

Received: July 2024
Accepted: September 2024
DOI: 10.7862/rz.2024.hss.35

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*The time has come to realise
that nature will prevail without humanity,
but humanity without nature will not.*
– Aristotle

SAFETY CULTURE OF ECOSYSTEM SERVICES

In this article, an attempt is made to indicate the role and importance of ecosystem services as advantages that are provided to us by the environment. The authors demonstrate selected concepts of ecosystem services and their classification, but only to introduce the reader to pilot studies of the urban ecosystem. The present article aims to define the factors that influence the culture of utilizing ecosystem services in urbanized areas. In this article, a fragment of an urban ecosystem, specifically the Old Town of Gdańsk (which features anthropogenic elements and whose functioning is dependent on ecological and natural systems), is observed through a researcher's eye. This area is predominantly focused on using international experiences in interdisciplinary research, a dynamically developing new science discipline called "city ecology." The key research problem of this study is as follows: how can the safety culture be efficiently developed and integrated with the management of ecosystem services to ensure their persistence and resistance to environmental and anthropogenic risks?

Keywords: safety culture, ecosystem services, ecological safety, ecologistics of the city, crisis management, security, crisis situation.

1. INTRODUCTION

Ecosystem services are a range of services used by the society – a branch of ecological economy initiated by scientists in the 60s and 70s of the last century, the task of which is to assess the value of ecosystems. They are the consequences of the realisation that the limited resources of the Earth and polluted environment primarily influence people's health and life, and then have negative effects on the world's economy. M. Stępniewska and A. Mizgajski note:

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The concept of services provided to a person by ecosystems, also referred to as ecosystem services (the contribution of ecosystems to the values revealed in economic, social, cultural and other forms of human activity), has gained considerable popularity among researchers of human–environment relations in the last quarter of the century. It can be assumed that it is a manifestation of searching for an increase in the efficiency of the protection of the natural environment by humans, which loses against market mechanisms and the societies' aspirations to raise the material standard of living, without paying attention to the negative effects on the natural environment (Stępniewska, Mizgajski, 2023).

H. Sommer, G. Zakrzewski described the idea of services in the following way:

Nature gave humanity access to food, clean waters, uncontaminated soil and the photosynthesis, describing the flow of energy in ecosystems in a perfect way. Nature generates ecosystem services for itself, ones than humans have started to use injudiciously. Our existence depends on the continuous supply of ecosystem services in both quantitative and qualitative sense. These goods, widely available to humans, have not been seen as valuable, and being public goods, they have not been a market product. Because how can one appraise the value of clean air or water? Establishing the cost of atmospheric emissions or fees for the economic use of water, however, poses no problems. Such activities lead to the degradation of ecosystems and decreasing biodiversity. We are approaching the ultimate natural thresholds, suffering painful consequences thereof (Sommer, Zakrzewski, 2020).

Ecosystem services are the benefits that humans draw from natural ecosystems. These services are necessary both for the subsistence and wellbeing of societies. They have crucial meaning for human survival and economic development. They ensure resources needed to fulfil basic human needs, aid livelihoods and contribute to cultural and spiritual wellbeing. In addition, they play an important role in regulating environmental conditions, which helps to alleviate the consequences of climate change and natural disasters. To sum up, it can be stated that ecosystem services are a specific stream of benefits, the origin of which is the natural capital as the resource of animate and inanimate goods, together with their associated energy. These ecosystem services are vital for the wellbeing of people and the environment. Acknowledgement of their meaning and taking measures to protect and maintain them is crucial to ensure a sustainable future.

2. ECOSYSTEMS AND HUMAN WELFARE

Artificial environments (Figure 1), which have appeared as a result of transitions from the natural human environment, have a specific organisational, spatial, social and cultural structure, in which processes suitable for the ecosystem occur. Each of the mentioned systems also represents a certain economic value. H. Sommer, G. Zakrzewski state:

The breakthrough point in the development of ecology was Tansey's introduction of the concept of “ecosystem” as the basic, ecological functional and spatial unit in 1935. An ecosystem is an area of relatively homogenic abiotic conditions (biotope), occupied by a corresponding set of species linked by trophic and

paratrophic relationships, through which a beam of energy and matter flows. A technically developed area can also be considered an ecosystem if it meets the above-mentioned conditions. According to this definition, an ecosystem consists of two closely related components:

- **inanimate one (biotope, also called habitat)**, which consists of soil, water and air with their physicochemical properties, as well as climate;
- **animate one (biocenosis)**, composed of a combination of species specific to a given biotope under given geographical conditions (Sommer, Zakrzewski 2023a).

