Investigation on the importance of ecosystem services based on the contingent valuation method

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Abstract

This work explores the value that residents of the Municipality of Karpenisi, who benefit from the forest, place (Willingness to Pay) to forest ecosystem services. This research based on contingent valuation methodand conducted with a structured questionnaire on a Likert five-point scale. The questionnaire included questions about the benefits that the forest provides to the life of local inhabitants and their willingness to pay for the benefits they enjoy. The largest percentage (49.5%) chose the answer "I do not discuss this issue". A 15.5% percentage of the participants expressed their willingness to provide 20 euros per year while another 11.3% are willing to give 10 euros and 9.3% 50 euros. Finally, 8.2% and 6.2% of the participants chose amounts of 5 and 0 euros respectively. On a cumulative basis, 53.7% of those who possess a secondary job in the forest expressed their willingness to pay some amount whereas those who have a main job in the forest were 44,0%.

Keywords: Ecosystem services, forest management, sustainable development, contingent valuation method.

JEL classifications: Q23,Q57, Q01, R58

Introduction

The term "ecosystem services" describes a conceptual framework for the biophysical description and understanding of ecosystem processes from the point of view of human well-being (Mooney and Ehrlich 1997). Ecosystem services can be divided into four categories (Millennium Ecosystem Assessment 2005). The first category, *provisioning*, includes services such as food, timber, water and generally services that are directly used by humans and are marketable. The second category, *regulating*, includes regulatory services that maintain the environment in a sustainable human condition. Services of this kind are the stabilization of the climate and the crops' pollination. The third category, *cultural*, includes services that create a pleasant environment for humans, such as leisure activities that contribute to human well-being. The fourth category,*supporting*, includes the support services that are necessary for the production of previous services (Brauman et al. 2007, Oikonomou et al. 2011).

The increasing understanding and awareness of the interdependence between ecosystem services and human well-being has contributed to the recognition of the need to analyse and integrate the multiple benefits of natural ecosystems into a holistic design process of their management (Egoh et al. 2007, Raymond et al. 2009).

The integration in the general design of the ecosystem services presupposes their economic valuation. In this context, methodologies have been developed to assess the value of ecosystem services that have proven to be very useful in decision-making related to ecosystem management (Wilson and Carpenter 1999). A popular method for conducting such assessments is the Contingent Valuation Method used in the present study (Mitchell and Carson 1989, Carson 2000, Venkatachalam 2004, Pantera et al. 2014).

The nature of ecosystem services carries considerable uncertainty but the design itself faces many conflicting requirements. Therefore, the economic evaluation of ecosystem services alone is not sufficient for correct decision making (Farber et al. 2002, Chee 2004, Petr et al. 2019). The integration of many ecosystem services in the design of forest ecosystem management has been made possible, in several occasions, by the use of multi-criteria analyses in the context of a holistic view of forest ecosystem management (Munda 2004, Messner et al. 2006, Kaloudis et al. 2008, Kaloudis et al. 2010). Evrytania has numerous environmental resources that offer a lush variety of ecosystem services. In particular, these resources are characterized by their biodiversity and their excellent aesthetics and traditionally are an important source of wealth for the local economy (Kaloudis et al. 2013). In addition to the traditional wood products provided by these ecosystems, there is a growing interest of the public, due to the environmental awareness and the increased demand for high quality traditional products and leisure and mountain tourism services.

In this work we assessed the value of certain ecosystem services in the area of the Municipality of Karpenisi. The value of ecosystem services was assessed by investigating the willingness of residents to pay a fee for the services they enjoy from the forest.

Materials and Methods

The research carried out using anonymous questionnaires in the wider area of the Municipality of Karpenisi. A structured questionnaire was used with questions, mainly of specific answers and a few open-answer questions, mainly for the "Other" option. This approach has the

advantage that it minimizes risk from any participants' misunderstandings and reduces the intervention of the researcher (Papaspyropoulos et al. 2012). The questions were structured on a five-point Likert scale (from "Strongly Agree" to "Strongly Disagree").

