

# RÄUMLICHE PLANUNG

## *SPATIAL PLANNING*

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### CONCEPTUALISING AND OPERATIONALISING GREEN INFRASTRUCTURE IN SPATIAL PLANNING: SELECTIVE EMBEDDING IN TRANSITIONAL GOVERNANCE CONTEXTS (STRUGA AND VEVCHANI, NORTH MACEDONIA)

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*Initial submission / erste Einreichung: 09/2025; revised submission / revidierte Fassung: 02/2026;  
final acceptance / endgültige Annahme: 03/2026*

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### *Summary*

*Over the past two decades, Green Infrastructure (GI) has gained prominence as a strategic spatial planning concept aimed at integrating ecological connectivity, ecosystem services, and socio-spatial objectives within coherent territorial frameworks. Yet empirical*

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evidence indicates that its operationalisation remains uneven, particularly in small municipalities and transitional governance contexts that are underrepresented in mainstream GI scholarship. This study examines how GI is conceptualised, operationalised, and implemented within the spatial planning system of North Macedonia, with a specific focus on the municipalities of Struga and Vevchani. Adopting a qualitative multiple-method design, the research combines Critical Discourse Analysis of national, regional, and municipal planning documents with a structured practitioner workshop aimed at examining institutional interpretations, implementation constraints, and cross-sectoral coordination dynamics. This triangulated approach enables a systematic assessment of how GI is framed, codified, and enacted in practice, while also capturing how practitioners negotiate its integration within existing regulatory mandates.

The findings reveal a persistent communicative-operative gap. Although Green Infrastructure (GI) is discursively endorsed and aligned with European environmental agendas, its operational embedding occurs primarily through pre-existing sectoral and land-use categories. Policy provisions remain predominantly aspirational, regulatory language is weak, cross-sectoral coordination limited, and monitoring mechanisms largely absent. GI is selectively embedded within protection-oriented domains, while multifunctionality, spatial connectivity, and equity dimensions are weakly codified in binding instruments. Rather than constituting an implementation failure, this configuration reflects a process of institutional adaptation, whereby GI stabilises in forms compatible with entrenched regulatory cultures and administrative mandates.

The study reconceptualises Green Infrastructure (GI) mainstreaming as a process of institutional translation rather than linear policy diffusion. It advances a configurational lens for analysing multifunctional infrastructure within hybrid governance regimes and demonstrates that conceptual adoption without regulatory specificity may produce discursive convergence while leaving spatial allocation logics structurally unchanged. These insights contribute to ongoing debates on GI governance, planning reform, and EU policy alignment in peripheral and institutionally fluid contexts.

*Keywords:* Green infrastructure, spatial planning, institutional translation, governance fragmentation, multifunctionality, transitional planning systems, North Macedonia

## Zusammenfassung

### KONZEPTUALISIERUNG UND OPERATIONALISIERUNG VON GRÜNER INFRASTRUKTUR IN DER RAUMPLANUNG: SELEKTIVE EINBETTUNG IN TRANSFORMATIVE GOVERNANCE-KONTEXTE AM BEISPIEL VON STRUGA UND VEVCHANI, NORDMAZEDONIEN

In den vergangenen zwei Jahrzehnten hat die Grüne Infrastruktur (GI) als strategisches Konzept der Raumplanung an Bedeutung gewonnen, das darauf abzielt, ökologische Konnektivität, Ökosystemdienstleistungen und sozialräumliche Zielsetzungen in kohärente territoriale Rahmenbedingungen zu integrieren. Empirische Befunde weisen jedoch da-

*rauf hin, dass ihre Operationalisierung weiterhin uneinheitlich bleibt, insbesondere in kleinen Gemeinden und in transitorischen Governance-Kontexten, die in der etablierten GI-Forschung unterrepräsentiert sind. In der vorliegenden Studie wird untersucht, wie GI im räumlichen Planungssystem Nordmazedoniens konzeptualisiert, operationalisiert und implementiert wird, mit besonderem Fokus auf die Gemeinden Struga und Vevchani. Auf der Grundlage eines qualitativen Multi-Methoden-Designs wird in der Untersuchung eine Kritische Diskursanalyse nationaler, regionaler und kommunaler Planungsdokumente mit einem strukturierten Praxis-Workshop kombiniert, der darauf abzielt, institutionelle Interpretationen, Umsetzungshemmnisse sowie Dynamiken sektorübergreifender Koordination zu untersuchen. Dieser triangulative Ansatz ermöglicht eine systematische Bewertung dessen, wie GI gerahmt, kodifiziert und in der Praxis umgesetzt wird, und erfasst zugleich, wie Planerinnen und Planer sowie lokale Amtsträgerinnen und Amtsträger ihre Integration innerhalb bestehender regulatorischer Vorgaben verhandeln.*

*Die Ergebnisse zeigen eine persistente kommunikativ-operative Lücke. Obwohl Grüne Infrastruktur (GI) diskursiv befürwortet und mit europäischen Umweltagenden in Einklang gebracht wird, erfolgt ihre operative Einbettung primär über bereits bestehende sektorale und flächennutzungsbezogene Kategorien. Politische Bestimmungen bleiben überwiegend aspirativ, die regulatorische Sprache ist schwach, die sektorübergreifende Koordination begrenzt, und Monitoringmechanismen sind weitgehend nicht vorhanden. GI wird selektiv in schutzorientierten Bereichen verankert, während Multifunktionalität, räumliche Konnektivität und Gerechtigkeitsdimensionen in verbindlichen Instrumenten nur schwach kodifiziert sind. Anstatt ein Umsetzungsversagen darzustellen, spiegelt diese Konfiguration einen Prozess institutioneller Anpassung wider, in dessen Rahmen sich GI in Formen stabilisiert, die mit verfestigten regulatorischen Kulturen und administrativen Zuständigkeiten kompatibel sind.*

*In der vorliegenden Studie wird das Mainstreaming von Grüner Infrastruktur (GI) neu als Prozess institutioneller Übersetzung statt als lineare Politikdiffusion konzeptualisiert. Sie entwickelt eine konfigurationale Perspektive zur Analyse multifunktionaler Infrastrukturen in hybriden Governance-Regimen und zeigt, dass eine konzeptionelle Übernahme ohne regulatorische Spezifizierung zu diskursiver Konvergenz führen kann, während die Logiken räumlicher Allokation strukturell unverändert bleiben. Diese Erkenntnisse tragen zu aktuellen Debatten über GI-Governance, Planungsreformen und die Angleichung an EU-Politiken in peripheren und institutionell fluiden Kontexten bei.*

*Schlagwörter: Grüne Infrastruktur, Raumplanung, institutionelle Übersetzung, Governance-Fragmentierung, Multifunktionalität, transitorische Planungssysteme, Nordmazedonien*

## **1 Introduction**

Over the past two decades, Green Infrastructure (GI) has emerged as a pivotal concept in spatial planning, environmental governance, and landscape management, reflecting a growing recognition of the imperative to integrate ecological, social, and economic

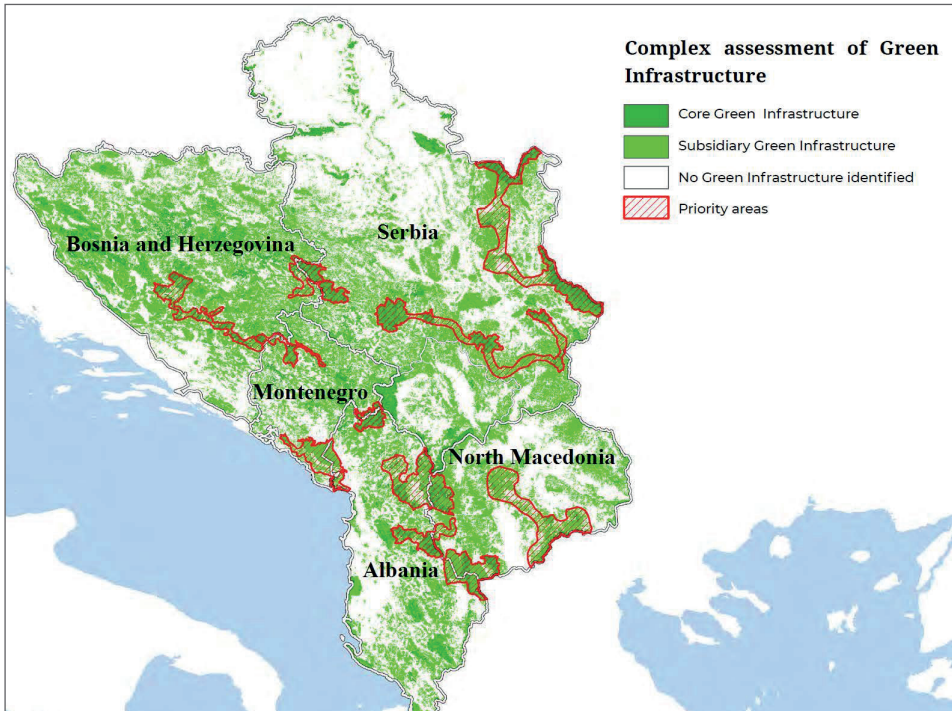
objectives within territorial planning. GI has been defined as “a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services. It incorporates green spaces (or blue if aquatic ecosystems are concerned) and other physical features in terrestrial (including coastal) and marine areas. On land, GI is present in rural and urban settings” (European Commission 2013, p. 3).

