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# Assessment of the environmental and social value of Lake Doirani

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**Abstract.** Doirani is a cross-border lake between Greece and the Former Yugoslav Republic of Macedonia and belongs in Kilkis. The importance of this wetland has led to its protection by European and National Legislation. In recent years, the water balance of the lake has been disturbed and has led to the decline of the fauna and the avifauna. Regarding the aesthetic value of the lake, on the Skopje side there is a great interest in the condition and protection of the lake in contrast to the Greek side where there is indifference, dirt and stench. The goal of the research was to record the views of the respondents regarding the current state of the lake and whether they consider that they benefit from it. The implementation of the research started from the construction of the respective questionnaire. The sample size was selected at 339 units (inhabitants), while the method followed was that of random sampling, at random locations in the study area. The results showed that most respondents believe that Doirani is in a miserable state and that their quality of life and financial situation is significantly affected by it.

**Keywords.** Wetland - Ecosystem Services – Questionnaire – Degradation - Aesthetic Value - Protection

## *Évaluation de la valeur environnementale et sociale du lac Doirani*

**Résumé.** Le Doirani est un lac transfrontalier entre la Grèce et la République de Macédoine du Nord et fait partie de Kilkis. L'importance de cette zone humide a conduit à sa protection par la législation européenne et nationale. Ces dernières années, l'équilibre hydrique du lac a été perturbé, ce qui a entraîné le déclin de la faune et de l'avifaune. En ce qui concerne la valeur esthétique du lac, alors que du côté de Skopje, il existe un grand intérêt pour l'état et la protection du lac, au côté grec règne l'indifférence, la saleté et la puanteur. La question centrale de la recherche était de recueillir les points de vue des personnes interrogées concernant l'état actuel du lac et si elles considéraient qu'elles en bénéficiaient. La mise en œuvre de la recherche a commencé par la construction du questionnaire respectif. La taille de l'échantillon a été sélectionnée à 339 unités (habitants), tandis que la méthode suivie était celle de l'échantillonnage aléatoire, à des emplacements aléatoires dans la zone d'étude. Les résultats ont montré que la plupart des répondants pensent que Doirani est dans un état misérable et que leur qualité de vie et leur situation financière en sont affectées de manière significative.

**Mots-clés.** Zones humides - Services écosystémiques – Questionnaire – Dégradation-Valeur esthétique-Protection

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## I - Introduction

The distinct geomorphology with the special diversity, the intense relief, and the many different climatic types are key factors in the existence of a large variety of fauna, flora and ecosystems in Greece. The effective management to the situations that pose a threat to the rich natural environment of Greece is considered imperative, with the loss of biodiversity being today one of the most important environmental challenges (WWF Greece, 2012). Regarding the protected areas in Greece, apart from the national legislation, a significant part of the country is included in the European Ecological Network Natura 2000. Furthermore, Greece has signed International

Conventions for the protection of the natural environment. Country's participation in international organizations, such as UNESCO and the Council of Europe comes with obligations ([www.ekby.gr](http://www.ekby.gr)).

Lake Doirani, which belongs in Natura 2000, is a source of life for both the natural environment and man. A wide variety of functions performed in this specific wetland, regard the storage of water, the support of the food webs, the enrichment of the underground aquifers and the modification of the flood phenomena. Also, in this wetland there are high values such as great variety of plant species, amphibians, reptiles, insects and birds, the irrigation, as lake water is used to ensure the quantitative and qualitative yield of crops, the scientific and the educational. Doirani is rather attractive for research and training due to the variety of natural features, the diversity of the species and the beauty of the waterfowl that it features. Finally, the recreational value is observed in it as it offers opportunities such as the enjoyment of the natural landscape, the photography, the observation of birds and plants as well as the amateur fishing (Gerakis and Tsiouris, 2010). In recent years, the water balance of the lake has been disturbed (Bonacci et al., 2014). From 1952 onwards, there has been a significant and continuous drop in water levels, which is due to both human activities and environmental change (Katsavouni and Petkovski, 2004). The aim of this study was to investigate if the inhabitants of the areas around the lake benefit from its current situation and what actions do they consider important to be done so that the Greek side of the lake is highlighted and utilized in the same way as on the Skopje side.

