

Ecosystem services: an interpretive paradigm of urban and territorial heritage. Strategies, guidelines and vision for sustainable cities



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Abstract

The current challenge in urban contexts is to achieve a sustainable balance between urban and rural areas, especially in conflict situations such as wars or natural disasters, where connectivity between ecosystems can be disrupted, causing a significant impact on ecosystem services (ES) provided by affected areas. For example, vegetation destruction can cause soil erosion and reduce water absorption capacity, increasing the risk of floods and avalanches. In a world plagued by the danger posed by climate change, it is necessary to reflect on the opportunities offered by ES that natural capital provides. How? This is the task of those, such as architects and designers, who can implement new paradigms of energy sustainability for resilient communities. It is a new opportunity that we must not miss for the ethics and mission that we have as builders of well-being. Cities are often places of conflict, where people struggle for limited resources, such as green spaces, water, clean air, and food. However, creativity can help solve these conflicts by finding new solutions that consider multiple interests and needs. For example, public art and music can be used to raise awareness about the importance of ES and to promote biodiversity conservation. Such initiatives can also contribute to strengthening the sense of community and improving people's psychological well-being, creating a positive impact on urban quality of life. While ecological connectivity and the promotion of ES are essential to create sustainable, resilient, and livable cities, the creation of green corridors and the promotion of urban biodiversity are just some examples of how connectivity can be promoted to improve the quality of the urban environment and the resilience of the city. But how can we integrate these concepts into urban design? My research aims to suggest some key strategies. First, it is important to consider ES in urban planning from the beginning so that they can be appropriately integrated into urban design. Second, ecological connectivity must be promoted in urban design through the creation of green corridors, the promotion of urban biodiversity, and the use of green infrastructure such as green roofs and walls. Finally, it is important to involve the community in urban design to arrive at solutions appropriate to local needs and expectations. This green balance is essential to ensure the conservation of biodiversity and the production of ES that positively influence human well-being.

My doctoral thesis focuses on the use of ES in a specific area of the Metropolitan City of Reggio Calabria (Calabria, Italy) to interpret urban and territorial heritage and understand how they can contribute to the sustainability of the city. The goal is to create a replicable model for enhancing green in urban, peri-urban, and extra-urban contexts, increasing the ecological functions of ecosystem services, and raising community awareness of their importance. The research methodology will follow a transdisciplinary and participatory approach, involving the community in the evaluation process.

Author's keywords

Ecosystem services - Strategies and guidelines - Environmental and social assessment - Natural capital - Biodiversity - Environmental resilience

Introduction

The processes of urbanization and chaotic growth of cities have taken place in most countries of the world. Almost 80% of the European population lives in cities, and it is estimated that by 2030 these regions will have even more inhabitants. This exerts enormous pressure on the natural environment and leads to the loss of components necessary for the proper functioning of ecosystems and human life. The impact of urbanization on ecosystem services has been emphasized, and it is important to consider ecological values in activity planning. Green areas in cities are important for human well-being as they perform ecological functions and provide ecosystem services. Seven different types of urban ecosystems have been identified that generate a range of ecosystem services: street trees, grasslands/parks, urban forests, cultivated land, wetland, lakes/sea. These systems generate a range of ecosystem services. The concept of ecosystem services has changed the perception of the importance of nature for human societies and transformed it into a vision of the environment as natural capital. However, the challenge is to increase society's awareness of the value of natural capital. (K. Pukowiec-Kurda, 2022).

Study area and methodology

The doctoral thesis aims to investigate the use of ecosystem services (ES) in a specific area of the Metropolitan City