GI has been explored across a wide range of academic disciplines, including landscape architecture (e.g., PANAGOPOULOS 2019), landscape ecology (e.g., GRAFIUS et al. 2018; LOVELL and TAYLOR 2013), environmental sciences (e.g., MCFARLAND et al. 2019), geography (e.g., BENTON-SHORT et al. 2019), economics (e.g., JAFFE 2010), and urban and regional planning (e.g., BUSH et al. 2021; MELL 2020), among others. However, as MELL and SCOTT (2023) convincingly argue, the expansion of GI across disciplines has generated not conceptual coherence but rather a proliferation of fragmented and discipline-specific interpretations that shape how GI is defined, valued, and operationalised in practice. They suggest that GI functions less as a stable planning concept and more as a flexible umbrella term, strategically rearticulated to align with sectoral priorities, professional norms, and policy agendas.

While this interpretative openness has facilitated its rapid uptake, it has simultaneously attenuated GI’s integrative capacity within spatial planning, obscuring underlying trade-offs, power relations, and questions of scale, governance, and equity. Consequently, MELL and SCOTT (2023) emphasise the need to move beyond siloed and instrumental readings of GI and to reframe it as a contested, place-specific, and inherently political construct – one that requires reflexive, transdisciplinary engagement if it is to function as genuinely integrative infrastructure rather than a depoliticised planning label.

Over the last decade, there has been growing interest among academics, practitioners and policymakers in research on Green Infrastructure (GI) and its integration into national and regional planning systems, strategies and practices. Numerous international studies have examined the ways in which GI is incorporated into spatial and land-use planning (see, for example, DE MONTIS et al. 2022; DI MARINO et al. 2019; DI MARINO and LAPINTIE 2018; DUPRAS et al. 2015; GRÄDINARU and HERSPERGER 2019; LAFORTEZZA et al. 2013; REINWALD et al. 2024; RONCHI et al. 2020; SLÄTMO et al. 2019; SZULCZEWSKA et al. 2017). Nevertheless, significant challenges persist in both understanding and implementing GI within planning systems.

A limited appreciation of the potential benefits of GI represents one of the key factors contributing to under-investment, particularly in South-East Europe (ESTREGUIL et al. 2019), including North Macedonia. In the context of North Macedonia, GI remains underdeveloped as a formal planning concept, with limited incorporation into spatial plans and weak conceptual visibility among key stakeholders, including planners and policymakers. Although environmental professionals increasingly refer to GI, its broader recognition across the built environment sector remains nascent, thereby constraining its integration into regulatory frameworks and planning practice. This limited uptake is further compounded by the absence of a shared understanding of GI definitions and implementation approaches, which complicates its operationalisation within policy and planning instruments (BOGDANOVA AJCEVA 2022; ILIEV and GADJOVSKI 2024).



Source: Adapted from Figure 20, p. 61 in: European Commission (2022): Study on Green Infrastructure Deployment and Ecological Connectivity Status in Albania, Bosnia and Herzegovina, Montenegro, Serbia and North Macedonia. Luxembourg: Publications Office of the European Union. – <https://doi.org/10.2779/495605>.

Figure 1: Green Infrastructure (GI) in the Western Balkans region and proposed priority areas for conservation based on biodiversity value and ecosystem services importance

The Western Balkans (including North Macedonia) are regions of high biodiversity and endemism within Europe and are ecologically linked through the “Balkan Green Belt” (BGB) (Figure 1). The BGB represents the south-eastern segment of the European Green Belt, forming a transboundary ecological network along formerly restricted border areas shaped by the legacy of the Iron Curtain. Owing to decades of minimal human intervention, these border landscapes encompass river corridors, wetlands, and mountain ecosystems of exceptional conservation value. Conceptually, the BGB functions as a connected system of protected areas and surrounding landscapes, linking biodiversity conservation with transboundary cooperation and sustainable regional development in historically sensitive border regions (SCHNEIDER-JACOBY et al. 2006). While SCHNEIDER-JACOBY et al. (2006) provide a foundational overview of the BGB, more recent documents emphasise its ecological significance and the ongoing challenges posed by land-use pressures and cross-border governance (German Environment Agency [Umweltbundesamt] 2024).

The ecological integrity and connectivity of the BGB are increasingly undermined by land-use intensification and infrastructure expansion. Consequently, spatial planning is essential for safeguarding ecological connectivity and managing land-use pressures across these landscapes and regions. Spatial planning refers to the discipline and practice of organising land uses and built environments to achieve sustainable development objectives through statutory instruments, policy frameworks, and participatory processes. It is particularly critical for Green Infrastructure (GI), as it provides the governance and regulatory framework necessary for its implementation across multiple scales, from national to local levels (SLÄTMO et al. 2019). For the purposes of this study, this definition is applied as a conceptual framework to examine the operationalisation of GI at the municipal level, ensuring consistency between planning theory and practice. Terms such as land-use planning and statutory instruments are widely recognised in both European and global spatial planning literature (e.g., FALUDI 2010; HEALEY 2006).

The integration of GI into spatial planning requires both commitment and time, as well as a thorough understanding of how the concept can be incorporated into planning documents. Introducing the GI into planning is not straightforward, occurring within complex socio-political contexts where existing knowledge is constrained by the regulatory status quo and entrenched planning practices (LÄHDE and DI MARINO 2019).

Against this background, this study examines the conceptualisation and operationalisation of Green Infrastructure (GI) within local spatial planning in North Macedonia, focusing on the municipalities of Struga and Vevchani, which are situated within the “Balkan Green Belt”. The study adopts a qualitative research design that combines Critical Discourse Analysis (CDA) of spatial planning and management documents with an exploratory analysis of practitioners’ perspectives, obtained via a structured workshop. This dual approach enables an examination of how GI is framed in policy and practice, providing both empirical insights and practical implications.

This paper is structured as follows. Following the introduction, which situates the study within its broader theoretical and regional context and defines its research objectives, the relevant literature and conceptual framework are examined. The subsequent section outlines the case study context and methodological positioning, detailing the study area and research design. The results are then presented and discussed in light of their implications. The paper concludes by synthesising the principal findings, outlining planning-relevant recommendations, and delineating avenues for future research.

## 2 Literature Review

### 2.1 Conceptual Foundations and Definitional Plurality of Green Infrastructure

Since the early 2000s, the concept of Green Infrastructure (GI) has been the subject of sustained research and debate (BENEDICT and MCMAHON 2002, 2006). Although the concept has been increasingly examined in the literature (see, for example, ALLEN 2012; ROE and MELL 2013; ROUSE and BUNSTER-OSSA 2013), and interpreted in diverse ways (BURGESS

2015; MATTHEWS et al. 2015), most understandings converge around the frequently cited definition proposed by BENEDICT and MCMAHON (2002, p. 12), which conceptualises GI as “ [...] an interconnected network of green space that conserves natural ecosystem values and functions and provides associated benefits to human populations”. In this sense, GI provides a strategic framework to guide future growth and development while conserving land and natural resources (BENEDICT and MCMAHON 2006). However, reducing GI to a single, universally accepted definition remains challenging (SEIWERT and RÖSSLER 2020). Difficulties persist in defining and operationalising the term; as MATTHEWS et al. (2015, pp. 156–157) observe, “[...] the term has tended to be conflated with ‘green-space’ generally, weakening its conceptual strength”.

Numerous scholars, practitioners, and policymakers have sought to define GI. Across different planning traditions, GI is commonly framed as an approach that integrates biodiversity conservation, ecosystem services provision, climate adaptation, and human well-being within a single spatial logic (MATTHEWS et al. 2015; MELL and CLEMENT 2020; THOMAS and LITTLEWOOD 2010). While definitions of GI are numerous and varied (BENEDICT and MCMAHON 2006), there is no universally accepted definition among scholars, nor in European or North American policy frameworks (DI MARINO and LAPINTIE 2018). MELL and SCOTT (2023, p. 5) note that “[...] to date, there is no gold standard definition that is widely accepted or used consistently in research and practice [...] reflecting the disciplinary and geographical biases”.