## **II - Materials and Methods**

The implementation of the research started from the construction of the respective questionnaire. The questionnaire consisted of two distinct parts. The first part included 22 questions, some of which included additional sub-questions. The total number of questions of the first part (together with the sub-questions) were 33. The second part contained a total of 9 questions related to demographic characteristics of the respondents. The questionnaires were completed through personal interviews in the settlements around the basin of Doirani. The on-site survey took place between December 2019 and January 2020. The reference population of the present study was determined by the total population of the surrounding areas of Lake Doirani. The sample size was selected at 339 units (inhabitants). The chosen method was random sampling and it regards conducting various researches at random locations in the study area. Furthermore, in order to carry out the research, the consent of the respondents was required according to the General Data Protection Regulation (GDPR). All statistical analyses were carried out with the SPSS® statistical software v. 25.0 (SPSS Inc., Chicago, IL, USA).

## **III - Results and discussions**

Approximately 70% of the visitors visit lake Doirani for its outstanding natural environment. The minority of them states that the primary reasons for visiting regard activities like fishing, outdoor dining and photography. Similar research was conducted concerning lake Pamvotis in Ioannina, Greece. The majority of the sample answered that sport and recreational activities mainly attract tourists (Lazoglou and Vagiona, 2018). Furthermore, survey participants were asked to answer if they visited lake Doirani more frequently 10 years ago, before its inclusion in NATURA 2000. The majority, approximately 60% of the respondents, answered in the affirmative. Those who stated that they do not visit the lake today, cited a percentage of more than 80% as the main reason for their attitude the lack of infrastructure. Using a series of questions, the perspectives and perceptions of the respondents about the current state of the lake were recorded. About 4 in 5 respondents (80%) believe that Doirani is in a terrible condition. The respective respondents share the same belief about lake Pamvotis (Lazoglou and Vagiona, 2018). Respondents were asked as well to address the problems and cause that led to the current

poor condition of lake Doirani. The most common problem is the lack of cleanliness (29.5%) and in minor percentages the abandonment (14.8%), the alteration of the natural landscape (13.7%) and inaccessibility (11.6%) (Table 1).

**Table 1.** The most important problems of Doirani lake today.

Problems	Percentage (%)
Cleanliness	29.5
Abandonment	14.8
Alteration of natural landscape	13.7
Inaccessible	11.6
Non-utilization	10.4
Indifference	9.2
Lack of infrastructure	5.4
Other reasons	4.6
Water level overflow	1.6
Low water level	0.2
Neglect of a museum	0.1
Total	100.0

Respondents were also asked to express their point of view on the impact of the lake regarding the financial status of the area's households and the quality of life. The majority of respondents (86%) believe that their financial situation is affected by the current state of the lake. Respectively, 78% of the sample assumes that the current situation has negative consequences on their lives (Stergiou, 2020). Finally, respondents were asked to identify which actions need to be taken in order to restore and ameliorate Doirani, following a priority order. Most of the respondents state that in order to restore the lake it is necessary at first place for tourists to have access to its environment so that they can explore it. They assume as well that the establishment of recreation areas, visitor information spaces and cleanliness might be beneficial for the lake's ecosystem (Table 2). Only 8.9% of the respondents consider that the key to restoration is the conservation of fauna and fish fauna.

**Table 2.** The most important actions for the restoration of Doirani.

Actions	Percentage (%)
Ability to access and tour the lake	27.3
Creating recreation areas	23
Creating visitor information spaces	21.6
Cleanliness	19.1
Conservation of fauna and fish fauna	8.9

## IV - Conclusions

Conservation of protected areas is one of the most important environmental challenges today. However, effective site management requires financial resources. It is therefore imperative to demonstrate, at various levels of decision-making, the social feasibility of this environmental policy. In this regard, the application of economic assessment methods of the environment can be particularly useful. According to the results obtained from this research it is understood that the need to implement a lake rehabilitation plan is imperative.

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