

# **“Strengthening Urban Resilience: Unleashing the Power of Green Infrastructure in European Cities”**

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## Introduction

Resilience is mainly perceived as complimentary extension of urban sustainability, fueling urban policy towards a highly integrated, multi-disciplinary and transparent planning system, which involves community stakeholders, as key to the process of planning; planners as creative, innovative, and holistic actors who work within multi-functional and multi-disciplinary frameworks. GI has been further considered as an interlinked network of multifunctional ecological systems, that are inclusive of semi-natural, natural, and artificial components within, around, and between urban regions, irrespective of its spatial scale.

This PhD dissertation aims to systematically review how urban resilience can be strengthened by unleashing the power of green infrastructure across European cities.

**Key words:** Urban Resilience, Green Infrastructure, European Cities, Systematic Review, Environmental Policies, Climate change Adaption, Sustainable development, City of Prague.

## Significance of the Dissertation

The concept of GI has been largely applied within urban contexts with the purpose of enhancing the overall structure of a city and to ensure that advantages from natural capital are provided within urban systems that mostly comprise of built spaces. It is possible to extend support to extensive levels biodiversity through urban green and blue spaces, while offering various ecosystem services. Adapting GI at diverse scales could augment the adaptability of urban regions to environmental modifications and also facilitate provisioning of ecosystem services through green spaces. In addition, the threat of climate change and the recent COVID-19 pandemic have drawn attention to the significance of GI within and around cities, thus triggering an urgent call for highly sustainable and functional planning and designs in urban regions. In such instances, a review of GI in terms of building resilient cities would have a key role to play in offering urban regions with a capacity for resilience which will be intrinsic for urban sustainability. The significance of this review would also lie in the fact that the findings from this review would emphasize on the need for widening and enhancing GI, specifically in European cities that are highly vulnerable on the basis of participatory and integrative procedures. This will help policymakers and planners to examine strategies for improving GI across cities in Europe.

### 1.4 Goal of the Dissertation

The purpose of this dissertation is to explore how green infrastructure can be used to facilitate the development of resilience within EU cities.

To achieve this, a review of previous literature will synthesize, analyze, and deliberate the findings from past studies, and present a summary on how resilient cities can be developed by incorporating green infrastructure into their planning and design process/requirements. By summarizing previous findings, this

dissertation will aim to make contributions to resilience within European cities, while also providing inputs on how urban planning could likely tackle future challenges. Thus, this dissertation will stress the need to anticipate future requirements, while outlining long-term goals for the future to tackle such challenges.

### **1.5 Research Questions**

1. To what extent does the historical background and institutional framework of Eastern European countries and specifically the Czech Republic influence the implementation and effectiveness of environmental policies, considering the higher regulations set by the European Union?
2. How does the distinction between city Borders and Ecosystem Edges influence the planning strategies for urban development and the application of Blue-Green Infrastructure (BGI) as a strategic solution for climate change adaptation in cities, with a focus on Prague (Czech Republic).
3. How does the social and cultural factor, including the role of users, influence the application and acceptance of Blue-Green Infrastructure (BGI) in urban areas, and how can user involvement in planning contribute to creating a better living environment in cities?
4. How do the robustness and applicability of Blue-Green Infrastructure (BGI) planning methods and technologies vary across different urban contexts, and how can the integration of social, technical, and resource considerations lead to sustainable development outcomes in cities?

### **1.6 Methodology**

A systematic review was the method adopted to conduct this research. This systematic review ascribes to an approach that has been previously utilized by several authors (Parker & Simpson, 2018; Peters et al., 2015). A detailed literature review was carried out, wherein papers that were highly pertinent to the phenomenon being investigated were found through diverse academic databases. The primary keywords used to identify the papers were ‘urban resilience’, and ‘green infrastructure’.

Further, the use of Landscape Functional Units (LaFU) method is also adopted. The technique for evaluating GI within European cities comprised of two key phases;

- Phase I: Planning the GI system, which refers to the identification and analysis of current semi-natural and natural areas and planning the GI system on this basis.
- Phase II: Assessing the GI system which refers to the segregation of the planned GI system into LaFU, and assessing such units for identification of strengths, potential, and threats within the functioning of the GI system.

The method proposed above is founded on the multifunctional and structural approach within GI planning. It intends to link the two vital facets of GI planning viz multifunctionality and connectivity.

### 1.6.1 Methodology Phases in LaFU

#### **Phase I: Planning the GI System**

**Phase Ia:** Identifying and analyzing semi-natural and natural types of land cover, its spatial connectivity and distribution. This would comprise of areas that encompass diverse types of nature protection, and areas that are unprotected, mainly areas that have greenery of possibly high significance for the GI system.

**Phase Ib:** Conducting the synthesis of the analysis of semi-natural and natural components and mapping the GI system on its basis.

