1
Roads and rail networks	1	1	0	1	0	1	1	0	1	1	0	1
Construction sites	1	1	0	1	0	1	1	0	1	1	0	1
Sport and leisure facilities	2	3	1	1	0	1	2	1	1	3	3	0
Non-irrigated arable land	2	4	2	2	2	0	2	1	1	2	1	1
Meadows and pastures	3	4	1	3	1	2	3	1	2	4	2	2
Complex cultivation patterns	3	3	0	3	1	2	3	1	2	4	1	3
Agriculture&natural vegetation	4	3	1	3	2	1	3	2	1	4	3	1
Broad-leaved forest	4	5	1	3	2	1	4	5	1	5	5	0
Coniferous forest	4	5	1	3	2	1	4	5	1	5	5	0
Mixed forest	4	5	1	3	2	1	5	5	0	5	5	0
Natural grassland	4	5	1	3	1	2	4	3	1	5	3	2
Transitional woodland shrub	4	3	1	3	1	2	4	1	3	4	2	2
Water bodies	3	4	1	2	2	0	3	1	2	4	5	1

mentioned ES is much higher. Similar unconformity in both rankings is also seen in CLC like meadows and pastures, natural grasslands and water bodies. Contrariwise, potential of arable land to provide supporting services is lower by the view of the responded experts.

Due to the diverse landscape structure in the district of Čadca, there is a possibility to clearly interpret the result of the expert judgments (Fig. 1). In each group of ES category, we can distinguish low capacities of basins and valleys with built-up areas and arable land from middle to high capacities of mountainous parts with forest and extensive agricultural areas with semi-natural vegetation. While the greatest heterogeneity among CLC classes to provide ES is visible in regulating services (mixed forest in top category), capacities of forest and extensive agricultural areas to deliver provisioning services are much less balanced.

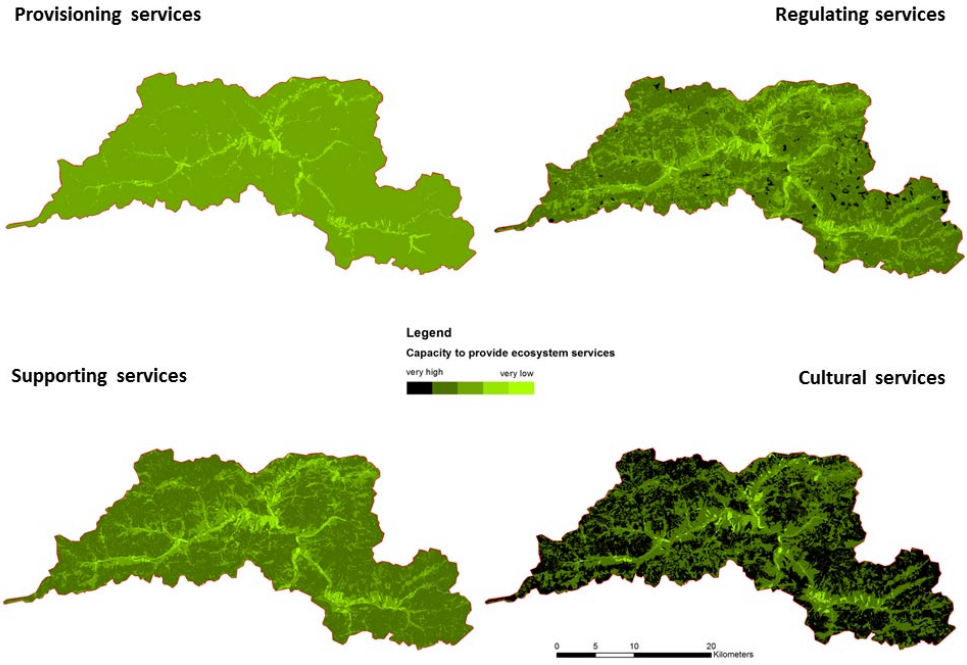

Fig. 1. Provision capacity in main ES categories in the district of Čadca based on the expert judgements.