The questionnaire was randomly distributed to people over the age of 18 in various workplaces. In the initial phase of the distribution of the questionnaires, the content of the research was updated and clarifications were given. The questionnaires were collected per distribution point at a following time, usually two to three days after the questionnaires were distributed. The survey was conducted from December 20, 2019 to January 17, 2020. The final sample size was 100 questionnaires, which is considered satisfactory in relation to the total size of the study area population and the percentage of those involved in the forest.

The economic valuation of ecosystem services was based on the contingent valuation method (Mitchell and Carson 1989, Carson 2000, Venkatachalam 2004, Papaspyropoulos et al. 2012, Pantera et al. 2014). This method is used to assess the value of non-market ecosystem services and is based on the willingness of users to pay a fee in order to continue to benefit in the future from the ecosystem services they enjoy today.

The research was based on the hypothetical scenario where the owner of the forest, the state in this case, intents to implement a management plan for the forest of the area that will not allow the future use of the forest in the way it is used today by the inhabitants of the area. Forest users are then asked to answer how much they are willing to pay today to avoid such a change. The options available as answers were "I do not discuss this issue - ND", 0 €, 5 €, 10 €, 20 € and 50 €.

The price 0 € means the willingness to pay but the inability to pay any amount and the ND (no discussion) disagrees with such a scenario. An additional question was asked to clarify why some citizens answered "ND".

Results and Discussion

The analysis of the questionnaires revealed a number of results that relate either to the individual questions or in combination and/or as a whole to the issue under study. In the total of the respondents 65.0% were men and 35.0% women. Concerning the gender of the respondents who do not have a main occupation in the forest, 59.2% were men and of the respondents who have a main occupation in the forest, 79.3% were men.

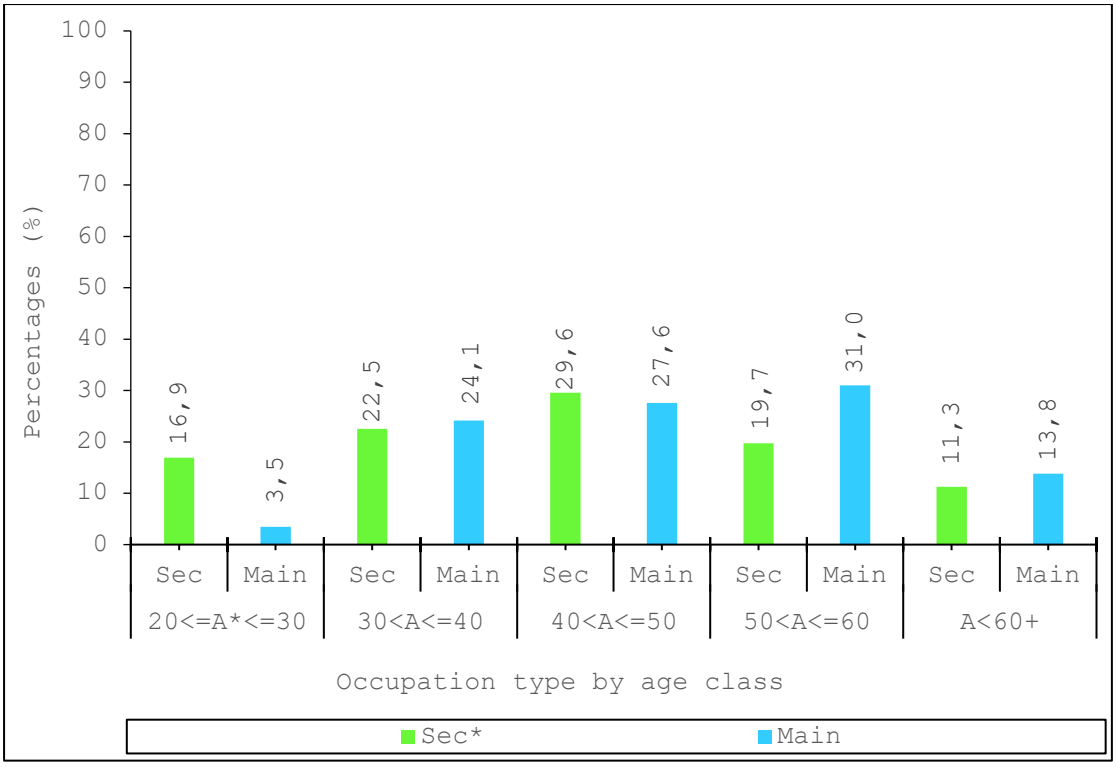

Figure 1: Occupation type chart in the forest by age class (Sec = Secondary, *A=Age*)**