of Reggio Calabria, whose territories are currently subject to various risks, mainly due to the low human presence and the lack of attention to the resources and values present. There is strong pressure for the transformation of coastal areas for the construction of holiday homes, while many villages and rural areas - which constitute our urban heritage - are being abandoned. In addition, the lack of care and management of forests, which cover over 30% of the total surface area of the Metropolitan City, leads to deliberate fires and the loss of an important resource. This contributes to a decrease in biodiversity and the loss of ES, causing damage to the environment and the quality of life of residents (Fallanca C, Taccone A., and Corazziere C. 2019). The use of the interpretative paradigm of SE becomes a unique opportunity for territorial and urban planning to create human settlements that, through new methods and approaches, can lead to greater integration of natural ecosystems into the city, greater environmental resilience, and the creation of more sustainable cities for residents and future generations. The interpretative paradigm refers to a way of seeing and understanding these ES as an integral part of the urban and territorial heritage and understanding how to transform cities from consumption cities to sustainable cities. The general scientific theme focuses on the development of strategies aimed at identifying a methodological system that is replicable and adaptable to contexts similar to the case study under investigation. The general objective is to develop a model for the "Enhancement and implementation of greenery" within urban contexts in order to improve/maintain the ecological functions of ES. The strategy will be identified through the elaboration of guidelines related to the development of SE within a vast territory such as that of the Metropolitan City of Reggio Calabria. These will take into account the effects of climate change and aim to achieve the objectives of the Agenda 2030 to build a resilient future. In other words, the goal is to look at the design and management of territories with an ecosystemic and strategic vision on the role of green spaces in cities, so that they can withstand future threats and pressures and provide essential ecosystem services for human well-being in a sustainable way. (Soil consumption report (2022), Taccone A. and Fallanca C. (2021), K. Jax, A. K. Bresch, S. Riediger (2020), A. L. Marques, A. T. B. Alvim and J. S. (2022), D. Poli (2020).

The ecosystemic vision of urban greenery is not just a matter of conservation, but also promotion. In fact, through greater awareness and appreciation of green areas, it is possible to promote an improvement in the quality of life for people by providing a healthier and more comfortable environment. For example, the presence of trees and other plant elements can help reduce air pollution, improve air quality, and reduce the perceived temperature for people. This can help mitigate the effects of climate change and create a more comfortable environment for the population. In this context, ecosystem services (ES) can play an important role in contributing to the improvement of connectivity and creativity in times of conflict. For instance, urban and peri-urban greenery can become a space for meeting and dialogue among diverse communities, promoting social cohesion and mutual understanding. Additionally, the presence of green spaces, the promotion of urban agriculture and biodiversity can reduce the level of stress and tension in the population, contributing to a better management of emergency situations. Furthermore, connectivity and creativity can be fostered through the creation of

bike and pedestrian paths, green corridors, and the enhancement of green spaces as venues for cultural and recreational activities. In this way, ES can become a tool for promoting innovation and creativity, contributing to a higher quality of life and the construction of a more sustainable and resilient society. The aim is to understand the various ways in which ES contribute to the well-being of people and the environment, develop innovative solutions for optimizing and utilizing specific assets in order to minimize environmental risks, and for the management, conservation, implementation, and reintegration of such services. It also involves developing a more sustainable and balanced approach to urban and territorial heritage, to the benefit of all stakeholders. To achieve this goal, research can involve a range of activities, including the mapping and evaluation of ecosystem services (Santolini R., Morri E. 2017b), analysis of trade-offs and synergies between different services, stakeholder engagement, and the development and experimentation of management strategies. The research project will use a transdisciplinary and participatory approach, involving the community in a "participatory evaluation" process. This will lead to more informed and sustainable decisions, as different perspectives and knowledge are taken into account. This will demonstrate that environmental resources have social and environmental value, as well as economic value. Currently, the prevailing approach is focused on the economic aspect, ignoring the negative effects on the ecosystem. Therefore, it is necessary to reverse this paradigm and protect ecosystem regulation and support services, evaluating first how the ecosystem works and then how it can be used. We are talking about the environmental and social values of urban parks, such as carbon capture, thermal regulation, mitigation of the urban heat island effect, and benefits for the mental and physical health of the population (WWF, 2022). Policies and actions must be coordinated to achieve these objectives, and investments from various sources indicate the urgency of intervention. Trees are an essential element of the One Health system (ISS, 2022), and their health impacts environmental, animal, and microbial health. Living near green spaces, such as forests and parks, has been shown to have beneficial effects on people's gut microbial flora, underscoring the importance of trees in cities. There is a lot being done to achieve city sustainability, from urban areas to large areas, and this is confirmed by the huge amount of measures and actions related to the National Recovery and Resilience Plan (PNRR) that plans to plant 6.6 million trees by 2024, and the EU plans to plant around 3 billion trees by 2030. (MASE 2022) The research will be structured in phases. The evolution of the concept of ecosystem services in recent decades will be analyzed, and the main themes and objectives of the research will be studied, emphasizing that regarding the two main theories on the value of ecosystem services, namely the theory of economic value and the theory of ecological and social value, this research intends to adopt the ecological and social aspect. Giving importance to this aspect and focusing on ecological and social evaluation and conservation of the services that ecosystems provide to humans and the environment, to contribute to sustainable management of ecosystems and ecosystem services for more sustainable and resilient cities. In the first phase, the following will be carried out: analysis of historical data, analysis of scientific literature, collection of data and information on the characteristics of the territory and the ecosystem services offered, for example