Perception by local inhabitants (village of Raková)

The mean values assigned to particular land cover types for case study Raková show more balanced capacity among them to provide ES comparing to judgment of the experts (Table 3). The respondents evaluated coniferous forest as the most beneficial (mean value 3.82 out of 5), followed by complex cultivation pattern with trees (3.23). Except built-up areas, the mean value of all remaining land cover types is close to 3. Considering individual groups of ES, we can highlight the capacity of arable land to provide the goods from nature (mean value 4.45) and of coniferous forest to provide regulating services (4.25). Opposite view on arable land is visible in its capacity to provide cultural services that is assessed as the lowest in this group of ES (1.63). In overall, the inhabitants put the greatest value to provisioning services while cultural services are ranked poorly. This result is completely contrary to the ranking obtained from the experts. The differences among groups of ES categories are moderate and the local inhabitants consider their importance for the human wellbeing almost equally.

The map of cadastral area of Raková reflects diverse landscape with many patches of forest, agriculture areas with dispersed settlement, having mostly extensive character and their combination in the form of mosaic pattern (Fig. 2). We can summarise that the majority of

T a b l e 3. Simplified assessment matrix of local residents - capacity of different land cover types to provide categories of ES.

Land cover types / ES categories	Provisioning services	Regulating services	Cultural services	Supporting services	MEAN
Built-up area	2.75	1.50	2.80	1.20	2.06
Arable land	4.45	2.37	1.63	3.13	2.89
Meadows and pastures	3.66	2.63	2.55	3.10	2.99
Mosaic of fields, grasslands with terraces and balks	3.05	3.24	2.55	3.06	2.98
Mosaic of fields, grasslands and trees with terraces and balks	3.34	3.54	2.86	3.19	3.23
Coniferous forest	3.88	4.25	3.51	3.65	3.82
Transitional woodland shrub	2.76	3.09	2.47	3.01	2.83
MEAN	3.41	2.94	2.62	2.91	

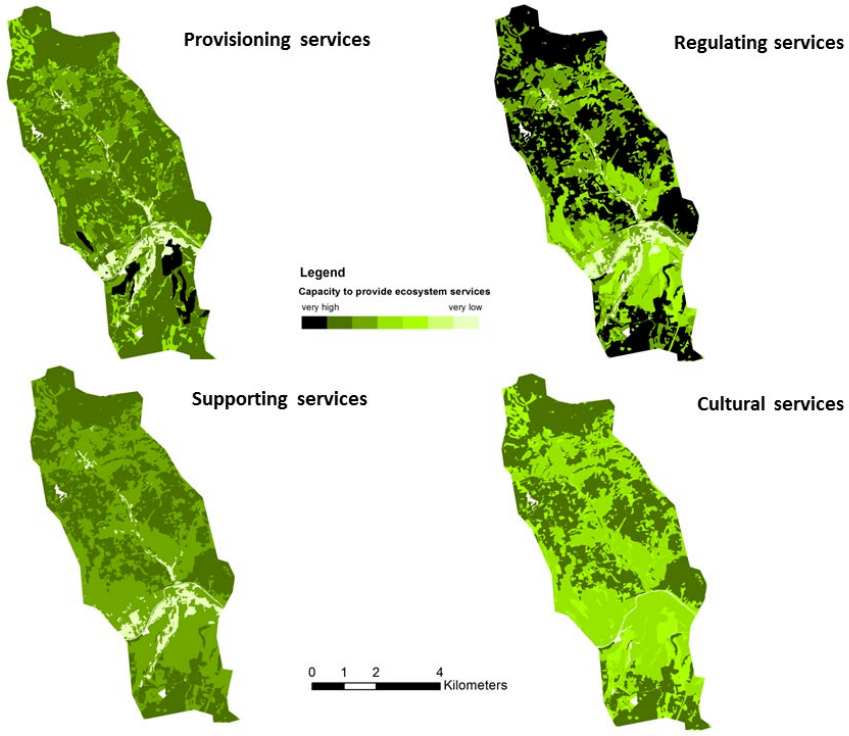

Fig. 2. Provision capacity in main ES categories in the cadastral area of Raková based on the assessment of local residents.

the output maps express the following ranking starting from the less important: a) built-up areas, b) agricultural areas c) mosaic of agricultural areas with terraces, shrubs and trees d) forest. Such result is clearly visible from the particular maps of ES categories, nevertheless the map for provisioning services prioritises arable land that bears the highest capacity in the opinion of the respondents. When assessing the spatial scale, we must say that due to the diverse landscape and mosaic distribution of land cover types, there is not always continual increase of ES importance from the valley with dense built-up areas to the mountainous peripheral parts.