Those whose main occupation was in the forest were the older participants (Figure 1) and, in particular, the higher percentage for this option was noticed in the age groups of 50-60 and 60+. Those who did not have a main occupation in the forest but used it as a secondary activity were distributed to the middle and younger age classes.

Most forest workers had primary or secondary level of education. However, there were also forest workers with higher education or holders of postgraduate degrees, in total, at a percentage of more than 20%.

Among the total of survey participants, 30.0% have a forest-related main occupation and 70.0% have a non-forest-related main occupation. The respondents whose main occupation relates to the forest were: a) Livestock farmers 33.3%, forestry 16.7%, lumberjacks 13.3% and beekeepers 10.0% b) by 6.7% firefighters, foresters and engaged in the collection of herbs and c) from 3.3% employment in earthworks and topographic surveys. Secondary activities by all respondents were touring, livestock grazing, hunting and beekeeping. Most respondents (64.2%) stated that they have an economic benefit from the forest. Also, 90.7% state that they have some type of benefit from the forest.

A significant percentage of respondents "strongly agree" or "agree" that the degradation of the forest will reduce their activity in it and about half stated that the economic crisis has affected them into engaging in agriculture and livestock. Based on the answers, a total of 62.3% stated that they would like further employment opportunities in agriculture, livestock, forestry and forest in general. The above finding is important because it indicates the desire of residents to stay in their homeland and work in the primary sector.

Regarding the residence place of those employed in the forest, it appears that, in general, most (higher than 87%) live in the city of

Karpenisi. This indicates that living in the largest city of the area does not prevent workers from engaging in forestry. The city of Karpenisi is located in the centre of the forest-main study area, and the distances to the forest are short. At the same time the city provides many living facilities and services to the forest workers and their families.

The higher percentage of the livestock breeders were men over 40 years old, managing sheep flocks. Most breeders had small businesses with a small number of animals. Among those who practice animal husbandry, 64.7% stated that they do not practice nomadic animal husbandry nowadays and 35.3% stated that they do. Concerning the past 61.5% answered that they did not practice nomadic animal husbandry in the past, while 38.5% used to practice nomadic animal husbandry in the past. The above results show that nowadays there is not much difference in livestock farming types compared to the past.

The farmers were mainly of ages between 40 to 50 years, cultivating farms usually less than 0.5 ha. More specifically, regarding the size of agricultural enterprises, in general, farmers cultivate area of less than 0.5 ha at a rate of 74.1% and between 0.5-1 ha at a rate of 22.2%. Growers prefer the local plant varieties, mainly, compared to others that may yield more but are not acclimatized to the demanding climatic conditions of the area and lag behind in quality characteristics, such as taste.

Respondents generally stated that they are not annoyed by the presence of visitors to the forest nor are their activities affected. This finding confirms the assessment that recreation in the forest, in its mild form, does not significantly affect other ecosystem services.

Regarding the future economic development of their area, the residents proposed the production of improved quality products and high demand in the market based on the capabilities of the area. Proposed fields for development include organic agriculture and animal husbandry with a cumulative percentage of those who "completely agree" or "agree" 96.0%, followed by beekeeping with 93.0% and other sectors of the economy. Traditional sectors of the economy, such as timber production and hunting, are less accepted.

