Ecological Questions 32 (2021) 3: 59–65 http://dx.doi.org/10.12775/EQ.2021.24

Visitors' opinions on the environmental protection in Shumen Plateau Nature Park from the negative anthropogenic impact of a nearby city, Bulgaria

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Received: 11 May 2020 / Accepted: 26 April 2021

Abstract. Parks are essential for the preservation and protection of wildlife, but human activity affects their functions. The objective of our study was to investigate visitors' opinions on the environmental protection of Shumen Plateau Nature Park from the negative anthropogenic impact of a nearby city. Face-to-face interviews were conducted among summer visitors. The standardized Pearson correlation coefficient was calculated to determine the correlation between items questioned and demographic variables. The highest percentage of the informants were of the opinion that the Shumen Plateau Nature Park is a relatively clean place and a much cleaner green area compared to the parks in Shumen. According to most visitors, the high level of fine particulate matter in the air in the town of Shumen does not affect organisms that inhabit the Nature Park, soil and groundwater. The main pollutant of the Shumen Plateau Nature Park is garbage left by park visitors (88.97%), landfills in the park area (46.32%) and car traffic in the nearby town of Shumen (30.88%). The factor that has the most adverse effect on the biodiversity and ecological balance in the Nature Park are the visitors. Both visitors and inhabitants of the town of Shumen should be more responsible for the environment and the conservation of the Shumen Plateau Nature Park as a clean green area. Park visitors do not consider the town of Shumen as a source of negative anthropogenic impact on the Shumen Plateau Nature Park, but our previous studies show the opposite. This indicates a gap in the relationship between the scientific community and society that needs to be addressed. Close cooperation between scientists and journalists can contribute to the visitors' opinions on the environmental protection in nature parks from the negative anthropogenic impact of nearby cities and towns and improve the effectiveness of the mass media.

Keywords: visitor survey, pollution, Peri-urban Nature Park, green area, anthropogenic impact, mass media.

1. Introduction

Biodiversity conservation is main focus in many countries around the world. The creation of protected areas such as national and nature parks contributes significantly to these conservation efforts (Jones et al., 2018). According to the Ministry of Environment and Water of Bulgaria the country has set aside 34.9% of its land as protected areas in Natura 2000 (Decisions of the Council of Ministers No 177, 03.08.2019).

Healthy environment is extremely important for biodiversity and human population (Chiabai et al., 2020). Protected areas often have a local community that lives inside or around it and traditionally used the natural resources for food, medicine, trade, building materials, etc. (Daim et al., 2012). Moreover, they often provide opportunities for tourism and recreation (Rossi et al., 2016). Our previous study shows that Peri-urban Nature Park Shumen Plateau (NP) is a preferred recreational area for local people and have great importance to their physical and mental health (Koynova et al., 2019). We have also found that environmental protection of the park is not enough. There is a degree of air pollution in the park as a result of adverse anthropogenic impact from activities in the nearby city (Koleva et al., 2018a; Koleva et al.,

2018b; Koynova et al., 2018). Therefore, ecosystem services provided by peri-urban nature parks may be compromised and limited. The media play a crucial role in framing public health debates and shaping public perceptions by selecting which issues are reported and how they are represented (Seale, 2003; Henderson & Hilton, 2018). The air quality statistics in the town of Shumen are public and often discussed in the media. The effect of particulate matter on human health is widely discussed. However, no one comments that this air pollution reaches the Nature Park.

The purpose of this study is to estimate the visitors' opinion about the environmental protection of Nature Park Shumen Plateau from the negative anthropogenic influence of the nearby city.

2. Materials and methods

2.1. Interviews

Nature Park Shumen Plateau is located in the Shumen Plateau, next to Shumen city in northeastern Bulgaria (Fig. 1). Since 1980 it has been declared as a protected area with a surface of 3930.7 hectares. The access of people to protected territory is unrestricted.