Nevertheless, two definitions provide a useful entry point into discussions of Green Infrastructure (GI). BENEDICT and MCMAHON (2006, p. 1) conceptualise GI as “[...] an interconnected network of natural areas and other open spaces that conserves natural ecosystem values and functions, sustains clean air and water, and provides a wide array of benefits to people and wildlife”. The European Commission (2013, p. 3) defines GI as “a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services. It incorporates green spaces (or blue if aquatic ecosystems are concerned) and other physical features in terrestrial (including coastal) and marine areas. On land, GI is present in rural and urban settings”. MELL and SCOTT (2023) consider these definitions complementary, integrating socio-economic and ecological perspectives that facilitate GI adoption by stakeholders globally.

Despite these widely accepted definitions, considerable debate persists. Scholars caution against imposing a single, universal definition. WRIGHT (2011, p. 1004) argues that “[...] searching for a single fixed definition of ‘GI’ is problematic because the concept is evolving, divided and gravitating toward socio-economic centres”. Similarly, MELL and CLEMENT (2020) note that excessive standardisation may undermine GI’s responsiveness to local socio-spatial conditions. Consequently, there remains limited consensus regarding how GI should be defined and operationalised in research and practice. As WRIGHT (2011, p. 1003) states, “[...] a single precise meaning of ‘GI’ is problematic because the concept is evolving and divided between environmental theory and socio-economic policy”.

This divergence arises because Green Infrastructure (GI) has been adopted by multiple disciplines, resulting in variations in its conceptual meaning (MELL and SCOTT 2023). Some scholars also note growing confusion among planners and policymakers regarding what

constitutes GI (MATTHEWS et al. 2015). Understanding GI is inherently complex, reflecting a deeply intricate interaction of people, place, and politics, as well as the wide range of issues for which GI is applied (MATTHEWS et al. 2015; MELL 2017). In this context, WRIGHT (2011, p. 1004) argues that “GI is ambiguous and essentially ‘a contested concept’”.

This tension between harmonisation and contextualisation remains unresolved, representing one of the core conceptual challenges in contemporary GI research. To provide a clear analytical basis for this study, an operational understanding of GI is adopted, integrating ecological, social, and economic dimensions. For the purposes of this study, GI is operationalised as a multi-functional network of natural and semi-natural areas that supports biodiversity, ecosystem services, and human well-being. This working definition provides a framework for analysis and interpretation throughout the manuscript, while acknowledging the ongoing conceptual plurality in the literature.

Despite the absence of a universally agreed definition, the GI approach consistently converges around a shared set of planning principles. Across the literature, GI is conceptualised in terms of key principles, with GI assets emphasised as fundamental infrastructure, alongside principles such as spatial connectivity, multifunctionality, and interdisciplinary collaboration, which together operate across multiple scales and necessitate integrated and cross-disciplinary modes of planning. These recurring principles – connectivity, multifunctionality, multiscale, integration and governance – constitute the common ground that enables GI to be flexibly applied across diverse planning contexts, despite conceptual and disciplinary differences (LENNON et al. 2016; MONTEIRO et al. 2020; SEIWERT and RÖSSLER 2020).

## **2.2 Integrating Green Infrastructure into Spatial Planning: Concepts, Governance and Persistent Gaps**

Green Infrastructure (GI) is widely framed as a strategic spatial planning instrument that integrates ecological processes, ecosystem services and socio-spatial objectives into coherent planning frameworks. Most studies concur that GI’s defining contribution lies in its capacity to function as a multiscale and multifunctional spatial network that mediates between environmental protection and development pressures, rather than as a residual category of green space (DI MARINO and LAPINTIE 2018; LAFORTEZZA et al. 2013; LENNON and SCOTT 2014; POZOUKIDOU 2020). There is broad agreement that GI can support the operationalisation of ecosystem services within spatial planning by translating ecological functions into spatial structures that influence land-use organisation and development trajectories (LAFORTEZZA et al. 2013; LENNON and SCOTT 2014; MONTEIRO et al. 2020).

This conceptualisation is reinforced by international planning frameworks, most notably the European Union’s Green Infrastructure Strategy and associated guidance documents, which explicitly promote the integration of GI into land-use planning, urban design, ecosystem restoration and climate adaptation policies, thereby framing GI as a cross-sectoral spatial planning principle rather than a standalone environmental measure (European Commission n.d.). Complementary project-based guidance, such as Interreg handbooks and manuals, further provides practical tools for linking GI networks with spatial development strategies and planning processes across diverse European contexts

(JOHN et al. 2019). Nevertheless, debate persists regarding the extent to which these normative and practice-oriented frameworks are translated into binding statutory planning instruments, as their implementation remains uneven and highly context-dependent, particularly outside metropolitan and well-resourced planning systems (DI MARINO and LAPINTIE 2018; MONTEIRO et al. 2020; POZOUKIDOU 2020).

Governance is consistently identified as a central determinant of whether Green Infrastructure (GI) can be meaningfully integrated into spatial planning practice. There is broad agreement that GI outcomes depend less on the rhetorical inclusion of GI in planning documents and more on the capacity of governance systems to coordinate actors, sectors, and policy levels (DUPRAS et al. 2015; REINWALD et al. 2024; SLÄTMO et al. 2019; SZULCZEWSKA et al. 2017). Policy integration deficits are widely recognised as a major barrier, as GI-related objectives are frequently distributed across sectoral policies without effective mechanisms to ensure coherence and alignment (DUPRAS et al. 2015; REINWALD et al. 2024; SZULCZEWSKA et al. 2017). Institutional fragmentation, overlapping mandates, and unclear responsibilities further undermine implementation, reinforcing the gap between strategic intent and on-the-ground delivery (REINWALD et al. 2024; SLÄTMO et al. 2019; ZABEL and HÄUSLER 2024). However, there is debate regarding whether governance barriers are primarily structural or procedural, with some authors emphasising rigid institutional arrangements and path dependencies (SZULCZEWSKA et al. 2017) and others highlighting procedural shortcomings such as weak inter-departmental coordination and limited shared evaluation frameworks (DUPRAS et al. 2015; ZABEL and HÄUSLER 2024).

GI performance is increasingly conceptualised in terms of its capacity to deliver multiple ecosystem services and to manage synergies and trade-offs across spatial contexts. There is broad agreement that single-function indicators are inadequate for assessing GI performance, necessitating integrated, multi-criteria, and spatially explicit evaluation approaches (GARCÍA et al. 2020; MEEROW and NEWELL 2017; VALLECILLO et al. 2018). High-performing GI systems are widely recognised as being characterised by the provision of ecosystem service bundles rather than the optimisation of isolated functions (GARCÍA et al. 2020; MEEROW and NEWELL 2017; VALLECILLO et al. 2018). However, debate persists regarding how multifunctionality should be operationalised in practice, as optimisation-based approaches may prioritise aggregate performance (GARCÍA et al. 2020; RONCHI et al. 2020), while obscuring spatial inequalities and normative assumptions embedded in weighting schemes (MEEROW and NEWELL 2017; VALLECILLO et al. 2018). This tension reflects a broader challenge in aligning technically robust evaluation methods with context-sensitive and socially responsive planning objectives (HOOVER et al. 2023; VALLECILLO et al. 2018).

GI is consistently framed as a strategic planning concept whose effectiveness derives from its ability to operate across multiple spatial scales and to align policies horizontally and vertically. There is broad agreement that strategic planning instruments provide the primary arena for embedding GI principles such as connectivity, multifunctionality, and spatial coherence over the long term (DAVIES and LAFORTEZZA 2017; DE MONTIS et al. 2022; GRĂDINARU and HERSPERGER 2019). GI is expected to function simultaneously at site, municipal, regional and landscape scales, enabling ecological flows beyond administrative boundaries (DAVIES and LAFORTEZZA 2017; GRĂDINARU and HERSPERGER 2019).

However, there is debate regarding how effectively this multi-scale logic is operationalised within existing planning systems. Empirical evidence suggests that while GI is frequently addressed at the municipal level, vertical integration across planning tiers remains weak, resulting in fragmented and discontinuous GI networks (DAVIES and LAFORTEZZA 2017; DE MONTIS et al. 2022; SLAVE et al. 2025). Some authors interpret these limitations as evidence of institutional inertia and sectoral silos constraining cross-scale coordination (GRÄDINARU and HERSPERGER 2019; SLAVE et al. 2025), while others argue that GI itself remains insufficiently embedded as a spatial structure within statutory planning instruments (DAVIES and LAFORTEZZA 2017; DE MONTIS et al. 2022).

