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Research paper

# Stakeholders' perception towards ecosystem services provided by forests: comparison among three Balkans countries

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**ABSTRACT** The stakeholders' involvement in forest management is a key point to facilitate the exchange of information between decision makers and the local community, to reduce conflicts between forest users, and to increase social acceptance of decisions made. The aims of the present study are to identify the stakeholders' preferences towards ecosystem services provided by forests and to analyze the impacts of forest management practices on ecosystem services in the Balkan region. To achieve these aims a face-to-face survey was conducted in three study areas in the Balkans: Shkrel district in Albania; Rugova valley in Kosovo; Knjaževac municipality in Serbia. The three study areas are in a rural context and they are characterized by strong linkages between the local community and natural resources. The questionnaire – provided as a digital application – was administered to a representative sample of stakeholders in each pilot area. The stakeholders were selected among four main groups of interest: public administrations; environmental NGOs, tourism promoters, and private actors of forest-wood chain. The results show that for the Balkan respondents the most important ecosystem services are supporting services (lifecycle maintenance, habitats protection), followed by provisioning services (wood for manufacturing, fuelwood, water supply).

**KEYWORDS**: public participation, stakeholders' involvement, questionnaire survey, Rugova valley (Kosovo), Shkrel district (Albania), Knjaževac municipality (Serbia).

## Introduction

Natural ecosystems provide goods and services which are beneficial for people whilst human activities have an impact on ecosystems as recognized by the European Union (EU) Biodiversity Strategy for 2030 (European Commission 2020). This Strategy aims to protect and restore natural ecosystems in order not to compromise key ecosystem services provided by them such as soil fertility, nutrient cycling, biodiversity conservation, water, and climate regulation. As emphasized by the Mapping and Assessment of Ecosystem and their Services (Maes et al. 2018), forest ecosystems are under six human pressure categories so summarized: (1) habitat conversion and degradation (e.g., fragmentation by roads and by forest cover loss, deforestation, landslides); (2) climate change (e.g., forest damage by storms); (3) pollution and nutrient enrichment (e.g., formation of tropospheric ozone, deposition of nitrogen, sulphate, sulphur, calcium, and magnesium); (4) over-exploitation and over-harvesting, (5) introduction of invasive alien species; and (6) other pressures (e.g., soil erosion, insect outbreaks, pest damage and parasites, damage by wildlife and herbivores).

In the last decades, the concept of ecosystem services has been studied from several perspectives with the aim to increase ecosystem services provision and to reduce human pressures on them (Häyhä and Franzese 2014). Many studies used biophysical metrics to assess ecosystem services (Vihervaara et al. 2010, Stürck et al. 2014), other researches focused on the monetary evaluation of these ecosystem services provided by natural capital (Costanza et al. 1997, Paletto et al. 2015, Rodríguez García et al. 2016, Nikodinoska et al. 2018), while a more limited number of studies considered the socio-cultural valuation of ecosystem services by stakeholders and experts (Oteros-Rozas et al. 2014, Iniesta-Arandia et al. 2014, Deniz and Paletto 2018). This last aspect concerns the investigation of social needs, opinions, and preferences – the so-called socio-cultural values – towards ecosystem services useful to better define objectives, concerns, and priorities for natural resources management (Lamarque et al. 2011), and to identify the traditional ecological knowledge to be included in the participatory decision-making process (Gómez-Baggethun et al. 2012). The socio-cultural valuation of natural capital and ecosystem services is a key aspect to include in the decision-making process concerning natural resources management.

The sustainable management of natural ecosystems is the key point to maintain natural capital and to ensure the long-term provision of ecosystem services (Pardos et al. 2016). Inappropriate management actions can generate negative consequences from the ecological, economic, and social points of view (Blattert et al. 2017). Recently, natural resources management has become more complicated due to increasing public interest and requires more transparency and participation (Vacik and Lexer

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2014) as emphasized by the United Nations Economic Commission for Europe (UNECE) Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (1998). Sustainable management must ensure that resources are sustained for future generations and adverse environmental effects are avoided, remedied, or mitigated (Adelana et al. 2008). In addition, the natural resources must be managed to balance the three pillars of sustainability – ecological, economic, and socio-cultural – and including in the decision making process the social needs and demands (Chan et al. 2012, Martínez Pastur et al. 2016). Regarding this last point, an inclusive and transparent public participation process should be developed to increase the social acceptance of decisions and reduce conflicts between users (Oteros-Rozas et al. 2014).