Forest workers generally reported relatively low annual incomes (Figure 2). More specifically, income less than € 10,000 declared by 81.5% of those who have a main job in the forest and 67.2% of those who have a secondary job in the forest. The main question of the research was "Suppose that the state studies the management and protection of the forest and the decision it makes results in you no longer being able to carry out your activity in the forest. How much would you be prepared to pay each year today to prevent such a change and to be able to use the forest for this activity in the future?" To this question the following answers were given of all the participants: a) Percentage (49.5%) stated "I do not discuss this issue" b) 15.5% stated that they are willing to give the amount of 20 euros per year to continue their activity in forest area c) 11.3%, offers 10 euros and d) 9.3% said willing to give the amount of 50 euros per year. Following are smaller percentages of 8.2% and 6.2% corresponding to the amounts of 5 euros and 0 euros.

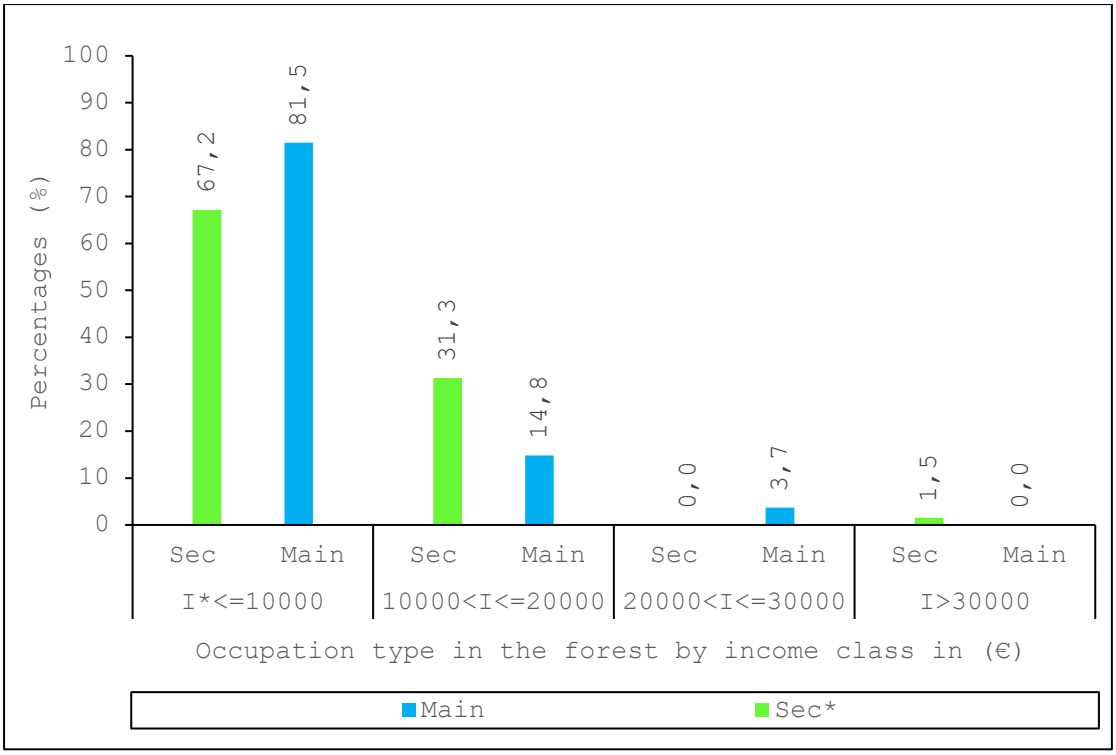

Figure 2: Chart of occupation in the forest by class of total annual income (I = Annual income, *Sec = Secondary*)**

Figure 3 shows the findings on willingness and payment amounts for ecosystem services in percentages (%). The percentages of the answers are given separately for each category of respondents depending on the relation of their main employment in the forest (main or secondary occupation in the forest). More specifically, in the income category under € 10,000, the respondents who do not have a main occupation in the forest state a lesser refusal to discuss possible payment of a certain amount, namely 26.9% compared to 52.0% of those who have a main occupation in the forest. Those who do not have a main occupation in the forest show a greater cumulative willingness to pay any amount (Cumulative WP) in a percentage (40.3%) compared to those who refuse to discuss the issue of payment (26.9%). On the contrary, those who have main occupation in the forest have a lower Cumulative WP of any amount (28.0%) compared to those who refuse to discuss the issue of payment (52.0%).
In the income category from € 10,001 to € 20,000, the respondents who do not have a main occupation in the forest expressed a greater refusal to discuss the payment of any amount (19.4%) compared to those who have a main occupation in the forest (0.0%). Also, those who do not have a main occupation in the forest express a lower Cumulative WP to pay some amount compared to those who have a main occupation in the forest (Figure 3).