Despite its growing prominence, Green Infrastructure (GI) research remains uneven with respect to geographical coverage, governance capacity and social outcomes. Much of the literature focuses on large metropolitan areas and well-resourced planning systems (e.g., BENTON-SHORT et al. 2019; BUSH et al. 2021; DUPRAS et al. 2015; GRABOWSKI et al. 2023; MEEROW and NEWELL 2017), leaving smaller municipalities, peripheral regions and transitional governance contexts under-represented. This spatial and institutional concentration also intersects with a broader concern regarding the limited integration of social equity within mainstream GI planning. Equity considerations are often described as weakly integrated into mainstream GI planning, as GI is frequently framed as a technical or ecological solution rather than a socially distributive planning instrument (DI MARINO et al. 2019; GRABOWSKI et al. 2023).

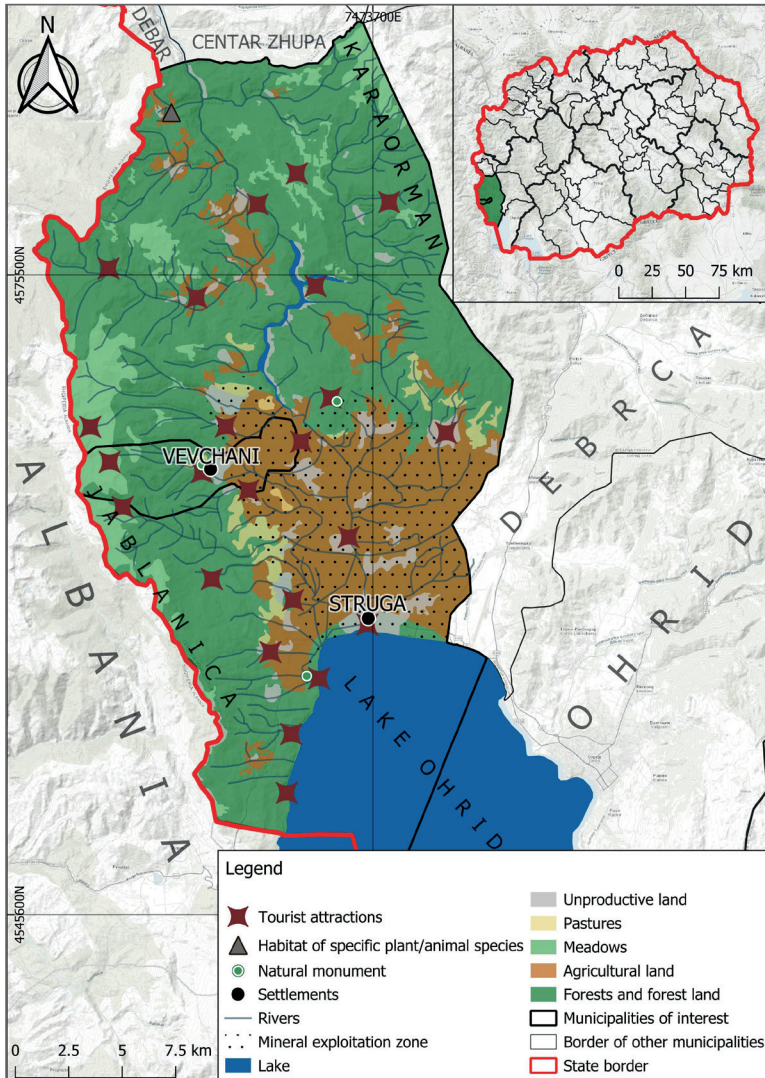
The literature identifies challenges regarding whether equity deficits arise from conceptual limitations of the GI framework or from governance and implementation failures. While some authors emphasise the technocratic framing of GI as a constraint on addressing social justice concerns (DI MARINO et al. 2019), others argue that inequities primarily emerge during implementation due to fragmented governance and limited monitoring of social outcomes (GRABOWSKI et al. 2023). Overall, the evidence suggests that without explicit attention to context, equity, and governance capacity, GI risks remaining a normative and unevenly operationalised concept rather than a fully embedded spatial planning instrument (DI MARINO et al. 2019; GRABOWSKI et al. 2023).

In this context, the municipalities of Struga and Vevchani provide a critical empirical setting to investigate the translation of GI from strategic planning discourse into local statutory practice within a small-scale and under-researched governance environment, thereby responding to identified tensions between conceptual ambition, institutional capacity, and spatial implementation.

### **3 Case Study Context and Methodological Positioning**

#### **3.1 Study Area and Spatial-Environmental Context**

The municipality of Struga, with an area of 483 km<sup>2</sup>, has a population of 50,980 inhabitants (State Statistical Office 2022) and is located in the southwestern part of North Macedonia (Figure 2). The administrative centre of the municipality is the city of Struga. In addition to the city of Struga, there are 50 rural settlements within the municipality.



Source: Author’s own compilation.

Figure 2: The municipalities of Struga and Vevçani: geographical location, administrative boundaries and land use

The territory of the municipality includes both valley and mountain areas. Forests, rivers, coastlines, and lakes dominate the landscape. Agricultural and arable land accounts for 16.74 percent of the Ohrid-Prespa region (Spatial Planning Agency 2010). Within the Struga municipality, forests cover relatively large areas. Of the total wood/forest mass in the Ohrid-Prespa region (9,762,005 m<sup>3</sup>), the municipality of Struga owns 3,193,571 m<sup>3</sup>,

or 32.35 percent (Spatial Planning Agency 2010). Forests are dominant on the Jablanica Mountain. From 600 to 1,300 metres above sea level, oak forests occur, while between 1,300 and 1,800 metres, beech forests prevail. Above them, subalpine and alpine grasslands stretch across the landscape, mainly used as high-mountain pastures.

Historically, the forest ecosystems of Jablanica have persisted despite human influence, resulting in the preservation of some of the largest populations of large mammals in Europe, including bear, wolf, and lynx. The presence of the Balkan lynx (*Lynx lynx martinoi*), a subspecies of the Eurasian lynx (*Lynx lynx*), adds significant ecological value to Jablanica. The Balkan lynx is considered the most endangered native lynx population in Europe. Due to these characteristics, Jablanica, along with the mountainous border area between Albania, Kosovo, and North Macedonia, forms part of the European Green Belt (VASILJEVIĆ and PEZOLD 2011). Jablanica remains largely unprotected. To date, the following sites within the Struga municipality have legal protection: Drenachka River (notable plant and animal species), Ohrid Lake (natural monument), Platanus – v. Kalishta (natural monument), and Mlechnik Cave (natural monument) (Spatial Planning Agency 2010).

The municipality of Vevchani was established in 1996, following its separation from the municipality of Struga. It is located in the southwestern part of North Macedonia, 14 km northwest of the city of Struga and Lake Ohrid (Figure 2). The municipality extends from 700 to 2,200 metres above sea level. To the west, it borders the Jablanica Mountain and the Republic of Albania, while to the east it descends towards the valley of the Crn Drim River. The municipality includes both lowland and hilly-mountainous areas. Covering an area of 35.68 km<sup>2</sup> (A.D. Urbanism and Architecture ‘Plan’ Ohrid 1999), it has a population of 2,359 inhabitants (State Statistical Office 2022). The municipality comprises a single settlement – the village of Vevchani, where the municipal administration is located. The village is situated at the foot of the Jablanica Mountain, at an altitude of 840–980 metres (A.D. Urbanism and Architecture ‘Plan’ Ohrid 1999).

Agricultural and arable land occupies only small areas in the municipality, accounting for 1.5 percent of the total arable land in the region (Spatial Planning Agency 2010). Forests and wildlife of Jablanica represent a significant natural treasure, with heterogeneous and exceptional landscapes. Jablanica is known for its variety of glacial and periglacial relief forms, natural amphitheatres, and glacial lakes. Karst features form a significant part of the mountain’s composition, resulting in numerous springs, the most notable being the Vevchanski Izvori (VASILJEVIĆ and PEZOLD 2011). Vevchanski Izvori is a protected area – a natural monument – located on the slopes of the Jablanica Mountain, at an altitude of 940 metres and covering an area of 1,370 ha. The site was designated as a protected area for the conservation of hydrological, hydrogeological, ecological, biological, and other scientific values (MITEV et al. 2019).