In natural resources management, the participatory process is not a standardized procedure with fixed rules, consequently, there are different approaches and techniques used to involve the stakeholders and citizens in the decision-making process (Siebrand 2006). The stakeholders can be involved with a growing level of participation from mere tokenism to collaborative partnerships (Chess 2000). In the international literature, there are many classification systems of the levels of participation. The best-known classification system elaborated by Arnstein (1969) considers eight rungs on a ladder of citizen participation: non-participatory (manipulation and therapy), degree of citizen influence (information, consultation, and conciliation), degree of citizen power (partnership, delegated power, and citizen control). Then, Pimbert and Pretty (1997) developed a seven-level classification system (from passive participation to self-mobilization), while Jones et al. (2000) and Tabbush (2004) synthetized the level of participation in a four-stage classification: information sharing, consultative practices, collaborative activities, and empowerment activities.

The socio-cultural valuation of natural capital and ecosystem services – based on the people's opinions, perceptions, and preferences – can be considered as a consultation of the stakeholders or as the starting point of an inclusive participatory process (De Meo et al. 2018).

Starting from these considerations, the aim of the present study is to identify and analyze the stakeholders' preferences and opinions towards ecosystem services provided by forests and the impacts of forest management practices on them. The study was developed in the framework of "FOR Balkans" project and implemented in rural areas in three Balkans countries: Albania, Kosovo[1], Serbia.

1) This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence

## Materials and methods

### *Study areas*

The three study areas – one per each country – involved in the "FOR Balkans" project are the following (Tab. 1):

- Rugova Valley (42°39'40.3"N 20°16'15.7"E), part of Pejë Municipality (274 km$^2$) in the Republic of Kosovo;
- Shkrel district (42°17'27.4"N 19°32'07.4"E) in Malësi and Madhe municipality (262 km$^2$), in the north of Albania;
- Knjaževac municipality (43°33'52.9"N 22°15'05.8"E) in South-East Serbia (1205 km$^2$).

Regarding the forestry sector (Tab. 2), Serbia is characterized mainly by the state forest sector (forest national public company Srbijašume). The forest management adopted by forest national public company Srbijašume is influenced by the wood market and economic rules. There is a considerable share of privately owned forests – approximately 47% of total forest area (Glück et al. 2011) –, and the development of private sector forestry appears as an important challenge at present (Stanisic 2005).

Until 1999, Kosovo forest sector was under the responsibility of the public company Srbjiasume. In February 2008, Kosovo was declared a sovereign and independent state. Since the same year, the public forests of Kosovo are national resources protected by Law (recalling first Law on Forests in Kosovo 2003/3). The Ministry of Agriculture, Forestry and Rural Development, Forestry Department is responsible for forest management including hydrogeological protection, reforestation activities, forest fires prevention, protection against insects and other diseases. The Ministry of Agriculture, Forestry, and Rural Development has established the Kosovo Forestry Agency (KFA) with the aim to provide cutting authorization.

In the last 30 years, Albania has been in a continuous transition, shifting from a centralized economy to a market economy. Many institutional changes have happened in all sectors, including forestry, where a completely new institutional framework have been developed (Koci 2014). Most of the forest areas in the country are managed by the government and many protected areas have been established by the government. The responsibility for protected areas was assigned to the Protected Area National Agency (AKZM) (13.65% of the national area), while other forest areas are directly under municipality responsibility.