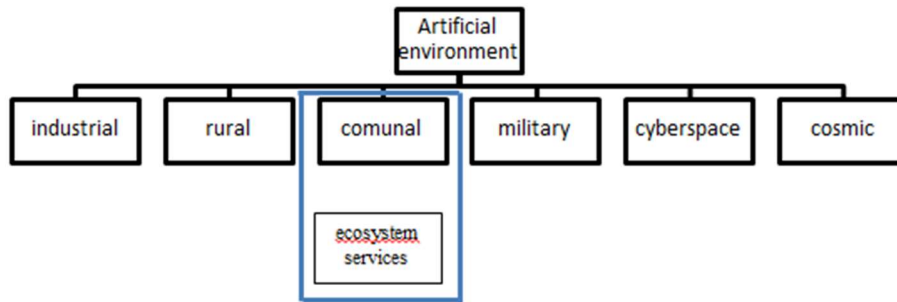


Figure 1. The location of the studied ecosystem services in an artificial environment

Source: Own elaboration based on: (Sommer, Zakrzewski, 2023).

Ecosystem services concern every environment; however, due to the length of the article, the authors will focus their scientific inquiries and research on the urban environment.

3. IMPORTANCE OF ECOSYSTEM SERVICES

Humans, transforming their natural environment, have never distanced themselves from it. Over time, the characteristic elements of the human natural environment have been transformed to such an extent that they have their own nomenclature. For the purposes of this article, the authors looked at the urbanised thousand-year-old habitat of the city of Gdańsk.

The urbanised, thousand-year-old habitat of Gdańsk is an example of the integration of the natural environment and buildings in order to create a vibrant, sustainable city. By recognising and improving its ecosystem services, Gdańsk can continue to thrive while preserving its rich historical and cultural heritage for future generations.

Limited accessibility zones in Gdańsk are a key element of the city's strategy to create a hospitable urban environment. By limiting vehicle access, these zones improve air quality, reduce congestion and improve urban experiences, making Gdańsk a more attractive and healthier place to live and explore.

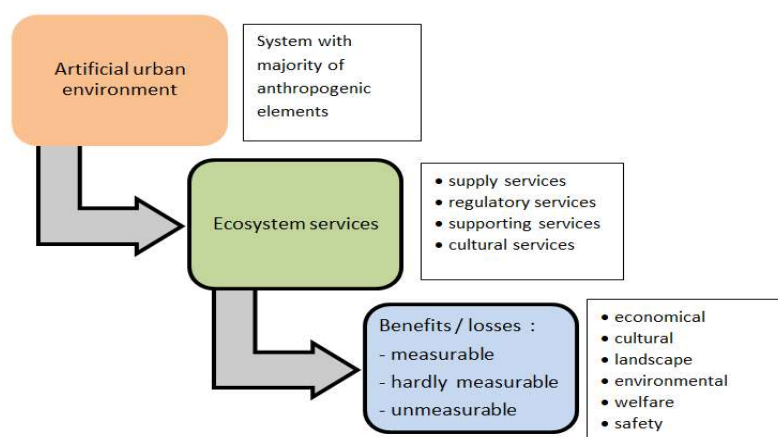


Figure 2. Cascade of ecosystem services

Source: Own elaboration based on: (<https://eur-lex.europa.eu/PL/legal-content/glossary/ecosystem-services.html>; <https://irmir.pl/wp-content/uploads/2022/03/Uslugi-ekosystemowe-B.Szulczewska.pdf>).