### 3.2 Research Design and Methodological Approach

This study adopts a qualitative multiple-method research design, combining a Critical Discourse Analysis (CDA) of planning documents with an exploratory workshop involving planning practitioners. This approach enables a systematic examination of how Green Infra-

structure (GI) is conceptualised, operationalised and implemented within the spatial planning system of North Macedonia, as reflected in selected municipal case studies, while also capturing practitioners' perspectives on policy effectiveness and implementation challenges.

The municipalities of Struga and Vevchani were selected as case studies based on three analytical criteria. First, both municipalities are located within the "Balkan Green Belt" (BGB, see Figure 1) representing a spatial context in which biodiversity conservation objectives intersect with development pressures. Second, they are embedded within an evolving policy environment characterised by increasing engagement among non-governmental organisations (VASILJEVIĆ and PEZOLD 2011), as well as academic actors and public authorities in promoting GI integration. Third, these cases offer analytically relevant instances of institutional experimentation, including recent initiatives aimed at incorporating GI principles into national spatial planning legislation. The selection of these cases thus prioritises analytical relevance over representativeness, enabling an in-depth exploration of policy discourses and practices within a transitional planning context.

The policy analysis focuses on a purposive sample of planning documents operating at national, regional, and local scales, selected for their role in articulating long-term development visions, spatial strategies, and regulatory frameworks that directly shape spatial-use decision-making. The analysed corpus comprises the Spatial Plan of the Republic of Macedonia, the Spatial Plan of the Ohrid-Prespa Region, and local-level plans for Struga and Vevchani, including the General Urban Plans of Struga and Vevchani, the Integral Plan for Local Development of Vevchani Municipality, and the Management Plan for the Nature Monument Vevchanski Izvori (Table 1). This selection reflects the planning reality of small municipalities, where cross-sectoral policy goals, such as local economic development, tourism, public health, recreation, and quality of life, are frequently embedded within existing spatial and environmental planning instruments rather than articulated through separate, stand-alone sectoral strategies. Furthermore, incorporating documents from various time periods allows the analysis to capture shifts and continuities in policy discourse, facilitating institutional learning in relation to the integration of green spaces and associated GI concepts (as demonstrated in comparative studies, SLAVE et al. 2025).

A qualitative Critical Discourse Analysis (CDA) was conducted following VAN DIJK (2011) to examine how Green Infrastructure (GI) and related proxy concepts are framed, prioritised, and translated into planning policy. The analysis was problem-oriented, proceeding in three stages. First, terminology related to GI, including associated concepts, was systematically identified across the documents. Second, thematic coding was applied to policy objectives, planning instruments, and implementation mechanisms. Third, policies were evaluated using a qualitative policy assessment framework adapted from GI policy literature (HISLOP et al. 2019; SCOTT and HISLOP 2019) and conceptually informed by broader studies on multifunctional GI planning, cross-sectoral integration, and cross-scale implementation (e.g., RONCHI et al. 2020; VALLECILLO et al. 2018).

The framework assessed: (i) the explicitness of GI objectives; (ii) cross-sectoral integration with economic development, environmental protection, and health and wellbeing policies; (iii) the strength of policy wording (e.g., mandatory versus aspirational formulations); and (iv) provisions for implementation, coordination, and monitoring (Table 2).

Planning document	Document purpose	Adopting institution	Planning horizon	Implementing institution	Implementation monitoring
<i>Spatial Plan of the Republic of Macedonia</i>	Integral planning of the space of the whole country, which provides guidelines for the usage and organisation of the entire space of the country	The Assembly of the Republic of North Macedonia	2004–2020	Ministry of Environment and Physical Planning and Spatial Planning Agency	Ministry of Environment and Physical Planning and Spatial Planning Agency
<i>Spatial Plan of the Ohrid-Prespa Region</i>	Work-out of the Spatial Plan of the country, which refers to the spatial planning of the region	The Assembly of the Republic of North Macedonia	2005–2020	Ministry of Environment and Physical Planning and Spatial Planning Agency	Ministry of Environment and Physical Planning and Spatial Planning Agency
<i>General Urban Plan of the City of Struga</i>	Plan for arranging the space within the boundaries of the city of Struga (Zoning of the types of buildings and the basis for the development of detailed urban plans)	Council of Struga Municipality	2006–2016	Struga Municipality	Struga Municipality
<i>General Urban Plan – Vevchani</i>	Plan for arranging the space within the boundaries of the village of Vevchani (Zoning of types of buildings and basis for detailed planning of the blocks)	Council of Vevchani Municipality	1997–2007	Vevchani Municipality	Vevchani Municipality
<i>Integral Plan for Local Development of Vevchani Municipality</i>	Gives directions for the economic development of the Municipality and for improving the quality of life of its inhabitants	Council of Vevchani Municipality	2019–2022	Vevchani Municipality	Vevchani Municipality
<i>Management Plan for the Nature Monument Vevchanski Izvori</i>	To provide protection and conservation of the natural heritage, through proper management of natural values, respecting the established regime of protection (zoning) of the protected area	Council of Vevchani Municipality	2019–2029	Vevchani Municipality	Vevchani Municipality and Environmental Administration – the constituent body of the Ministry of Environment and Spatial Planning

Source: Author's own compilation

Table 1: Planning and management documents relevant to spatial governance in Struga and Vevchani

This criterion-based approach moves beyond descriptive analysis, enabling an assessment of the relative effectiveness and transferability of GI-related planning policies.

To complement the policy analysis and explore practitioner perspectives, an exploratory workshop was organised in the municipality of Vevchani on 7 June 2023. The workshop lasted approximately five hours and involved eight participants representing diverse professional backgrounds, including environmental protection (N=2), nature conservation (N=2), forestry (N=1), ecology (N=1), architecture (N=1), and local economic development (N=1). Participants were invited by municipal authorities to ensure institutional relevance. The diversity of professional profiles facilitated interdisciplinary exchange. The workshop was structured around moderated thematic sessions focusing on participants' understanding of the GI concept, experiences with GI integration in spatial planning, and perceived barriers and opportunities for implementation. The workshop therefore served as both a data collection tool and an informal learning environment (LENNON et al. 2016).

The workshop was audio-recorded with participants' consent and transcribed verbatim. All data collection was conducted in accordance with institutional ethical guidelines: participation was voluntary, informed consent was obtained, and anonymity and confidentiality were ensured during transcription, analysis, and reporting. Audio recordings and transcripts were securely stored and used exclusively for research purposes. As this study involved minimal risk and complied fully with institutional guidelines, a formal ethics approval number was not required. The resulting transcripts were analysed using qualitative thematic content analysis. Manual inductive coding was applied to identify recurring themes and sectoral problem areas emerging from the discussions.

Qualitative triangulation is employed as a strategic analytical approach to strengthen interpretive depth when examining GI in spatial planning. Through joint analysis of planning documents and practitioner perspectives, the study captures the interaction between formal policy framings and their interpretation in professional practice. This triangulated approach allows policy framings to be interrogated through experiential knowledge, while practitioner accounts are situated within the institutional and regulatory contexts that shape them. Rather than merely seeking corroboration, triangulation is used to reveal interpretive gaps, tensions, and complementary insights between plans and practice, thereby providing a robust methodological foundation for the results that follow.

## 4 Results

### 4.1 Critical Discourse Analysis of Planning Documents

This section presents the results of the qualitative critical discourse and policy analysis of six strategic, urban, and sectoral planning documents. The findings are structured thematically, reflecting the methodological stages and criteria, and provide a comparative assessment of how Green Infrastructure (GI) is conceptualised, embedded, and operationalised across different planning levels and policy domains.

### *Framing and Conceptualisation of Green Infrastructure*

Across the analysed documents, Green Infrastructure (GI) is characterised by a high degree of conceptual inconsistency and terminological fragmentation. Explicit references to GI are largely absent from the older spatial and urban plans, where environmentally related objectives are framed using proxy concepts such as green systems, protected natural areas, ecological corridors, and landscape values (IN-PUMA – Institute of Urban Planning, Transport and Environment 2007; Public Enterprise for Spatial and Urban Planning 2004).

At the national and regional levels, environmental considerations are primarily articulated through a sectoral protection discourse, emphasising biodiversity conservation, water protection and landscape preservation rather than the development of multifunctional GI networks (Public Enterprise for Spatial and Urban Planning 2004; Spatial Planning Agency 2010). These documents do not employ GI as an integrated planning concept; instead, green and natural areas are treated as static spatial categories.