According to the Köppen-Geiger map (Kottek et al. 2006), all study areas present both boreal and warm temperature climatic zones, with some relevant differences. The Rugova valley has a predominantly alpine climate with 1,500 mm per year (KAS

**Table 1** - Population data (2011) in the three study areas.

| Site | Shkrel district | Rugova valley | Knjaževac municipality |
|---|---|---|---|
| Number of settlements | 12 | 13 | 86 |
| Total population (inh.) | 3,520.00 | 100.00 | 31,419.00 |
| Population density (inh. $Km^{-2}$) | 13.42 | 0.37 | 26.07 |
| Urban population (inh.) | - | 48,962 | 18,404 |
| Surface ($Km^2$) | 262 | 274 | 1,205 |

**Table 2** - Institutional framework related to the forest sector in the three study areas.

| Country | Institutions in charge of forest sector |
|---|---|
| Republic of Serbia | Public Company Srbjiasume |
| Republic of Kosovo | Ministry of Agriculture, Forestry and Rural Development - Kosovo Forestry Agency (KFA) and Department of Forestry;<br>For protected areas: Ministry of Environment and Spatial Planning - Department of Environmental Protection |
| Republic of Albania | Ministry of Tourism and Environment - Protected Area National Agency (AKZM) |

2017), while the Knjaževac municipality has a more continental trend with 615 mm per year. The Shkrel district is influenced by the Mediterranean climate, presenting warm temperatures, steppe classification regarding precipitation, and hot summers, while the mountain part is more like an alpine climate.

Forests and semi-natural areas are the most diffused land cover category in all three study areas, respectively: 82% Shkrel district, 96% Rugova valley, and 73% Knjaževac municipality. Broadleaved forests – European beech (*Fagus sylvatica* L.), Italian oak (*Quercus frainetto* Ten.), Turkey oak (*Quercus cerris* L.), Cornish oak – (*Quercus petraea* (Matt.) Liebl.), chestnut (*Castanea sativa* Mill.) – and mixed forests are predominant in Shkrel and Knjaževac, while coniferous forests are predominant in the Rugova valley.

In 2003, the Rugova valley became a protected area, inside the institution of Bjeshket e Nemuna National Park. With this establishment, the area has been divided into four protection regimes (Law 04/L-086 Republic of Kosovo). It is interesting to note that in the Bjeshket e Nemuna National Park there are both public lands and private lands.

In Albania, with Territorial Reform (Laws n.115/2014 and n.139/2015), Shkrel became a district part of Malësi and Madhe municipality. This centralization, added to the fragmentation of forest management between the National Agency for Protected Zones (AKZM) and municipalities, increased difficulty in building an integrated and effective forest management system. Moreover, missing land regularization represents in Northern Albania an unresolved problem, unlike the progress registered in the rest of the country.

In the Knjaževac municipality, Srbijašume (forest national public company) is responsible for forest management. Park of Nature Stara Planina, established in 1997, is part of the study area, with a surface of 11 $km^2$.

The Rugova Valley and Shkrel district are similar in human settlement distribution, with small villages sparsely distributed. However, in Rugova valley tourism is rapidly changing traditional settlements and road networks, while the Shkrel district has lower number of tourists and, consequently, a preservation of rural identity. On the other side, the Knjaževac municipality – with 60% of inhabitants in the town – covers a wide area that is facing depopulation, both from small villages to cities and from Knjazevac city to Nis and Belgrade.

### *Questionnaire survey and sampling*

Survey activity started in June 2019, a preliminary version of the questionnaire was developed and pretested with four randomly selected stakeholders in the Rugova study area. The final version of the questionnaire – provided as a digital application developing Desktop and Android app – was formed by 21 closed-ended and open-ended questions. Stakeholders' perception and opinions towards stand characteristics (forest type and structure), ecosystem services provision, and sustainable forest management practices were investigated using dedicated maps. The questionnaire was administered with face-to-face interviews to a sample of stakeholders in each study area. The respondents interacted directly with the app, developed as a demo, and by now, non-available to the public. In case of uncertainties regarding the questions, any respondent interacted with

the interviewer with the support of a translator.

In the first thematic section of the questionnaire, the personal information of stakeholders was investigated. The second thematic section focused on stakeholder preferences towards forest landscape and stand characteristics, while the third thematic section of the questionnaire considered the most relevant ecosystem services provided by forests in each study area. According to the Millennium Ecosystem Assessment (2005), four categories of ecosystem services were considered and investigated:

1) Provisioning services, referring to the goods that can be harvested such as food, timber, fuelwood, water provision;
2) Regulating services, considering the role of ecosystem in the regulation of ecological processes (i.e. water and climate regulation, protection against natural hazards);
3) Supporting services such as habitats and species diversity, plant production, and nutrient cycling;
4) Cultural services, involving the non-material benefits provided by ecosystems (i.e. recreational opportunities, cultural and spiritual values).