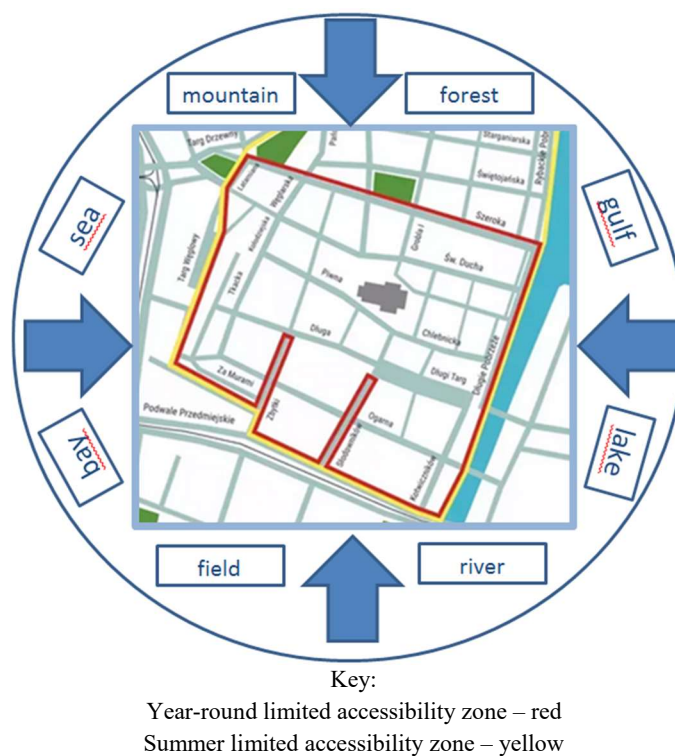


Figure 3. Simplified diagram of the site/area of ecosystem services research in Gdańsk

Source: Own elaboration based on the following map: (<https://gzdz.gda.pl/zalaw-sprawc/strefa-ograniczonej-dostepnosci-na-glownym-miescie,a,3141>).

4. METHODOLOGY AND RESULTS OF THE CONDUCTED RESEARCH

Research methodology is an approach used to conduct research, including techniques and procedures used to collect, analyse and interpret data. It includes the selection of specific data collection methods (e.g. surveys, interviews), data analysis (e.g. statistical analysis, thematic analysis) and ethical considerations necessary to ensure the integrity and validity of the research. The study adopted a mixed approach, combining quantitative and qualitative techniques to achieve a comprehensive understanding of the topic. Data will be collected through structured surveys to collect quantitative data. Partially structured interviews will be conducted to obtain qualitative information from key stakeholders.

We call the research problem what is the subject of the research efforts, i.e. what orientates cognitive endeavours (Sztumski 1999).

The main research problem in the present study is formulated as follows: “How can a safety culture be effectively developed and integrated into the management of ecosystem services to ensure the sustainability and resilience of these services to environmental and anthropogenic threats?”

The research was carried out in May 2024 among residents and tourists staying in the area of the city of Gdańsk shown in Figure 3. The area of scientific research called administratively the Limited Accessibility Zone (LAZ) in the Main City is a specially separated area in the city centre of Gdańsk⁴ located between: Kotwiczników Street, Ogarna Street, Słodowników Street, Za Murami Street, Bogusławskiego Street, Wełniarska Street, Teatralna Street, Latarniana Street, Szeroka Street, Old Motława River marked in red in the figure. During the holiday season, the LAZ area is also expanded to include other streets of the Main City, marked in yellow in the figure⁵. The research was conducted in front of three small convenience stores between 9am and 12pm (50 people). Moreover, from 12pm to 3pm, tourists (50 people) who stayed in the researched area at that time were subjected to the study. The survey contains 9 categorised questions. It was conducted on a diverse group of participants to collect quantitative data on their insights and experiences. In addition, interviews were conducted to obtain a qualitative insight into the unique perspectives of both residents and tourists. Interviews were conducted with city officials, owners of local businesses (restaurants, shops and hotels in the centre of Gdańsk), employees of cultural organisations and the Environment and Environmental Protection organisations, as well as scientists dealing with environmental protection.

Quantitative data were analysed using statistical methods to identify trends and dependencies, while qualitative data were subjected to thematic analysis to identify key threads and narratives. This methodological approach ensured a solid and holistic understanding of the research topic, providing valuable insights from a wide range of interested parties. Ethical considerations were adhered to throughout the research process, ensuring informed consent, confidentiality and integrity of the data collected.

The questions asked to the respondents were aimed at collecting various perspectives and insights on the development and integration of the safety culture in the management of ecosystem services, taking into account both challenges and potential solutions.

⁴ See more: Śródmieście District, number of residents: 24 536, area: 5,65 km², population density: 4 343 people/km² <https://www.gdansk.pl/srodmiescie/ludnosc-i-ilosc-mieszkanow,a,180411> [Access: 21.06.2024].