Discussion and conclusion

The expert evaluations applied for filling in ES matrices that were used also in our research, are considered as easy or starting tool to proceed with ES assessment (Burkhard et al., 2012). Their role is to provide an overview and see trends for the assessment of ES. Nevertheless, discrepancy in scores given by the experts is not unusual. We must admit large variation in the scores of some valued CLC classes in our research that seems resulting from lack of knowledge in the background and differences in viewpoint and appreciation (Kopperoinen et al., 2014). Complex assessment of ES in Slovak condition, especially considering landscape scale, is very recent and unexplored approach. Comparison of evaluation matrices based on the expert judgments from our research and work of Burkhard et al. (2009) uncovered uncertainty in several land cover types, respectively groups of EC categories. Surprisingly, supporting services role of which is usually hardly handled by public, look clear in cross-assessing with the land cover. Vice versa, capacities of the land cover types to provide cultural services seem to have many variations in the view of the experts. Resuming further results of this comparison, we may conclude that expectation about perceptible capacities of forest to provide ES was fulfilled, similarly expected difficulty to assess capacities of transitional woodland shrub or complex cultivation patterns. However, additional land cover types in question are meadows and pastures or discontinuous urban fabric. By our meaning, their capacities to provide especially cultural and regulating services was overestimated in our research comparing to Burkhard et al. (2009), mainly due to the above mentioned underdeveloped approaches in Slovakia to understand and assess ES. Further research touching the above mentioned gaps should include more in-depth personal interviews with social analysis behind (Martin-Lopez et al., 2012) and employment of discourse-based methods (Wilson, Howarth, 2002; Kelemen et al., 2013).

Diversity of social preferences by local inhabitants in the assessment of ES reflects many heterogeneous responses, but these were predicted in the outset. Difficulty to handle landscape from ES point of view in short time available and especially lack of knowledge we evaluate as main reasons behind. Mostly middle ranking values prevail in overall and uncertainty in the background is much greater than in case of experts. Some trends can be however derived and highlighted. High ranking of the forest capacity to provide regulating services confirms experts opinion, on the other side appreciation of capacity of arable land to deliver products from the landscape is more significant. Proportion of the arable land in the mountainous landscape of north region of Slovakia is small and thus local inhabitants strongly

perceive potential benefits from the provisioning of food. Local respondents also recognised importance of the regulating services and except the forest also complex cultivation patterns obtained values above the average, while their capacities to gain cultural services are not considered extra valuable. We suppose that experience from everyday living close to the nature appears to be main argument here. The results provided by wide-range questionnaire survey in the work of Martín-López et al. (2012) shows that rural people recognised diversified flow of services that may be the effect of their everyday close connection to more ES.

Likewise, ecosystem services are place-based, perception of local residents is influenced by spatial landscape components in local environment together with cultural traditions, social and economic capital, etc. We might find examples where main attention of local residents is put to the provisioning (e.g. Hartter, 2010) or regulating services (Lewan, Söderqvist, 2002; Martín-López et al., 2012), similarly to our research findings. On the contrary, cultural services were prioritised by the local residents in the research of Agbenyega et al. (2009).

Our attempt to replicate well known and simple evaluation of the ES at the landscape level aimed to provide starting point to build more detailed and complex investigation. We understand the above mentioned uncertainties in evaluating ES by the experts and resident population as good experience and key challenge for the further steps and fine-tuning of the research methods. Therefore, the results provided from both approaches represent rather raw data and do not express final and accurate assessment of ES in the study areas. Nevertheless, combination of both profiles - expert judgments and public perception, that was acknowledged also by other studies (e.g. Garcia-Llorente et al., 2012; Kopperoinen et al., 2014), tends to have a major contribution to the sustainable landscape planning.

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