**Phase Ic:** Deciding the foremost functions of individual components of the GI system, like regulations on climate, retention and conservation of water, while also ensuring appropriate development of the area in connection with the city and the provision of pertinent ecosystem related services. At the same time, the current and possible advantages of the planned GI system for local communities need to be indicated, which is significant to promote the citizens as well as authorities to initiate steps to safeguard, reinforce and develop the proposed GI system (Niedźwiecka-Filipiak et al., 2022).

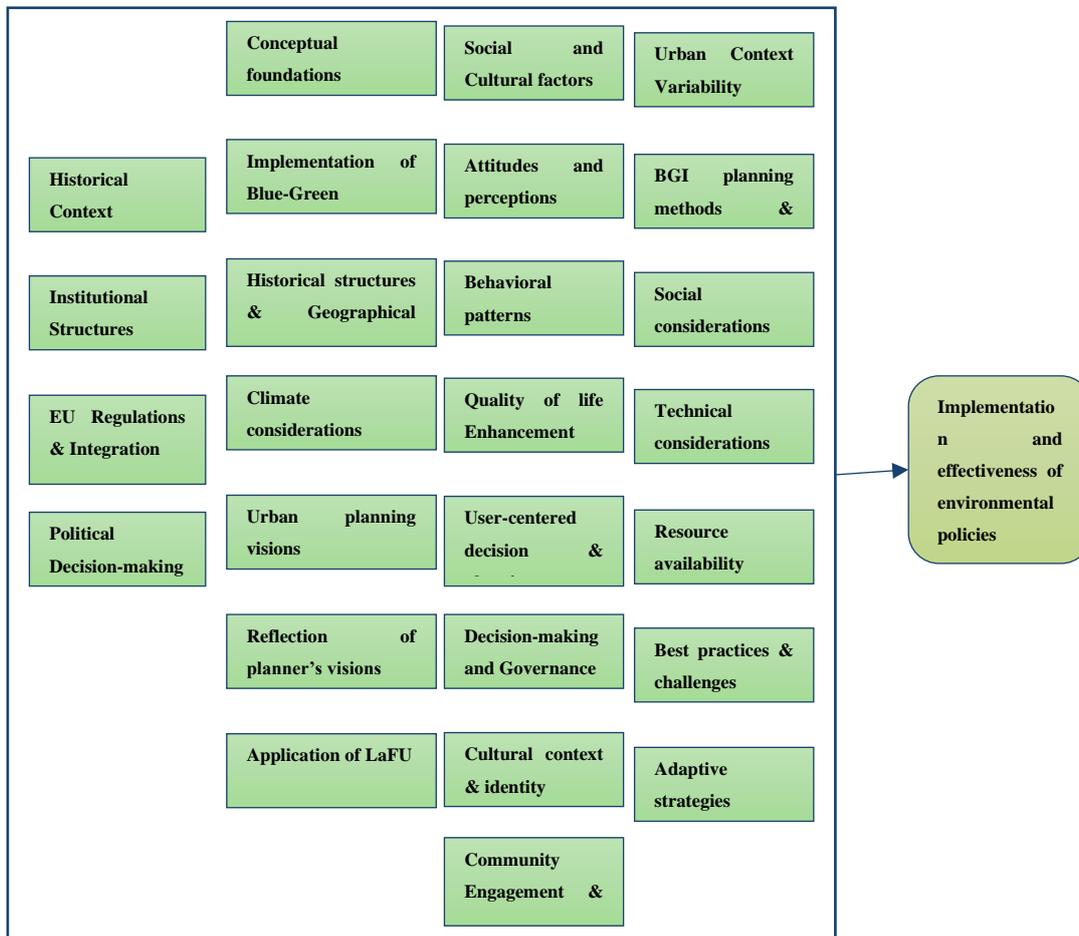
#### **Phase II: Assessing the GI System**

This phase would comprise of an analysis that will be executed in five steps wherein the first step would be to segregate the area into landscape functional units, the next would be its evaluation. The second and third steps would comprise of designing units that are significant for continuity and communication of GI. The fourth step would be to determine threats from the expansion of built-up areas, and the last step refers to defining the strengthening and protective measures for the GI system.

#### **CONCEPTUAL FRAMEWORK:**

The conceptual framework for this research thesis, wherein the framework essentially investigates the interaction between environment sustainability, urban development, and strategies for resilience. It comprises of understanding the diverse types of green infrastructure like parks, green roofs, and urban forest, and the multifaceted role it plays in improving the resilience of the city to environmental, social, and economic challenges. Through this research, the idea is to examine the mechanisms through which green infrastructure would contribute to urban resilience by circumventing the impact from climate change, lowering urban heat island effects, improving biodiversity, nurturing social cohesion, and encouraging sustainable urban development practices. In addition, it also involves analyzing the effectiveness of various policy interventions, planning strategies, and governance mechanisms in incorporating green infrastructure within urban landscapes to develop resilient cities that have the capability to adapt to challenges in the future.

Figure. Conceptual Framework (Author)



This frame work shows the main concepts we are going through , how it is connected, interacted and will be reflected in the final findings and conclusions for other others to be as lessons to be learned the field of Green Infrastructure application for city resilience.