⁵ See more: <https://gzdziz.gda.pl/zalatw-sprawe/strefa-ograniczonej-dostepnosci-na-glownym-miescie,a,3141> [Access: 21.06.2024].

The first question in the survey concerned the knowledge of the safety culture in the management of ecosystem services.

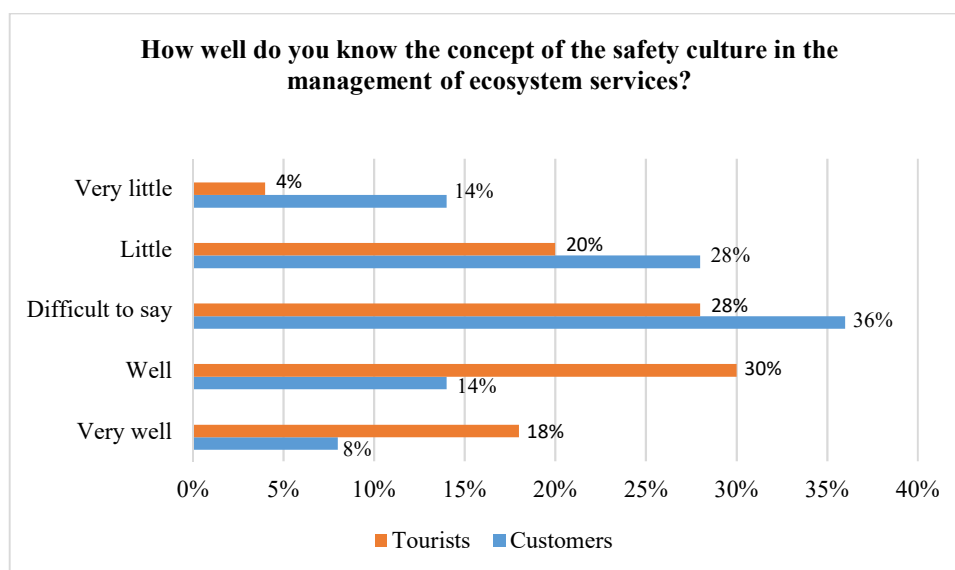


Chart 1. The level of knowledge of the safety culture in the management of ecosystem services

Source: authors' own research.

The level of knowledge of the respondents on the concept of safety culture in the management of ecosystem services is generally insufficient. A significant proportion of the respondents frequently chose the “Difficult to say” option, indicating uncertainty or the lack of knowledge of the concept. Data analysis shows that tourists have a greater knowledge on the topic than customers of the local stores. This discrepancy can be attributed to the demographical features of the local customers, who were often at the retirement age and may not have heard of the researched concept.

When it comes to interviews conducted with key stakeholders, they indicate that city officials, local business owners, employees of cultural organisations, environmental protection workers and scientists usually have a moderate understanding of the studied concept. The level of knowledge is diverse, with scientists and environmental protection workers having the greatest knowledge, and local business owners and employees of cultural organisations exhibiting limited awareness.

To guarantee the comprehensiveness of the research, after answering the initial question, the respondents were precisely introduced to the concept of the safety culture in the management of ecosystem services. Such preparation allowed them to provide more accurate and informative answers to the following questions.

The next question concerned the meaning of the integration of the safety culture into the management of ecosystem services.