At the local level, particularly in the General Urban Plans of Struga and Vevchani, green spaces are predominantly framed as urban amenities or land-use categories, such as parks, recreational areas and buffer zones, with limited reference to ecological connectivity or the provision of ecosystem services (A.D. Urbanism and Architecture ‘Plan’ Ohrid 1999; IN-PUMA – Institute of Urban Planning, Transport and Environment 2007).

More recent sectoral and implementation-oriented documents indicate a partial conceptual shift, with indirect references to ecosystem services, sustainable tourism and nature-based assets, particularly in relation to protected areas (KUKOSKA et al. 2019; MITEV et al. 2019). However, even in these cases, GI is not articulated as a coherent spatial network spanning administrative and sectoral boundaries.

### *Policy Objectives and Cross-Sectoral Integration*

The analysis reveals limited cross-sectoral integration of GI-related objectives across the planning documents. Environmental goals are typically articulated in isolation from economic development, public health and social wellbeing policies.

At the national and regional levels, GI-related objectives are embedded within environmental protection chapters, with weak horizontal linkages to spatial development, infrastructure provision or economic strategies (Public Enterprise for Spatial and Urban Planning 2004; Spatial Planning Agency 2010). Environmental assets are positioned primarily as constraints on development rather than as enabling forms of infrastructure.

In the General Urban Plans, green areas are acknowledged as contributing to urban quality of life; however, explicit links to health outcomes, climate adaptation or local economic development are largely absent (A.D. Urbanism and Architecture ‘Plan’ Ohrid 1999; IN-PUMA – Institute of Urban Planning, Transport and Environment 2007). This reflects a predominantly land-use-oriented planning logic in which GI functions remain implicit rather than being strategically articulated.

Stronger, albeit still partial, cross-sectoral integration is evident in the sectoral plans. The Management Plan for the Nature Monument Vevchanski Izvori explicitly links environmental protection with sustainable tourism and local economic development,

positioning natural assets as a foundation for place-based development (MITEV et al. 2019). Similarly, the Integral Plan for Local Development recognises green and natural assets as contributing to municipal development priorities; however, these linkages remain largely programmatic rather than spatially operationalised (KUKOSKA et al. 2019).

### ***Strength of Policy Wording and Regulatory Intent***

A criteria-based assessment of policy wording reveals that GI-related provisions are predominantly aspirational, exhibiting limited regulatory force across all analysed documents. Binding formulations ('shall', 'must') are rare, whereas objectives are typically expressed through non-mandatory terms such as 'encourage', 'promote' or 'support'.

At the strategic planning level, environmental and green-space objectives are framed as long-term aspirations, lacking clearly defined implementation obligations (Public Enterprise for Spatial and Urban Planning 2004). Similarly, the regional spatial plan employs broad strategic language, emphasising protection and sustainable use without specifying enforceable mechanisms (Spatial Planning Agency 2010).

Urban plans contain zoning provisions for green areas; however, these are predominantly descriptive and do not specify requirements regarding ecological connectivity, multifunctionality, or maintenance standards (A.D. Urbanism and Architecture 'Plan' Ohrid 1999; IN-PUMA – Institute of Urban Planning, Transport and Environment 2007).

In contrast, sectoral plans exhibit comparatively stronger policy wording (Table 2). The Management Plan for Vevchanski Izvori includes more explicit prescriptions

<b>Planning document</b>	<b>Explicit GI objectives</b>	<b>Cross-sectoral integration</b>	<b>Strength of wording</b>	<b>Implementation provisions</b>
<i>Spatial Plan of the Republic of Macedonia</i>	Low	Low	Aspirational	Weak
<i>Spatial Plan of the Ohrid-Prespa Region</i>	Low	Low – Medium	Aspirational	Weak
<i>General Urban Plan of the City of Struga</i>	Low	Low	Descriptive	Weak
<i>General Urban Plan – Vevchani</i>	Low	Low	Descriptive	Weak
<i>Integral Plan for Local Development of Vevchani Municipality</i>	Medium (implicit)	Medium	Programmatic	Medium
<i>Management Plan for the Nature Monument Vevchanski Izvori</i>	Medium	Medium	Semi-binding	Medium

Source: Author's own compilation

Table 2: Qualitative assessment of Green Infrastructure (GI) policy strength

regarding protection regimes, permitted activities, and management responsibilities, reflecting its statutory basis within nature conservation legislation (MITEV et al. 2019). Nevertheless, even here, monitoring indicators and enforcement mechanisms remain underdeveloped.

### *Implementation Instruments, Coordination and Monitoring*

Implementation mechanisms related to Green Infrastructure are unevenly developed and weakly institutionalised across the planning system. Strategic and urban plans largely defer implementation to lower-level instruments without specifying concrete tools, responsible actors, or timelines (IN-PUMA – Institute of Urban Planning, Transport and Environment 2007; Public Enterprise for Spatial and Urban Planning 2004).

Coordination mechanisms between sectors and administrative levels are rarely articulated. Where institutional responsibilities are mentioned, they are typically fragmented across multiple authorities, with limited guidance on inter-institutional cooperation (Spatial Planning Agency 2010).

Monitoring provisions are notably absent from most documents. None of the spatial or urban plans include measurable indicators related to green space performance, ecological connectivity or ecosystem services. More advanced monitoring considerations are found only in the Management Plan for Vevchanski Izvori, which outlines basic reporting and supervision arrangements, although without a comprehensive indicator framework (MITEV et al. 2019).

### *Areas of Convergence and Divergence across Documents*

Despite differences in scale and scope, several areas of convergence can be identified (Table 3). All documents acknowledge the importance of protecting natural and green areas, and all incorporate some form of spatial designation for green or protected spaces.

Aspect	Convergence	Divergence
Recognition of green areas	Universally acknowledged	Varying functional interpretations
Policy framing	Environmental protection focus	Limited multifunctional GI logic
Policy strength	Generally weak	Stronger in sectoral plans
Implementation	Broad intentions	Fragmented instruments
Monitoring	Largely absent	Partial only in the management plan

Source: Author's own compilation

Table 3: Convergence and divergence in GI-related policies

However, significant divergences are evident in how these spaces are conceptualised and operationalised. Strategic and urban plans prioritise spatial allocation and protection, while sectoral documents emphasise management and use. The absence of a shared GI framework results in limited vertical and horizontal policy coherence, constraining the transferability and cumulative effectiveness of GI-related measures.

## 4.2 Planning Practice and Perceptions of Green Infrastructure: Evidence from a Participatory Workshop

This section presents an analytical synthesis of practitioner perspectives emerging from the participatory workshop conducted in Vevchani. The analysis examines how Green Infrastructure (GI) is conceptualised, selectively operationalised, and unevenly embedded within local planning practice. The findings highlight two cross-cutting patterns: a persistent gap between policy intentions and planning practice, and the absence of equity-oriented considerations in how GI is framed and mobilised by practitioners.

### *Conceptual Understanding of Green Infrastructure: Operational Ambiguity and the Absence of Equity Framing*

Practitioner understandings of Green Infrastructure (GI) were characterised by conceptual plurality; however, this plurality did not translate into operational clarity. GI was predominantly framed through existing planning categories rather than as an integrative spatial instrument capable of guiding land-use decisions. Several participants implicitly equated GI with conventional green areas, reflecting the continued dominance of static land-use classifications in statutory planning. As one participant noted, “*We may not call it the GI concept, but in the planning documents there are terms such as green areas, green spaces*” [Ecologist]. A similar understanding was expressed by a local development actor, who associated GI primarily with green spaces around buildings [Local economic development advisor].

While participants also referred to GI as a connected system, this understanding remained largely abstract and weakly spatialised. GI was discussed as a network of existing elements rather than as a spatial structure capable of reshaping planning priorities. “*GI includes the green areas and green networks that we already have in the settlements*” [Local economic development advisor]. Even when connectivity was extended beyond green spaces – “*GI can also be networked with traffic infrastructure*” [Environmental Protection Engineer (Participant 1)] – such interpretations were not accompanied by references to binding planning instruments or regulatory mechanisms.

Multifunctionality was widely acknowledged, yet selectively articulated. Ecological protection and recreation dominated practitioner narratives, while social dimensions were notably absent. Statements emphasising the protection of forests and waterways – “*I would definitely protect the forests*” [Nature Conservation Expert (Participant 1)]; “*In addition to forests, I would also protect waterways*” [Nature Conservation Expert (Participant 2)] – illustrate a protection-oriented framing. Notably, considerations related

to social equity, accessibility, or the uneven distribution of GI benefits across different social groups were absent from practitioners' conceptualisations. This suggests that GI is primarily framed as an environmental and spatial concern, rather than as a social planning instrument, thereby prefiguring its limited role in addressing distributive or justice-related planning objectives.