through studies already conducted and geographical and satellite data. Identify and map areas that provide the most important ecosystem services and that need to be protected and enhanced, using spatial analysis and modeling techniques (e.g. QGIS, ArcGIS, etc.). In this phase, the use of artificial intelligence could also be envisaged to: analyze data and identify any deficiencies or critical areas where ecosystem services are not adequately provided (e.g. for data processing for creating predictive models [federated learning/machine learning] - analyzing user feedback, for example through social media analysis or other geospatial data sources. The phase will conclude with the analysis of virtuous case studies. In the second phase, we will proceed with: identifying and involving local stakeholders/placemakers, such as residents, associations, businesses, and public institutions, as well as researchers to create a research network that shares knowledge and perspectives on ecosystem services and their relationship with urban sustainability. Participation techniques such as questionnaires, workshops, and focus groups will be used to study the relationship between the community and the urban and territorial heritage, the use of natural resources, and the impact of urban development on the environment and communities. These actions can provide information on the community's perceptions regarding the urban and territorial heritage and the ecosystem services used. This second phase will conclude with the definition of specific research objectives based on the results of data analysis and the community's needs, and they will be consistent with them. Moreover, they will be formulated in such a way as to ensure that the research is relevant and useful to the end-user. The objectives should be shared by all stakeholders, ensuring that all stakeholders and placemakers are committed and involved in the research. In the third phase of the project, a highly structured and well-defined approach is planned. First, strategies and guidelines for a sustainable city are designed, taking into account the results of the analysis phase and the defined objectives. This step is crucial to define the objectives and actions that must be taken to achieve them. Next, the implementation of the designed strategies and guidelines is carried out, involving stakeholders and placemakers through co-design processes. This participatory approach is essential to jointly define strategies and

guidelines with the aim of integrating ecosystem services into urban and territorial planning. In this phase, it is important to adopt a transdisciplinary approach, considering the needs and perspectives of different categories of actors. Finally, once the strategies and guidelines have been implemented, the effectiveness of the actions taken is evaluated. This is done through a series of environmental, social, and economic sustainability indicators. These indicators are crucial to understand whether the actions taken have actually achieved the set objectives and have been able to produce a positive impact on the community and the environment. This ensures the continuity and sustainability of the project over time.

Conclusion

In conclusion, the research emphasizes the importance of adopting an ecosystemic vision of urban and peri-urban green areas, in order to conceive green spaces as a natural capital of our cities, such as tree-lined streets, green roofs, neighborhood green spaces, as well as larger areas in peripheral fabrics such as large urban and territorial parks, agricultural green spaces, and green areas around rivers, schools, and hospitals. This requires strategic actions aimed at protecting and enhancing green areas and their urban and territorial heritage, creating a better future for all inhabitants. The proposed strategy involves the identification of a replicable and adaptable methodological system for similar situations to the study context, in order to identify the ecosystem services present on the territory, those that are lacking and those that are needed, understanding the risk of their loss and their counter value. This emphasizes the importance of considering synergies between different ecosystem services and finding alternative solutions to compensate for the loss of one of these. For example, if a green area is converted into a building area, it is important to find an alternative to maintain a certain level of ecosystem services, such as CO₂ absorption or noise pollution reduction. This holistic approach is essential to ensure sustainable and long-lasting urban planning. The expected result at present is therefore the elaboration of guidelines related to the development of ecosystem services in order to ensure sustainable development and the safeguarding of the natural heritage of the territory.

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