Finally, in the last thematic section, stakeholders selected and compared the most important forest management practices aimed to improve ecosystem services provision distinguishing between the four categories of ecosystem services. The list of forest management practices used in the questionnaire has been identified in collaboration with local experts taking into account the forestry context in the Balkans.

The questionnaire was administered to a representative sample of stakeholders identified through preliminary stakeholder analysis. During the stakeholder analysis, stakeholders were selected among four main groups of interest: public administrations and authorities, environmental NGOs, tourism promoters, and private actors of the forest-wood chain. The stakeholders were selected with the support of local partners through a preliminary brainstorming session and a non-probability sampling technique. Non-probability sampling was chosen for several reasons that can be summarized as follows (Clark et al. 2016, Adem Esmail et al. 2017): *(i)* pilot dimension of the study area, and the willingness to deploy the survey to a small sample of stakeholders; *(ii)* willingness to enhance the role of local partners, building bases for bridging organizations; *(iii)* time availability. Local partners – based on their expertise and knowledge of local context – provided, through quota-convenience sampling, relevant stakeholders, assuring coverage of the four above mentioned groups of interest. At the end of the stakeholder analysis, 51 stakeholders were identified and contacted by telephone.

### *Data processing*

The data concerning the preferred categories of ecosystem services and forest management practices to maintain and improve ecosystem services provision was processed using a Multiple-Attribute Decision Making (MADM) procedure. This method is aimed to rank a limited number of alternatives in the presence of conflicting criteria (Sadok et al. 2008). From the methodological point of view, in the present study the MADM procedure was implemented using the Analytic Hierarchy Process (AHP) based on a hierarchy structure to represent the importance and relationships of elements – e.g., ecosystem services, forest management practices – in a multi-criteria decision situation (Chavez et al. 2012). During the survey, the stakeholders assigned a judgment of relative weights ($w_i$) of all pairs of the $n$ elements, and these judgments are included in as a number ($a_{ij}$) in a square matrix $A$ called "comparison matrix":

$$A = (a_{ij}), (i, j = 1, 2, \ldots n) \quad \text{(eq. 1)}$$

Where: $a_{ij} = w_i / w_j$ e $a_{ij} = 1/a_{ij}$

If all judgments are perfectly consistent (cardinal consistency), then $a_{ik} = a_{ij}\, a_{jk}$ for all $i, j, k = 1, \ldots n$.

Matrix $A$ has an associated eigenvector ($W$) with the maximum eigenvalue ($\lambda_{max}$). The normalized eigenvector gives priority ordering and the maximum eigenvalue is a measure of the consistency of the judgment. The eigenvector is found using the following condition:

$$AW = \lambda_{max} W \quad \text{(eq. 2)}$$

The consistency of the respondents' information depends on how much the value of $\lambda_{max}$ deviates from the value of $n$. In cases where $\lambda_{max}$ equals $n$, the responses are perfectly consistent. The matrix $A$ is, thus, tested for consistency using the following formula:

$$CI = (l_{max} - n)/(n - 1) \quad \text{(eq. 3)}$$

$$CR = CI/RI$$

Where $CR$ is the consistency ratio, $RI$ is the expected consistency index obtained from random generated comparisons of the same order $n$ and $CR$ is the consistency ratio. $CR$ should be lower or equal to 0.1 (10%) to have the consistency of the matrix $A$. When a $CR$ larger than 0.10 is detected, the respondent is asked to reconsider changing her/his more problematic judgments.

The priority score for each element (ecosystem services category and forest management practice) was used to identify the rank of priority. These two elements combined allow to identify the most socially suitable strategy to maintain and improve the favorite categories of ecosystem services.

The non-parametric Chi-square ($X\chi^2$) test was used to highlight the significance of any observed differences between study areas, but also to understand exactly which categories account for any differences found. In the present study, the Chi-square ($X\chi^2$) test was applied to highlight statistically significant differences between the three study areas for all four categories of ecosystem services considered in the survey ($\alpha$=0.01).

