

Ecosystem Service Valuation of Urban Green Roofs: A Case Study in Berlin, Germany

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Abstract. Urban green roofs are increasingly recognized for their potential to contribute to urban sustainability by providing essential ecosystem services. This study employs a mixed-methods approach to evaluate the ecological and economic value of green roofs in Berlin, utilizing both qualitative assessments and quantitative ecosystem service metrics. Findings demonstrate that green roofs significantly enhance biodiversity, mitigate urban heat effects, and improve stormwater management, contributing to the city's resilience against climate change. A cost-benefit analysis reveals that the initial investments in green roofs yield substantial long-term ecological and economic returns. Policy implications for urban planning and green infrastructure development are discussed, emphasizing the need for integrating green roofs into urban sustainability strategies.

Keywords: Urban Green Roofs, Ecosystem Services, Sustainability, Biodiversity, Climate Change Resilience, Urban Planning, Cost-Benefit Analysis

Introduction

The escalating challenges posed by climate change and urbanization have amplified the urgency for effective strategies to enhance urban sustainability. Urban areas are increasingly vulnerable to the adverse effects of rising temperatures, poor air quality, and intensified stormwater runoff, necessitating innovative solutions to maintain ecological balance and improve residents' quality of life. In this context, urban green roofs have emerged as a promising strategy for mitigating these challenges. Green roofs not only enhance biodiversity but also provide vital ecosystem services such as stormwater management, temperature regulation, and air purification. Furthermore, the integration of green roofs into urban landscapes can significantly contribute to the aesthetic and

recreational value of urban settings, making them appealing to residents and promoting social well-being. This paper presents a comprehensive case study of green roofs in Berlin, Germany, exploring their ecological functions, economic implications, and contributions to urban sustainability. Employing a mixed-methods research design, this study combines qualitative insights from stakeholders and quantitative assessments of ecosystem services to provide an in-depth analysis of urban green roofs. The findings illustrate the multifaceted benefits of green roofs, highlighting their role in enhancing urban resilience and sustainability. This paper is structured as follows: first, a detailed overview of the literature on green roofs and urban sustainability is provided. Next, the methodology employed for the case study is outlined, followed by the presentation of results and discussion of their implications for urban planning and policy. Finally, the paper concludes with recommendations for future research and practice in the field of urban ecology.

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References

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