### ***Institutional Fragmentation and the Selective Embedding of Green Infrastructure in Planning Practice***

Institutional fragmentation emerged as a structural condition shaping how Green Infrastructure (GI) is positioned within local planning systems. Rather than being anchored within a single institutional mandate, GI-related elements are addressed through parallel sectoral frameworks, resulting in fragmented and uneven spatial outcomes. Participants implicitly acknowledged that responsibility for GI is dispersed across forestry, environmental protection, and urban planning, without an integrative governance arrangement. As one practitioner stated, "*Green areas at the local level are regulated by the Law on Urban Greenery, but that law applies exclusively to urban areas*" [Architect].

This institutional configuration produces a selective embedding of GI, whereby certain elements are regulated within specific territorial or sectoral boundaries, while others remain outside formal planning control. "*In this way, we cannot obtain a comprehensive picture of GI outside the urban area*" [Forestry engineer], highlighting how GI's landscape-scale logic is constrained by institutional demarcations. Fragmentation thus does not merely hinder coordination; it actively shapes which GI elements are considered planning-relevant and which remain peripheral.

Rather than generating conflict, fragmentation appears normalised within everyday planning practice. GI is accommodated insofar as it aligns with existing sectoral competencies, but rarely challenges institutional boundaries. This selective positioning limits GI's potential to function as a coordinating spatial framework and reinforces its treatment as an auxiliary rather than structuring planning concept.

### ***Limited Cross-Sectoral Coordination: Green Infrastructure as a Communicative rather than Operative Framework***

Although practitioners consistently emphasised the importance of coordination, Green Infrastructure (GI) appeared to function primarily as a communicative concept rather than as an operative planning framework. Calls for integrative approaches reflected an awareness of systemic limitations, rather than evidence of established coordination mechanisms. One participant argued that "*a different methodological matrix is needed for more flexible planning and implementation*" [Architect], thereby implicitly acknowledging that existing planning routines do not accommodate cross-sectoral GI integration.

Environmental and ecological practitioners articulated GI as a multiscale network requiring alignment across sectors and planning levels. "*Connectivity needs to be considered at all spatial scales, as GI is essentially a connected multiscale network of assets*" [Environmental Protection Engineer (Participant 1)]. However, such perspectives

remained weakly institutionalised, with no corresponding mechanisms in place to translate cross-sectoral recognition into coordinated planning action.

As a result, GI tends to facilitate dialogue across professional domains, yet it rarely restructures decision-making processes. Cross-sectoral coordination appears to emerge primarily within informal or project-based contexts, thereby reinforcing a policy-practice implementation gap, whereby GI supports shared narratives without acquiring substantive regulatory or procedural force.

### ***Ambiguities in Policy Interpretation and Discretionary Implementation***

Policy ambiguity emerged as a central factor enabling the discretionary application of Green Infrastructure (GI) within planning practice. Practitioners repeatedly referred to GI-related provisions as non-mandatory, allowing them to be invoked selectively depending on institutional priorities and resource availability. This was particularly evident in discussions of ecological connectivity, where proposed measures lacked binding status. *“Biocorridors may be proposed in the study, but they are not mandatory”* [Environmental Protection Engineer (Participant 2)].

Such ambiguity enables flexibility, yet it simultaneously weakens GI’s operational relevance. When GI-related measures entail additional financial or administrative obligations, their implementation becomes negotiable rather than obligatory. This discretionary logic sustains a persistent policy-practice gap, whereby GI is embedded in strategic visions and planning narratives but remains weakly translated into enforceable land-use regulations.

Rather than representing an unintended shortcoming, ambiguity appears to function as a systemic feature, enabling GI to coexist with established planning practices without fundamentally challenging prevailing regulatory arrangements.

### ***Spatial Scale Mismatch and Uneven Implementation Outcomes***

Scale-related challenges were consistently identified as a key constraint on Green Infrastructure (GI) implementation. Practitioners recognised GI as inherently multiscale, yet highlighted the difficulty of aligning ecological processes with administratively bounded planning instruments. According to a Nature Conservation Expert (Participant 1), *“The current situation in the Municipality of Struga indicates incoherence and discontinuity of green areas”*, thereby pointing to fragmented spatial outcomes shaped by jurisdictional boundaries.

Efforts to address GI across scales often involved adapting existing planning instruments rather than reconfiguring planning logic to accommodate GI’s spatial requirements. Proposals to plan GI outside urban areas through village or non-inhabited area plans [Architect] illustrate attempts to retrofit GI into established planning hierarchies. Nevertheless, such interventions tend to be overshadowed by the prioritisation of GI in visible or strategically valued urban areas, meaning that less advantaged, peripheral, or rural spaces remain under-addressed in practice.

Beyond these spatial disparities, discussions of scale rarely engaged with questions of social distribution or differential access to GI benefits, thereby further emphasising the limited consideration given to equity within multiscale planning practice.

### ***Opportunities and Enabling Conditions: Conditional Pathways towards Operational and Equitable Green Infrastructure***

Despite these constraints, practitioners articulated conditions under which Green Infrastructure (GI) could become more operationally effective. Importantly, these conditions were framed as contingent on regulatory clarity and institutional alignment, rather than relying solely on voluntary coordination. Urban practitioners highlighted the potential of Urban Green Infrastructure (UGI) elements to reconcile development pressures with environmental objectives, noting that “*UGI elements such as street trees, green roofs and green facades should be implemented because they improve both spatial and ecological connectivity*” [Architect].

At the same time, participants emphasised the need for stronger regulatory frameworks, noting that “*UGI elements should be mandatorily applied in urban planning*” [Architect], which indicates recognition that flexibility without enforceability limits implementation. Similarly, forestry and conservation practitioners identified protected area designation as an enabling condition for GI delivery, with one noting that “*If Jablanica were declared a national park, the GI concept would be better implemented*” [Forestry Engineer].

Building on these insights, these perspectives suggest that GI’s potential to address broader societal objectives – including the more equitable and consistent provision of benefits – depends on its integration into binding planning instruments. Without such institutional embedding, GI risks remaining a selective and unevenly applied concept, thereby reinforcing existing spatial and social disparities rather than mitigating them.

### **4.3 Qualitative Triangulation: Interpreting Alignments, Tensions and Persistent Gaps between Policy and Practice**

The triangulated analysis of planning documents and practitioner perspectives reveals a pattern of partial discursive convergence combined with pronounced operational divergence in the treatment of Green Infrastructure (GI). While both policy texts and planning practice increasingly acknowledge the relevance of green and natural assets, they do so according to fundamentally different logics, temporalities and institutional priorities. Rather than reinforcing one another, these framings interact in ways that reproduce ambiguity, selectively enable implementation and ultimately constrain GI’s capacity to function as a transformative spatial planning framework.

At the level of discourse, a broad alignment becomes evident. Planning documents consistently recognise the importance of protecting green and natural areas, and practitioners similarly articulate GI as a connected system of ecological and spatial assets. However, triangulation demonstrates that this shared vocabulary masks fundamentally different logics of action. In planning documents, GI-related elements are embedded within protection-oriented and land-use-based framings that treat green spaces as static spatial categories or regulatory constraints. In practice, practitioners draw on similar conceptual vocabularies but mobilise them pragmatically, aligning GI with existing planning routines

rather than allowing it to reconfigure planning priorities. This produces a situation in which conceptual recognition fails to translate into operational coherence.

A central finding emerging from the triangulated analysis concerns the mismatch between the integrative potential attributed to GI in abstract terms and its sectoral positioning in both policy and practice. Planning documents rarely articulate GI as a cross-sectoral spatial infrastructure, instead situating it within environmental chapters or sector-specific management plans. Practitioner accounts mirror this fragmentation, acknowledging GI's multifunctionality while simultaneously locating responsibility within discrete institutional domains such as forestry, nature protection or urban greenery. Triangulation thus reveals that fragmentation is not merely an implementation failure but a mutually reinforcing feature of policy design and professional practice, institutionalised and normalised across governance levels.

Regulatory ambiguity plays a pivotal mediating role between policy and practice. The predominance of aspirational and non-binding language in strategic and urban plans creates interpretive flexibility that practitioners actively navigate. From a triangulated perspective, ambiguity does not simply hinder implementation; rather, it enables discretionary engagement with GI, allowing actors to invoke GI selectively when it aligns with existing mandates, resources, or project-based opportunities. This finding complicates linear policy-practice narratives by demonstrating how weak regulatory intent is reproduced, rather than contested, within everyday planning practice.