## Results

### *Characteristics of respondents*

After the preliminary interview request, 47 stakeholders confirmed their willingness to participate to the survey (response rate of 92%): 14 stakeholders in Serbia (Knjazevac municipality), 13 stakeholders in Kosovo (Rugova valley), and 20 in stakeholders Albania (Shkrel district) were involved in the survey. The respondents were subdivided into four main groups of interest: public administrations and authorities (municipalities, forestry, and protected areas offices and agencies), environmental NGOs, tourism sector (tourism offices, guides, operators, and guesthouse owners), and private forest-wood chain actors (forest owners' associations, sawmills, and carpentries). The distribution of respondents by group of interest in the three study areas is the following: 23.0% public administration, 30.8% environmental NGOs and tourism sectors respectively, 15.4% private actors in the Rugova valley; 30.0% public administration, 20.0% environmental NGOs, 40.0% tourism sector and the remaining 10.0% private actors in the Shkrel district; 28.6% public administrations, 14.3% environmental NGOs, 42.9% tourism sector, and 14.3% private actors in the Knjaževac municipality.

The majority of respondents have been residents in the study areas for more than 10 years: 92% of total respondents in the Rugova valley, 85% in the Shkrel district, and 100% in the Knjazevac municipality. The remaining 8% of total respondents of the Rugova valley have been resident for less than 5 years, while in the Shkrel district 10% have been resident in a number of years in between 5 and 10 years, and the remaining 5% have been resident for less than 5 years.

### *Forest landscape and stand characteristics*

The results concerning the stakeholders' preferences towards forest landscape and stand characteristics show interesting differences among the three case studies (Tab. 3). In the Shkrel district, the landscape preferred from the sample of respondents is characterized by pastures with scattered trees (60.0% of total respondents), while in the Knjazevac municipality the respondents showed a clear preference for dense forests (85.7%). In the Rugova valley, pastures with scattered trees and dense forests are the two most appreciated landscapes by respondents (each with 38.5%).

Regarding forest types, the respondents of the Knjazevac municipality prefer chestnut and oak forests (50.0% of total respondents), followed by coniferous forests (42.9%). In the other two study areas, coniferous forests are the preferred forest type for

**Table 3** - Preferred forest landscape and stand characteristics by respondents (%).

| Characteristics/Study area | Rugova valley (*n*=13) | Shkrel district (*n*=20) | Knjazevac municipality (*n*=14) |
|---|---|---|---|
| Landscape | 12 | 13 | 86 |
| Open pastures | 23.1 | 20.0 | 7.1 |
| Pastures with scattered trees | 38.5 | 60.0 | 7.1 |
| Dense forests | 38.5 | 20.0 | 85.7 |
| Forest type | 262 | 274 | 1,205 |
| Coniferous forests | 61.5 | 40.0 | 42.9 |
| Beech forests | 15.4 | 25.0 | 7.1 |
| Chestnut and oak forests | 23.1 | 35.0 | 50.0 |
| Forest governance | | | |
| Coppices | 7.7 | 5.0 | 0.0 |
| High forests | 92.3 | 95.0 | 100.0 |
| Trees distribution in the space | | | |
| Regularly distribution | 69.2 | 40.0 | 21.4 |
| Randomly distribution | 30.8 | 15.0 | 28.6 |
| Cluster distribution | 0.0 | 45.0 | 50.0 |
| Vertical stand structure | | | |
| Monoplane | 15.4 | 45.0 | 57.1 |
| Biplane | 15.4 | 20.0 | 14.3 |
| Multiplane | 69.2 | 35.0 | 28.6 |

In bold the highest value for study area

61.5% of respondents of the Rugova valley and 40.0% of the Shkrel district. Besides, the respondents in all three study areas show a clear preference for high forests rather than coppices (92.3% in the Rugova valley 95.0% in the Shkrel district, and 100.0% in the Knjazevac municipality).

Observing respondents' preferences for stand structure, the results show that the distribution of trees in clusters is the preferred situation (45.0% of respondents in the Shkrel district and 50.0% in the Knjazevac municipality), followed by the random distribution of the trees (30.8% in the Rugova Valley and 28.6% in the Knjazevac municipality). Regarding the vertical stand structure, the results show that the respondents prefer multiplane forests (69.2% of the respondents in the Rugova valley, 35.0% in the Shkrel district, and 28.6% in the Knjazevac municipality) rather than biplane and monoplane forests.