The present study is part of larger survey (Koynova et al., 2019). The survey was carried out among summer visitors to the Nature Park Shumen Plateau in 2016. The face-to-face interview technique was used. People were chosen randomly at two main visitor points for 5 days (3 working and 2 weekdays). The information about the visitors' opinion on the main pollutants of the Peri-urban Nature Park Shumen Plateau was obtained using the following questionnaire: 1) In your opinion, can Nature Park Shumen Plateau be considered a clean green zone? 2) In your opinion, is Nature Park Shumen Plateau a cleaner green area than the parks in Shumen? 3) Which do you think are the main pollutants of Nature Park Shumen Plateau? 4) According to RIEW data (Regional Inspectorate of Environment and Water Shumen), in the winter months the level of fine particulate matter in the air in the town of Shumen exceeds the limit values. In your opinion, does this fact negatively affect Nature Park Shumen Plateau? 5) In your opinion, which factor has the most adverse effect on biodiversity and ecological balance in the Nature Park Shumen Plateau? The demographic features of the people who accepted to participate in the interview were determined. Data from each questionnaire were checked for inconsistencies. Questionnaires containing logical errors were excluded from the study.

2.2. Statistical analysis

Descriptive statistic procedures like percentages and frequency distributions are used for analysing the data. The chi-square test was used to compare different groups of data. To determine the correlation between items questioned and demographic variables was used standardized Pearson correlation coefficient. Depending on the values of the Pearson's contingency coefficient (r), the following types of

Figure 1. Map of the study area with location of Nature Park Shumen Plateau (in red) and Shumen city (in blue)

correlation were differentiated: 0 < r < 0.3 weak correlation, 0.3 < r < 0.5 moderate correlation, 0.5 < r < 0.7 significant correlation, 0.7 < r < 0.9 strong correlation, 0.9 < r < 1 very strong correlation.

3. Results and discussion

The demographic features of the respondents were reported and discussed in detail in the first part of this study (Koynova et al., 2019). The majority of NP visitors represent a consistent group of inhabitants of the city of Shumen. They had a university degree, employed, 20–59 years old. Data on the visitors' attitude towards the pollution in Nature Park Shumen Plateau are given in Table 1. Demographic variables contribute to the analysis of the study results (Rughinis & Humă, 2015). Influence of these independent features of the informants on the responses to the inquiry is presented in Table 2.

The availability of green areas is important for human health and improve people's quality of life (Gidlow et al., 2012; Pietilä et al., 2015; Shuib et al., 2015; Zhang et al., 2017). It is important to have enough quality green spaces within urban and peri-urban areas (Li et al., 2005; Szulczewska et al., 2014). According our results in first part of this survey two main motivations of people to visit Nature Park are to be near to nature and to practice sport (Koynova et al., 2019). Therefore, a clean environment is essential. In present survey 27.21% of informants were of the opinion that Nature Park Shumen Plateau is a clean green space and 61.03% reckon that is true but to some extent. Moderate impact on this statement exerted demographic variable age (r=0.38). Half of the respondents over the age of 60 believe that the NP is a clean green area, while 60–75% of those surveyed under the age of 60 consider it to be so but to some extent. This is due to the larger proportion of respondents (59.56%) believe that Nature Park Shumen Plateau is a cleaner green space than city parks in Shumen or at least to some extent (27.21%). Only 8.82% disagree with this statement. Demographic variable gender (r=0.31), age (r=0.34) and occupation (r=0.38) have moderate influence on answers of this question. Almost all retirees gave positive answer while the most negative answers were received from the unemployed. Academic and professional experts are also the opinion that Nature Park Shumen Plateau has better qualities as a green space compared to the Shumen City Park (Koynova, 2018). The park quality is considering factor that contribute to park visitation. Quality was mostly assessed through park amenities and hazards (Vaughan et al., 2013; Rigolon & Flohr, 2014; Jenkins et al., 2015; Hughey et al., 2016). Vegetation as trees and woodlands has a natural capacity to absorb and remove air pollutants (Chaparro & Terradas, 2009; Escobedo

Table 1. Responses of the respondents to the inquiry about the environmental protection of Nature Park Shumen Plateau from the negative anthropogenic influence of the nearby city, Bulgaria (n=136)