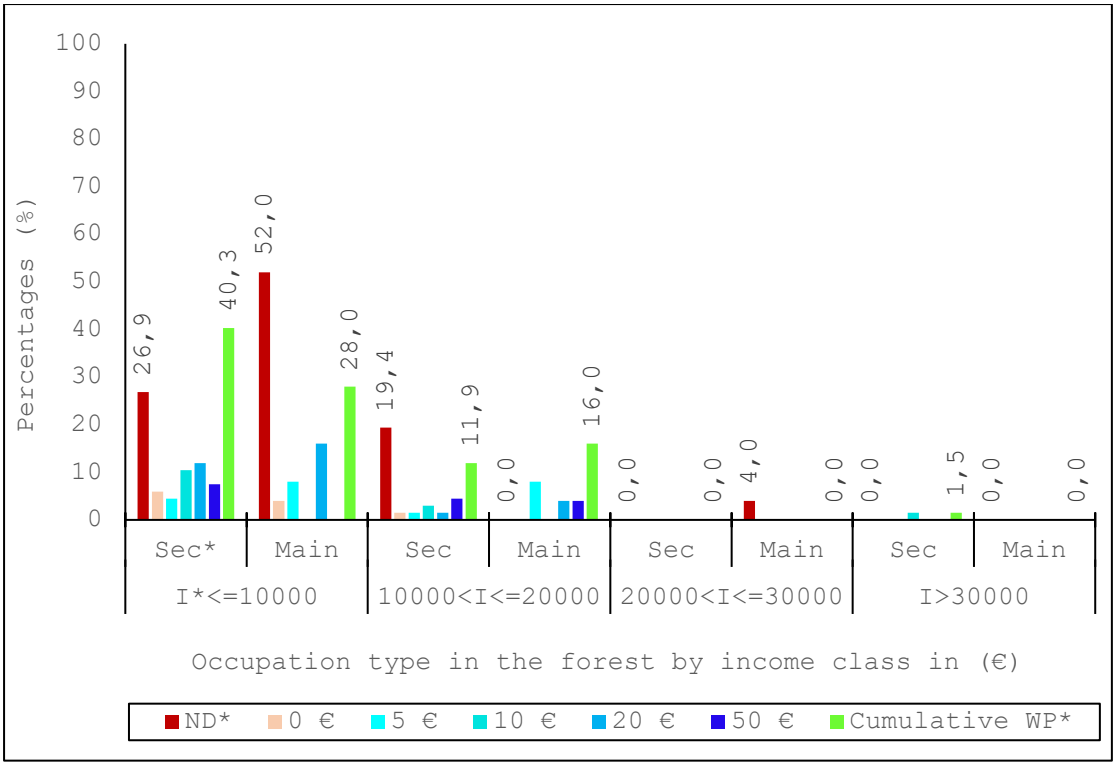

Figure 3: Willingness to pay chart (%) per class of total annual income and type of occupation in the forest (*Sec = Secondary, *I = Annual income, *ND = I do not discuss this issue, *WP = Willingness to pay)

The results by income category indicate that those who have a main occupation in the forest and have a higher income are more willing to pay for the benefits they receive from the forest than those who have a lower income. This finding is supported by the answers to the question "What is the reason you chose: I do not discuss this issue." More specifically, the respondents who do not have a main occupation in the forest stated in a percentage of 6.9% that "I cannot pay" while a percentage of 93.1% stated, "I believe that the state should meet needs of all involved in the forest". Respondents who have a main occupation in the forest stated, at a rate of 26.7%, that they cannot afford to pay and at a rate of 73.3% that "I believe that the state should meet the needs of all those involved in the forest». The answers show that the higher refusal of those who have a main occupation in the forest to pay a certain amount is due, in part, to the inability to pay and not to their stronger belief that the state should take care of them.