The non-parametric Chi-square ($\chi^2$) test shows statistically significant differences among the three case studies for the following forest landscape and stands characteristics: landscape (p-value=0.002, $\alpha$=0.01) and trees distribution in the space (p-value=0.004, $\alpha$=0.01). Conversely, for the other three stand characteristics no statistically significant differences were found.

### *Provision of ecosystem services*

Regarding the most important ecosystem service in each category (Fig. 1), the results show that wood for manufacturing is the most important provisioning services for 46.2% of the Rugova respondents, followed by fuelwood and water supply (23.1% for both services respectively). Conversely, for 60.0% of the Shkrel respondents and 64.3% of the Knjazevac respondents, the fuelwood is the most important provisioning services. Besides, it is interesting to highlight the high level of importance of non-wood forest products (NWFPs) in the Shkrel district highlighted by 30.0% of respondents.

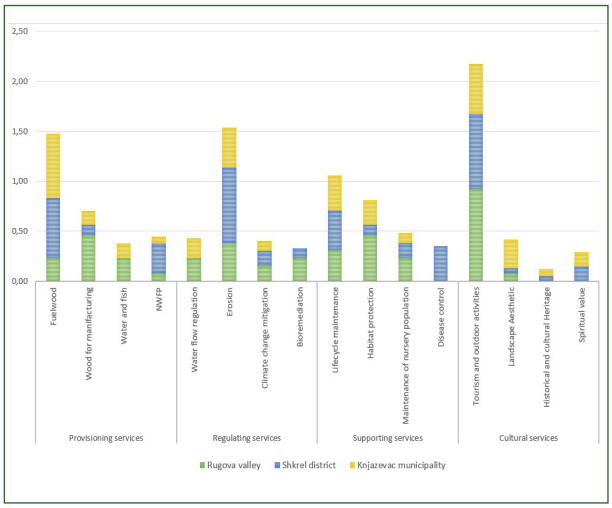
In the regulating services, the results show that protection against erosion and landslides is the most important service in all three case studies for 38.5% of the Rugova respondents, 75.0% of the Shkrel respondents, and 57.1% of the Knjazevac respondents.

In the supporting services category, the respondents of the Shkrel district and Knjazevac municipality areas assigned the greatest importance to lifecycle maintenance (40.0% and 50.0% of respondents respectively), while for the Rugova respondents the most important supporting services is habitats and species protection (46.2% of respondents).

Regarding the cultural services, the results show a more homogeneous situation as such 92.3% of the Rugova respondents, 75.0% of the Shkrel respondents, and 50.0% of the Knjazevac respondents assigned the highest importance to tourism and outdoor activities in forests. In the Knjazevac municipality, the sample of respondents emphasized the importance of the other two cultural services such as landscape aesthetic (28.6% of respondents) and spiritual value related to the forest resource (14.3%).

The non-parametric Chi-square ($\chi^2$) test shows statistically significant differences among the three case studies for the following two categories of ecosystem services: provisioning services (p<0.0001) and supporting services (p=0.021). In the provisioning services, the statistical differences are related to the highest importance assigned to NWFP and to the lowest one assigned to wood for manufacturing in the Shkrel district, while in the supporting services the Rugova respondents assigned higher importance to habitats and species protection and the Shkrel respondents to disease control compared to the others.

**Figure 1 -** Relative importance (normalized data) of ecosystem services in the three study areas in accordance with the respondents' opinions.

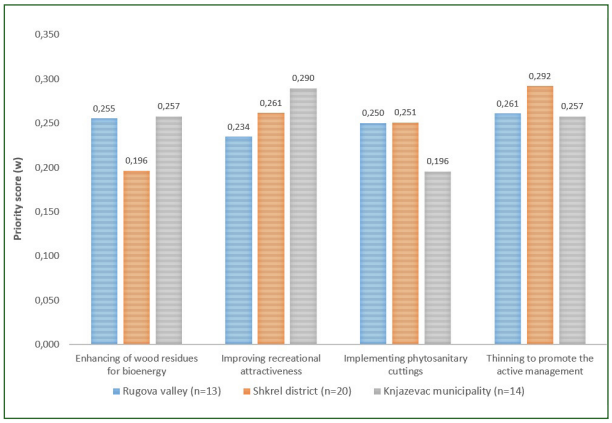



The results of pairwise comparison applied to the ecosystem services categories show that for all respondents (w=47) the most important category is supporting services (priority score w=0.2834), followed by provisioning services (w=0.2449). The other two categories are considered to be of equivalent importance by the sample of respondents: regulating services (w=0.2324) and cultural services (w=0.2392).