Question	Responses	Number
In your opinion, can Nature Park Shumen Plateau be considered a clean green zone?	Yes	37 (27.21%)
	No	11 (8.09%)
	To some extent	83 (61.03%)
	I can't decide	4 (2.94%)
	No answer	1 (0.74%)
In your opinion, is Nature Park Shumen Plateau a cleaner green area than the parks in Shumen?	Yes	81 (59.56%)
	No	12 (8.82%)
	To some extent	37 (27.21%)
	I can't decide	6 (4.41%)
Which do you think are the main pollutants of Nature Park Shumen Plateau? [a]	The close location of the town of Shumen by car traffic	42 (30.88%)
	The close location of the town of Shumen through the manufacturing enterprises	13 (9.56%)
	The close location of the town of Shumen through heating with solid fuels	27 (19.85%)
	Garbage left by park visitors	121 (88.97%)
	Unregulated landfills in the park area	63 (46.32%)
	I don't think there are any	3 (2.21%)
	No answer	2 (1.47%)
According to RIEW data, in the winter months the level of fine particulate matter in the air in the town of Shumen exceeds the limit values. In your opinion, does this fact negatively affect Nature Park Shumen Plateau? [a]	Yes, on the purity of the air	98 (72.06%)
	Yes, on the soil	35 (25.74%)
	Yes, on groundwater	29 (21.32%)
	Yes, on the organisms that inhabit it	52 (38.24%)
	No, there is no negative impact	19 (13.97%)
	I can't decide	14 (10.29%)
In your opinion, which factor has the most adverse effect on biodiversity and ecological balance in the Nature Park Shumen Plateau?	Greatest impact of visitors	54 (39.71%)
	Greatest impact of cars	48 (35.29%)
	Greatest impact of organized events	26 (19.12%)
	Impact of visitors	37 (27.21%)
	Impact of cars	49 (36.03%)
	Impact of organized events	42 (30.88%)
	Least impact of visitors	37 (27.21%)
	Least impact of cars	31 (22.79%)
	Least impact of organized events	60 (44.12%)

[a] - **The** percent differs from 100% since more than one response was marked.

Table 2. Influence of demographic variables of the respondents to their answers to the questions about the environmental protection of Nature Park Shumen Plateau from the negative anthropogenic influence of the nearby city, Bulgaria (n = 136)

Question	Demographic features			
	Gender (r)	Age (r)	Level of education (r)	Occupation (r)
In your opinion, can Nature Park Shumen Plateau be considered a clean green zone?	0.20	0.38	0.28	0.27
In your opinion, is Nature Park Shumen Plateau a cleaner green area than the parks in Shumen?	0.31	0.34	0.26	0.38
Which do you think are the main pollutants of Nature Park Shumen Plateau?	0.22	0.36	0.26	0.33
According to RIEW data, in the winter months the level of fine particulate matter in the air in the town of Shumen exceeds the limit values. In your opinion, does this fact negatively affect Nature Park Shumen Plateau?	0.14	0.37	0.17	0.25
In your opinion, which factor has the most adverse effect on biodiversity and ecological balance in the Nature Park Shumen Plateau? Greatest impact	0.24	0.38	0.31	0.32
Impact	0.28	0.40	0.31	0.37
Least impact	0.15	0.33	0.28	0.31

* - $P \leq 0.05$; r – Pearson's contingency coefficient: $0 < r < 0.3$ weak correlation, $0.3 < r < 0.5$ moderate correlation, $0.5 < r < 0.7$ significant correlation, $0.7 < r < 0.9$ strong correlation, $0.9 < r < 1$ very strong correlation.

& Nowak, 2009; Gomez-Baggethun et al., 2013). However, it has long been known that the air pollution also effects on ecosystems (Lovett et al., 2009).

Our next question to visitors of the Nature Park was „Which do you think are the main pollutants of Nature Park Shumen Plateau?". The greatest proportion of the respondents think that the main pollutant of Nature Park Shumen Plateau is garbage left by park visitors (88.97%). The amount of garbage left is related to individual behaviour and local traditions (Muhar et al., 2002). The high percentage of this answer indicates that this is a serious problem for the park visitors. As a further reason, they cite landfills in the park area (46.32%). The negative anthropogenic influence of a nearby town of Shumen by car traffic (30.88%), heating with solid fuels (19.85%) and manufacturing enterprises (9.56%) on the protected area are not considered as essential. The analysis reveals some impact of demographic variables like age (r=0.36) and occupation (r=33) on the opinion of respondents on this issue.