Interpreting the results on the importance that participants attribute to the ecosystem services they enjoy from the forest is a rather complex process. In particular, this interpretation should be based on a more complex analysis that takes into account their income, their employment relationship with the forest and the practice based on which ecosystem services were made available free of charge up to today.

In another similar research for the evaluation of the economic value given by the locals in an oak forest in Aetoloakarnania (Pantera et al. 2014), similar results were found to those of the present research. Most participants in both surveys expressed a reluctance to discuss the issue of changing the current state of the forest. Few

were willing to pay the maximum amount of 50 euros while there is a relatively small percentage that would pay any other amount.
The approach adopted by the participants in both surveys is that, in general, they do not want a new intervention to affect their forest activities and stated that the state should take into account the needs of the locals before changing the forest management plan.
In some countries, such as Ecuador, Costa Rica and Vietnam, there are subsidy schemes for landowners or beneficiaries. The subsidies are applied for areas that are important for the ecosystem services they offer both from an environmental and socio-economic point of view, in order to maintain the existing form of use of these lands (To et al. 2012). In the present research, the owner of the forest is the Greek state which, as a rule, provides ecosystem services to users free of charge. However, assessing the value of ecosystem services and prioritizing them by the users themselves is particularly important for integrating these services into the overall design of natural ecosystem management. The above process is important in the context of participatory decision-making for the planning of the management of forest ecosystems and the focused offer of ecosystem services to the inhabitants of the forest areas.
Ecosystems and ecosystem services change over time, as do public attitudes, needs and preferences. A better understanding of the degree and process of environmental degradation has led to protection activities in the past and may also support payment for ecosystem services by users.
The application of a fee for the use of ecosystem services could be applied in cases where the ecosystem is threatened by excessive use such as, for example, overgrazing that degrades ecosystems. Another example of payment for ecosystem services is the payment of a fee for hunting licenses, which is already applied in our country and has a multiple regulatory impact.

Conclusions

The results of the research show that those whose main occupation does not related to the forest, as a whole, declare a greater willingness to pay a certain amount compared to those who have a main occupation in the forest. This finding is partly justified by the fact that those who do not have a main occupation in the forest declare insolvency by only 6.9% while those who have a main occupation in the forest declare insolvency by 26.7%.This finding is reinforced by the choice of the answer "I believe that the state should take care of meeting the needs of all those involved in the forest". Specifically, those who have a main occupation in the forest believe, at a rate of 73.3%, that the state should takes care of meeting the needs of all those involved in the forest, in relation to 93.1% of those who have secondary employment in the forest. Based on the above it can be concluded that those who have a main occupation in the forest recognize to a greater extent the provision of free ecosystem services, from public forests, compared to those who do not have a main occupation in the forest.
The interpretation of the importance given by the beneficiaries of the ecosystem services of the forest should be based on a more complex analysis that will take into account the income of the interested parties, the relation of their employment with the forest and the practice so far in which ecosystem services are available free of charge.
The assessment of the importance given by the beneficiaries to the ecosystem services is useful in the planning of the management of the forest and natural ecosystems in general in the context of their

integrated management while strengthening local economy. In our country, forests are mainly public and the payment for ecosystem services could act as a regulator, along with other measures, in case of excessive use of resources, such as overgrazing or in case of significant ecosystem disturbance.

References

Brauman, K.A., Daily, G.C., Duarte, T.K., Mooney, H.A. (2007). The nature and value of ecosystem services: An overview Highlighting Hydrologic Services. Annual Review of Environment and Resources, 32(1), 67–98.

Carson R.T. (2000). Contingent Valuation: A user's guide. Environmental Science & Technology, 34, 1413–1418.

Chee, Y.E. (2004). An ecological perspective on the valuation of ecosystem services. Biological Conservation, 120, 549–565.