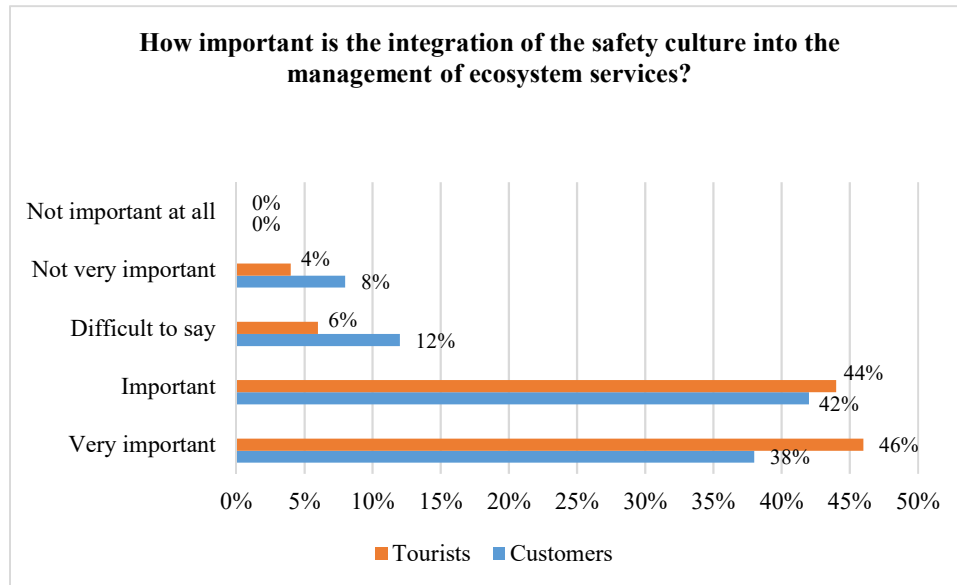


Chart 2. The importance of integrating the safety culture into the management of ecosystem services

Source: authors' own research.

The respondents attach importance to the role of the safety culture in the management of ecosystem services. The vast majority, no less than 100%, determined it as important or very important. Only a small percentage of respondents were not able to make a decision on this issue or determined it as not very important. Similarly, interviews with key stakeholders indicate that they perceive the safety culture in the management of ecosystem services as very important. These answers were given shortly after a thorough introduction of the respondents to the analysed concept.

In the third question, the respondents were asked to indicate the most important threats to the persistence of ecosystem services.

In question 3, the sum of the answers does not equal 100%, because the respondents indicated all answers which in their opinion applied. The most frequently indicated threats were successively: environmental contamination, climate change, habitat destruction, socio-economic pressures, excessive exploitation of resources and intrusive species. No other threats were indicated by any of the respondents.

The most important threats to the persistence of ecosystem services, identified by key stakeholders, were climate change, contamination, habitat destruction, excessive exploitation of resources, intrusive species, socio-economic pressures and inappropriate regulatory frameworks.

In the following question, the respondents indicated the most efficient actions in the development of the safety culture in the management of ecosystem services.

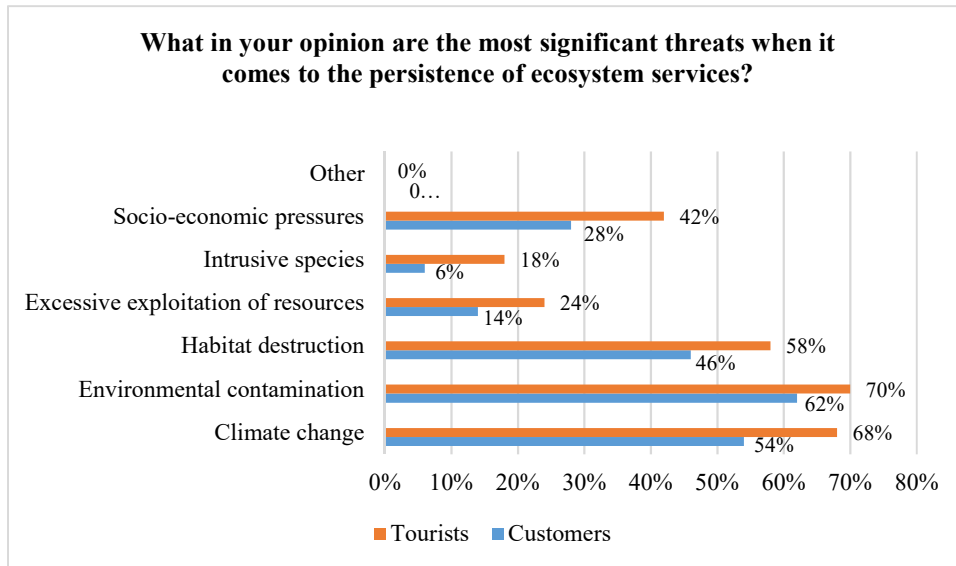


Chart 3. The most important threats to the persistence of ecosystem services

Source: authors' own research.