The moderate influence of the age is the result of the large percentage under the age of 20 that reckon the nearby town of Shumen by car traffic is a main pollutant in the NP. Also, with increasing age, the percentage of people who identified unregulated landfills in the protected area as the main pollutant in the Park has increased. It is interesting that none of the group of university students and pensioners found heating with solid fuels in Shumen city a main pollutant in Nature park and none of the group of unemployed and pensioners found manufacturing enterprises in Shumen city a main pollutant in the Park. The answers to this question clearly show that the visitors do not consider the nearby town of Shumen to be a significant source of negative anthropogenic influence on the Park. There is a gap between science community and society and relationship between them need to be improved (Rapley & De Meyer, 2014).

According to RIEW data, in the winter months the level of fine particulate matter in the air in the town of Shumen exceeds the limit values (Regional Inspectorate of Environment and Water Shumen, 2018). Atmospheric particulate matter through rain, snow or dust are deposited in plant and soil. The major impact of particulate matter occurs through the soil because they can alter nutrient cycling and inhibit plant nutrient uptake (Grantz et al., 2003). Therefore, we asked visitors if in their opinion this fact negatively affects Nature Park Shumen Plateau. As shown in Table 1, a greatest proportion of informants (72.06%) suppose that high level of particulate matter in the air in the city of Shumen affects purity of the air in Nature Park. 38.24% of respondents said that this high level of fine particulate matter also affects the organisms inhabiting the Nature Park. Just over 20% believe that this also affects the soil and groundwater. A moderate impact (r=0.37) of age of respondents on the answers to this question has been established. Only the youngest informants (up to the age of 29) don't answer "No, there is no negative impact". Our previous results show the presence of water-soluble contaminants in the soil and waters of the Nature Park Shumen Plateau, which are probably result of heating with solid fuels in Shumen (Koleva et al., 2018a; Koleva et al., 2018b; Koynova et al., 2018). However, a lot of research are focused on effect of air pollution on human health

(Mace et al., 2004; Mabahwi et al., 2014; Burns et al., 2020). The traditional media in Bulgaria focus also only on particulate matter in air and their negative impact on human health. Probably this is the reason why most of the participants in our study do not consider soil and groundwater to be affected either. This also may be due to the great influence of social media nowadays in people life (Jiang et al., 2015; Henderson & Hilton, 2018). The studies indicate correlation between real world events and social media messages in the cyberspace and collective human behaviours (Kaplan & Haenlein, 2010; Nagel et al., 2013; Sasahara et al., 2013).

Many activities that occur in protected area can have an adverse effect on biodiversity and ecological balance (Jones et al., 2018). The Nature Park Shumen Plateau has many visitors, car traffic and events are often organized there (Grigorova, 2016). According to the participants in this study the most adverse effect on biodiversity and ecological balance in the Nature Park is rendered by visitors, followed by car traffic and organized events (Table 1). Demographic variable age and occupation have moderate influence on answers of this question. About half of informants under the age of 40 believe that park visitors have the most negative effect on biodiversity and ecological balance in the Nature Park. Only a quarter of people over 60 share this opinion, while half of them say that the most adverse effect is resulting from car traffic in protected area. The potential for negative environmental impact of visitors in protected areas is well known to researchers (Nepal, 2000; Karanth & DeFries, 2010; Leung et al., 2018). Our results show that the respondents are aware of the great importance of the behaviour of visitors to the Natural park on the environment. However, there are good environmental practices and management systems that successfully combine protected area visits with economic and social benefits (Leung et al., 2018).

4. Conclusion

In modern society visits to nature parks are considered as an appropriate way of achieving healthy lifestyle by people. This survey revealed that visitors of Nature Park Shumen Plateau do not realize negative anthropogenic impact of nearby city on the Park. Our survey revealed that relationship between science community and society need to be improved and evolved. The media is one of the main factors which influences community behaviour and perceptions. In order, for the mass media, to be more public health efficacy, it is necessary scientists and journalists to work closely to ensure complete information on the need of the environmental protection of nature parks from the negative anthropogenic influence of the nearby city.

Acknowledgment

This work was supported by the Bulgarian Ministry of Education and Science under Grant No. RD-08–104/30. 01.2020.

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