Egoh, B., Rouget, M., Reyers, B., Knight, A.T., Cowing, R.M., Jaarsveld, A.S., Welz, A. (2007). Integrating ecosystem services into conservation assessments: A review. Ecological Economics, 63, 714-721.

Farber, S.C., Constanza, R., Wilson, M.A. (2002). Economic and ecological concepts for valuing ecosystem services. Ecological Economics, 41, 375-392.

Kaloudis, S., Costopoulou, C.I., Lorentzos, N.A., Sideridis, A.B., Karteris, M. (2008). Design of Forest Management Planning DSS for Wildfire Risk Reduction. Ecological Informatics, 3(1), 122-133.

Kaloudis, S.T.,Yialouris, C.P., Lorentzos, N.A., Karteris, M., Sideridis, A.B. (2010). Forest management planning expert system for wildfire damage reduction. Computers and Electronics in Agriculture, 70(2), 285-291.

Kaloudis, S., Galanopoulou, S., Vassileiou, I. and Tzourmana, L. (2013). Management of the Natural Environment and Tourism Development: The case of the Prefecture of Evrytania. In: Proceedings of the 16th Panhellenic Forestry Conference, Thessaloniki 6-9 October 2013, pp. 123-133.

Messner F., Zwirner O., Karkuschke M. (2006). Participation in multicriteria decision support for the revolution of a water allocation problem in the Spree River basin. Land Use Policy, 23, 63–75.

Millennium Ecosystem Assessment (2005). Statement of the board, https://www.millenniumassessment.org/documents/document.429.aspx.pdf, accessed at 12 June 2021.

Mitchell R.C., Carson R.T. (1989). Using Surveys to Value Public Goods: The Contingent Valuation Method. Washington, DC: Resources for the Future p. 484.

Mooney, H.A. and Ehrlich, P.R. (1997). Ecosystem services: A fragmentary history. In G.C. Daily, ed. Nature's Services: Societal dependence on natural ecosystems, pp. 11–19. Island Press, Washington, DC.

Munda, G. (2004). Social multi-criteria evaluation: methodological foundations and operational consequences. European Journal of Operational Research, 158, 662–677

Oikonomou, V., Dimitrakopoulos, P.G., Troumbis, A.Y. (2011). Incorporating ecosystem function concept in environmental planning and decision making by means of multi-criteria evaluation: The case-study of Kalloni, Lesbos, Greece. Environmental Management, 47(1), 77-92.

Pantera, A., Papaspyropoulos, K.G., Papadopoulos, A., Kaloudis, S., Kandrelis, S. (2014). Willingness to pay for ecosystem services in

a valonia oak forest. 12th International Conference on Protection and Restoration of the environment, June 29 to July 3, 2014, Skiathos island, Greece, pp. 941-947.

Papaspyropoulos, K.G., Koufis, J., Tourlida, L. and Georgakopoulou, A. (2012). Estimating the economic impact of a long-term hunting ban on local businesses in rural areas in Greece: A hypothetical scenario. Animal Biodiversity and Conservation 35(2), 163–170.

Petr, M., Vacchiano, G., Thom, D., Mairota, P., Kautz, M., Goncalves, L.M.S., Yousefpour, R., Kaloudis, S. and Reyer, C.P.O. (2019). Inconsistent recognition of uncertainty in studies of climate change impacts on forests. Environmental Research Letters 14(11).

Raymond, C.M., Bryan, B.A., MacDonald, D.H., Cast, A., Strathearn, S., Grandgirard, A., Kalivas, T. (2009). Mapping community values for natural capital and ecosystem services. Ecological Economics, 68, 1301-1315.

To, P.X., Dressler, W. H., Mahanty, S., Pham, T.T., Zingerli, C. (2012). The prospects for payment for ecosystem services in Vietnam: A look at three payment schemes. Human Ecology, 40(2), 237-249.

Venkatachalam, L. (2004). The contingent valuation method: A review. Environmental Impact Assessment Review, 24, 89–124.

Wilson, M.A., Carpenter, S.R. (1999). Economic valuation of freshwater ecosystem services in the United States: 1971–1997. Ecological Applications, 9, 772–783.