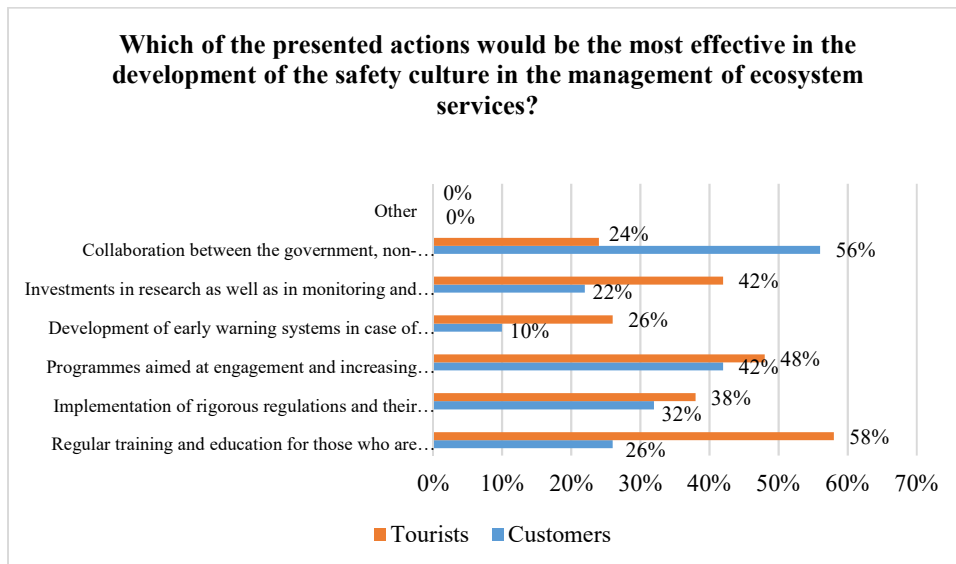


Chart 4. The most effective actions in the development of the safety culture in the management of ecosystem services

Source: authors' own research.

In the fourth question, the respondents could indicate a maximum of three actions. Among the most effective actions in the development of the safety culture in the

management of ecosystem services indicated by tourists were regular training and education, programmes aimed at increasing public awareness as well as investment in research and monitoring and security technology. However, customers of small local stores indicated the collaboration between the government, non-governmental organisations and local communities. Similarly to tourists, they paid attention to programmes aimed at increasing public awareness as well as to the introduction of rigorous regulations and their enforcement. During the interviews, key stakeholders expressed similar views to those of the respondents.

The next question concerned the biggest challenges in implementing a safety culture in the management of ecosystem services.

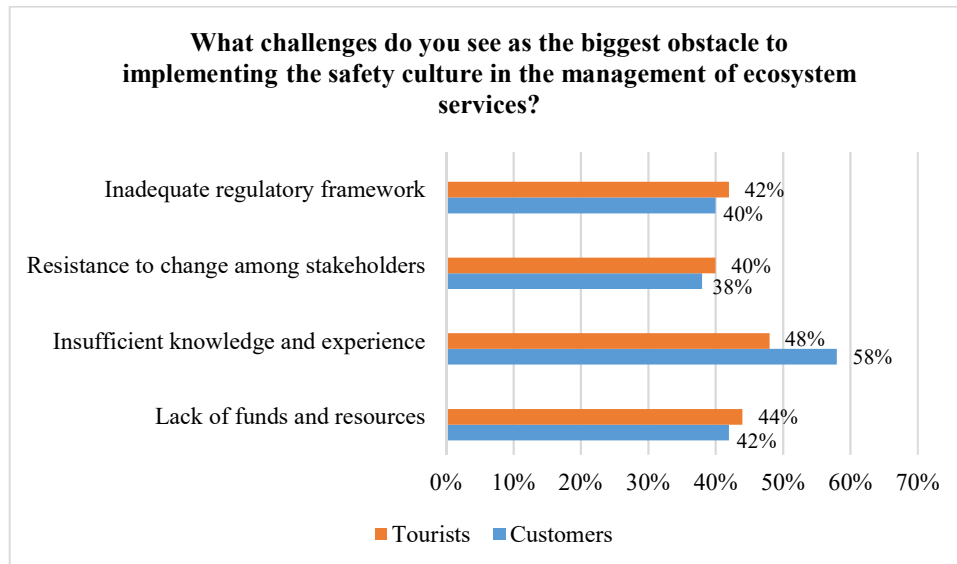


Chart 5. Challenges that pose the biggest obstacle to implementing the safety culture in the management of ecosystem services

Source: authors' own research.

In question 5, the respondents were able to select all challenges that they felt were applicable. The responses of customers of small, local shops and tourists from the studied area were very similar. Despite minor differences in the indications, it was noted that the respondents most often considered insufficient knowledge and experience as the main challenge.