When observing the data by study area (Fig. 2), interesting differences are found due to the local context and priorities. In the Rugova valley, the sample of respondents assigns the highest level of importance to the provisioning services (w=0.2936), followed by supporting services (w=0.2586). Conversely, in the Shkrel district, the respondents assign the highest value to the supporting services (w=0.2984), followed by provisioning services (w=0.2864). In the Knjazevac municipality, for the respondents, the most important ecosystem services categories are cultural services (w=0.3847) and supporting services (w=0.2599) For all study areas the Consistency Ratio (*CR*) is less than 0.05 (5%)

**Figure 2 -** Priority scores (w) for the ecosystem services categories by study area.


**Figure 3 -** Priority scores (w) for the forest management practices aimed to increase ecosystem services provision by study area.




Concerning the forest management practices aimed to increase ecosystem services provision, the results show that for the stakeholders the four most important forest management practices are: implementing phytosanitary cuttings (priority score $w$=0.2835); enhancing of wood residues for bioenergy production ($w$=0.2449); thinning to promote active forest management ($w$=0.2392); and improving recreational attractiveness ($w$=0.2324).

Comparing the results of each study area, some interesting differences are shown (Fig. 3). For the Rugova respondents, thinning is the most important silvicultural treatment to improve the stability and functionality of forest ecosystem ($w$=0.2606), followed by the enhancing of wood residues for bioenergy production ($w$=0.2551). Likewise, in the Shkrel district, the respondents emphasized the importance of thinning ($w$=0.2918), but the second most important forest management practice is the improvement of the recreational attractiveness of forests through the development of tourism facilities (e.g., refreshment and picnic areas, paths and message boards). The respondents of the Knjazevac municipality assigned the highest importance to the improvement of the recreational attractiveness of the forests ($w$=0.2896), followed by the enhancing of wood residues for energy purpose and thinning to improve the stability and functionality of forest ecosystem with the same level of importance ($w$=0.2574).

Also for this question, the Consistency Ratio ($CR$) is less than 0.05 (5%) for all study areas.

## Discussion

The results of this study show that for Rugova stakeholders provisioning services (i.e. wood for manufacturing, fuelwood) are the most important category of ecosystem services. According to respondents' opinions, this ecosystem service category can be enhanced through a greater use of wood residues for energy purposes associated with the promotion of active forest management. In this study area, wood products have high importance for local community which should be more economically valued through a "cascade" approach, able to allocate in the market both high- and low-value products. According to the "cascade" approach emphasized by the European Union (EU), raw wood materials should preferably be used for building, furniture, and other products with long life span, while bioenergy should preferably derive from the use of wood residues from harvesting operations (Proskurina et al. 2016, Pieratti et al. 2019). Therefore, the forest sector in Rugova valley could be incentivized through the use of low value wood assortments (e.g., branches, tops, wood residues from harvesting operations) to satisfy local energy demand as suggested by the stakeholders.

As for Shkrel district, interviewed stakeholders consider supporting services (habitats protection and lifecycle maintenance) as the most important category of ecosystem services. According to them, supporting services in the Shkrel district can be mainly maintained and improved through the implementation of phytosanitary cuttings aimed to reduce the risk of biotic disturbances (insects and pathogens). The functionality and health of the ecosystem are key points to ensure the provision of all other ecosystem services as highlighted by some studies (Summers et al. 2012, Yan et al. 2016).