Based on the interviews, the key stakeholders emphasise the importance of eliminating these challenges through increased funding, comprehensive education and training programmes, a stronger regulatory framework and enhanced cooperation and engagement of the interested parties.

In the next question, the respondents were asked to assess the effectiveness of the current ecosystem services management practices in counteracting environmental and anthropogenic threats.

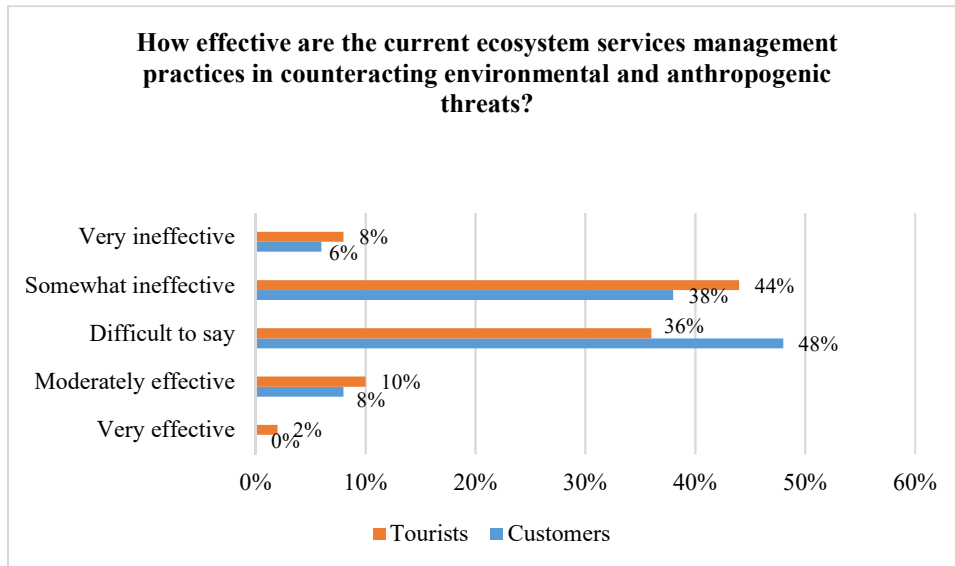


Chart 6. The effectiveness of the current ecosystem services management practices in counteracting environmental and anthropogenic threats

Source: authors' own research.

When asked about the effectiveness of the current practices in the management of ecosystem services, the vast majority of respondents were not able to take a clear position or believed that these practices are to some extent ineffective. Only a very small, statistically insignificant percentage of respondents considered them to be very effective.

Based on the interviews, key stakeholders generally assess the effectiveness of the current ecosystem services management practices in counteracting environmental and anthropogenic threats as moderate. They acknowledge some successful initiatives, but also emphasise the need for better enforcement of regulations, closer cooperation with interested parties and integration of advanced technologies and innovative strategies to increase overall effectiveness.

In the last, open-ended question, the respondents were asked to answer the following: Who should be most involved in promoting the safety culture in the management of ecosystem services?

The responses obtained from customers, tourists and significant persons show that the promotion of the safety culture in the management of ecosystem services requires the active involvement of many key stakeholders. Governmental and regulatory bodies, local communities, non-governmental organisations devoted to protecting the environment, academic institutions, the private sector and international organisations play an important role in ensuring the effective and sustainable management of these vital services. Their cooperation is essential for developing policies, raising awareness, conducting research and implementing best practices as well as setting global standards.

5. CONCLUSION

Based on the study, the level of knowledge of the respondents about the concept of safety culture in the management of ecosystem services is insufficient. The most frequently indicated threats to the sustainability of ecosystem services include environmental pollution, climate change, habitat destruction, socio-economic pressure, excessive exploitation of resources and intrusive species. Key stakeholders also drew attention to these threats as well as to the inappropriate regulatory framework. The main challenge in the implementation of the safety culture in the management of ecosystem services indicated by the respondents is insufficient knowledge and experience. Key people emphasise the importance of eliminating these challenges through increased funding, comprehensive education and training programmes, a stronger regulatory framework and enhanced cooperation and engagement of the interested parties.

Promoting the safety culture in the management of ecosystem services requires an active involvement of various key stakeholders, including governmental and regulatory bodies, local communities, non-governmental organisations devoted to protecting the environment, academic institutions, the private sector and international organisations. Their joint efforts are crucial to ensure the effective and sustainable management of these core services.

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