Finally, in Knjazevac municipality, stakeholders emphasize the importance of cultural services which can be improved through the promotion of mixed forests and the improvement of recreational facilities to increase the site attractiveness. Concerning the importance of these two aspects to improve cultural services, several European studies have emphasized the visitors' preferences towards mixed forests compared to the pure conifer and broadleaved forests (Gundersen and Frivold 2008, Paletto et al. 2013, Filyushkina et al. 2017, Pelyukh et al. 2019). According to those previous studies, mixed forests attract more visitors rather than pure forests. Furthermore, recreational facilities (e.g., areas for sports, refreshments and picnic areas, benches, trail marking,

wastebaskets) relevance has been stressed by other authors in order to enhance forests with low site attractiveness (De Meo et al. 2015, Paletto et al. 2017). According to stakeholders' opinions, the forest areas of the Knjazevac municipality can be enhanced from a recreational point of view by promoting mixed high forests and developing equipped paths. These – associated with good territorial marketing – should increase the recreational attractiveness of Knjazevac forests in a few years.

The results of the present study show additional differences between study areas due to the peculiarities and characteristics of each context. Regarding forest landscape and stand characteristics, respondents' preferences are in line with land cover types: in Shkrel district – where the preferred landscape is pasture with scattered trees – rangelands and sparse vegetation covers more than half of the total surface (approximately 55% of the Shkrel district), while forest and agriculture area covers 27% and 18% respectively. In the Knjaževac municipality, the respondents confirm their preference for a dense forest in a site where forest cover is 52% of land cover.

Regarding forest types, in two study areas (Knjaževac municipality and Rugova valley) respondents' preferences are in line with forest types predominance, while in the Shkrel district, respondents prefer coniferous forests even if they only represent only 0.4% of land area. Probably, it is due to the presence of a well-known tourist site (Razem) characterized by coniferous forests.

The preferences for high forests reflect stakeholders' willingness to enhance landscape aesthetic and forest attractiveness as confirmed by the highest importance assigned to recreational activities in all three study areas. In the Knjaževac municipality and Shkrel district, stakeholders' preference for cultural services is also confirmed by the preferred forest management practices aimed to improve recreational attractiveness.

Regarding the other ecosystem services, Rugova valley is more oriented to wood for manufacturing (provisioning services), also since the city of Pejë, located at the beginning of the valley, is the second most important and active city of Kosovo. In the Shkrel district, the most important products from forest are fuelwoods due to the higher rurality of the site. Finally, in the Shkrel valley, particular importance to NWFPs can be easily explained due to the important economic income that NWFPs have for the site, especially chestnuts and officinal herbs.

The results of the pairwise comparison by study area can be useful to have a first idea of stakeholders' priorities regarding ecosystem services. In a Decision Support System (DSS) framework for decision makers, public participation is an important element to assess natural resources and to involve local communities in the decision-making process.

Thus, it is possible to evidence local priorities regarding forest resources, considering both ecosystem services and management practices suggestions. The Rugova stakeholders give great importance to wood for manufacturing and wood residues obtained through thinning interventions, while the Shkrel community highlights the importance of lifecycle maintenance provided by forests through a proactive role of the public authority. The stakeholders of the Knjaževac municipality are more oriented on cultural importance of the forest resource with special regard to recreational activities development.

## Conclusions

The socio-cultural valuation of ecosystem services based on people's opinions and preferences is an important line of study supporting the participatory process for natural resources management. The strength points of the socio-cultural valuation of ecosystem services provided by forests are the opportunity to draw up an order of priority that forest managers should take into consideration during a participatory process. The inclusion of social needs and preferences in participatory forest management can have a potential positive impact to increase knowledge awareness and to facilitate two-way communication between public authority and the local community. For this aim, the present study was conducted to support local forest planners and managers in starting a participatory process. The main advantage of the proposed method is to provide a lot of information to decision makers that can be easily collected and processed.

The main difficulty encountered by this study was the identification of the stakeholders to be involved in the survey. To take into account all interests, a balanced number of stakeholders for each group of interest must be consulted. However, for some groups of interest – public administrations and authorities – identification is relatively simple, while for other groups in certain contexts the identification of the representatives can be not simple. In these cases, the non-probabilistic sampling (snowball sampling) is a suitable method to identify the barely visible stakeholders through the information provided by other more visible stakeholders.

The future steps of the project will be to use the collected data to develop and calibrate a Spatial Decision Support System (SDSS) for multifunctional forest management to maintain and improve the ecosystem services supply in the long-term period. The SDSS implementation in rural and marginal areas in the Balkan region could enhance the multifunctional management of natural resources based on community knowledge.

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