Triangulation further exposes scale as a persistent point of tension. Planning documents acknowledge green and protected areas across multiple territorial levels, yet fail to articulate mechanisms for spatial or institutional alignment. Practitioners similarly recognise Green Infrastructure (GI) as inherently multiscalar but remain constrained by administratively bounded planning instruments. The result is a patterned form of spatial selectivity in which GI is more readily operationalised in visible, protected, or development-sensitive areas, while peripheral or less regulated spaces remain weakly addressed. This scale mismatch is not accidental; it reflects the absence of a shared spatial logic capable of coordinating ecological processes with statutory planning hierarchies.

Notably, the triangulated analysis reveals a shared omission of social equity considerations across both policy and practice. While planning documents frame GI primarily in terms of environmental protection and spatial allocation, practitioner narratives similarly prioritise ecological and recreational functions. Issues of accessibility, distributive justice or differentiated social benefits are largely absent from both sources. This convergence suggests that the marginalisation of equity considerations is not a gap between policy and practice but a structural omission embedded within dominant planning rationalities.

Finally, triangulation reveals the conditional pathways through which GI could acquire greater operational and transformative capacity. Practitioners' calls for clearer regulatory frameworks, mandatory instruments, and stronger institutional alignment resonate with the relative effectiveness of sectoral plans that possess a statutory basis. Rather than relying on voluntary coordination or conceptual persuasion, both empirical strands indicate that GI's integration into binding planning instruments is a prerequisite for reducing policy-practice gaps and mitigating uneven spatial outcomes.

## 5 Discussion and Implications

The findings prompt a theoretically informed integration of how Green Infrastructure (GI) is conceptualised across three interconnected spheres: academic theory, statutory planning documents, and practitioner interpretation.

The literature has consistently highlighted both the definitional plurality and conceptual ambiguity of GI (DI MARINO and LAPINTIE 2018; MELL and SCOTT 2023; SEIWERT and RÖSSLER 2020; WRIGHT 2011), while simultaneously framing it as a multifunctional and strategically planned network that integrates ecological, social, and economic objectives (BENEDICT and MCMAHON 2006; European Commission 2013). This plurality has been interpreted both as a conceptual strength, allowing adaptability across governance contexts, and as a source of ambiguity that may dilute operational clarity.

The empirical material from Struga and Vevchani demonstrates that this plurality does not travel intact across governance levels. Within municipal planning documents, GI is framed primarily in terms of land-use and protection categories, with selective references to connectivity and multifunctionality. In practitioner discussions, awareness of ecological integration and spatial continuity is evident; however, the concept remains operationally ambiguous and largely detached from equity considerations. The absence of distributive or justice-oriented framing is particularly notable given the integrative ambitions articulated in the academic literature.

This triangulation reveals both convergence and tension. Convergence emerges in the shared recognition of GI as an environmentally integrative approach, while tension arises in the narrowing of its conceptual scope as it moves from theory to statutory instruments and from strategic rhetoric to operational practice. The definitional plurality identified in the literature thus manifests in practice not as productive flexibility, but as selective abstraction. Multifunctionality is acknowledged discursively, yet remains largely reduced to environmentally oriented interpretations, leaving social, economic, and redistributive dimensions under-articulated.

This conceptual filtering has institutional consequences. The empirical evidence confirms that Green Infrastructure (GI) is formally acknowledged within municipal planning discourse, while only partially embedded within binding statutory instruments. While this finding resonates with the implementation gaps identified in the literature (DI MARINO and LAPINTIE 2018; MONTEIRO et al. 2020), the present analysis suggests that the North Macedonian case cannot be reduced to a deficit of administrative capacity or delayed policy uptake. Rather than representing a temporary misalignment between strategic ambition and operational practice, GI appears to stabilise within a pattern of selective institutional embedding, shaped by historically entrenched sectoral planning logics.

Fragmentation and coordination challenges have been frequently identified as obstacles to GI integration (DUPRAS et al. 2015; SLÄTMO et al. 2019). However, the present case demonstrates that fragmentation functions not merely as a barrier but also as a structuring condition. GI elements are incorporated where they align with established administrative competences, such as urban greenery management, landscape protection, or designated natural areas, without fundamentally reconfiguring zoning hierarchies or development

logics. In this respect, GI is accommodated rather than transformative. Thus, it becomes institutionally contained within sector-specific mandates, reinforcing earlier concerns about the difficulty of translating integrative GI visions into statutory spatial planning systems (LAFORTEZZA et al. 2013; LENNON and SCOTT 2014).

The divergence between European policy framings and local statutory practice further accentuates this containment dynamic. At European Union (EU) level, Green Infrastructure (GI) is articulated as a strategically planned, multifunctional, and interconnected network capable of structuring territorial development across scales (European Commission n.d.; JOHN et al. 2019). Such framing presupposes horizontal coordination and vertical coherence, positioning GI as infrastructure co-equal to grey systems. By contrast, the analysed municipal documents conceptualise green and natural areas primarily in terms of protection-oriented or categorical land-use classifications. Connectivity and ecosystem service provision are referenced, but rarely operationalised through binding instruments. This divergence reflects not merely incomplete policy transfer, but a conceptual-institutional misalignment between multifunctional infrastructure narratives and land-use-centred regulatory systems. As noted by BOGDANOVA AJCEVA (2022), GI discourse is increasingly present in the North Macedonian context; yet the present findings demonstrate that discursive convergence does not automatically translate into regulatory transformation.

This misalignment becomes particularly visible in the relationship between communication and regulation. Practitioners demonstrate awareness of multifunctionality and connectivity, aligning rhetorically with principles identified in the literature (DAVIES and LAFORTEZZA 2017; DE MONTIS et al. 2022; GRĂDINARU and HERSPERGER 2019). Nevertheless, statutory provisions rely largely on generalised, non-binding formulations. Consistent with observations by SLÄTMO et al. (2019), as well as with recent analyses of GI policy instruments (ZABEL and HÄUSLER 2024), GI tends to operate predominantly through soft and coordinative governance arrangements rather than binding regulatory mechanisms. Moreover, the present case extends these insights by demonstrating that regulatory ambiguity performs a stabilising institutional function. It allows GI to be referenced across planning documents while avoiding structural adjustments to development rights or zoning hierarchies. The resulting communicative-operative gap is therefore not merely a weakness; rather, it represents an institutional compromise that preserves established planning ontologies while accommodating emerging sustainability narratives.

Spatial consequences of this compromise are patterned rather than incidental. GI-related measures are more clearly articulated in protected or symbolically significant areas, whereas everyday urban and peri-urban development zones exhibit limited integrative requirements. This uneven operationalisation reinforces arguments regarding the institutional structuring of spatial outcomes (GRĂDINARU and HERSPERGER 2019) and highlights concerns about technocratic and equity-blind interpretations of GI (DI MARINO et al. 2019; GRABOWSKI et al. 2023). The absence of explicit social equity references across both policy texts and practitioner narratives suggests that multifunctionality is interpreted largely through environmental performance rather than territorial justice. Consequently, GI risks consolidating environmental assets in already regulated spaces while remaining peripheral to growth-oriented areas where integrative planning would arguably have the greatest impact.

Synthesising these dynamics, the study advances a configurational understanding of fragmented and selective Green Infrastructure (GI) operationalisation in transitional spatial planning systems. This configuration is characterised by discursive endorsement at the strategic level, sectoral embedding within established administrative mandates, regulatory ambiguity in statutory instruments, and weak vertical integration across governance scales. Together, these dimensions produce a stable equilibrium in which GI is neither absent nor transformative. By conceptualising this condition as an institutional adaptation rather than an implementation failure, the analysis refines prevailing narratives in GI governance scholarship. It suggests that the effectiveness of multifunctional infrastructure concepts depends not only on coordination mechanisms but also on their compatibility with dominant land-use ontologies and regulatory cultures.

For spatial planning practice, the findings indicate that definitional plurality should be coupled with regulatory specificity if multifunctionality is to achieve territorial coherence. At the municipal level, embedding Green Infrastructure (GI) into binding statutory instruments – through mandatory connectivity requirements, ecosystem service-based zoning criteria, and measurable monitoring indicators – appears essential for reducing the communicative-operative gap. Flexibility alone is insufficient; regulatory clarity is a prerequisite for operational coherence. At the national level, strengthening vertical integration mechanisms between spatial, environmental, and sectoral legislation could reduce conceptual-institutional misalignment. Clear assignment of coordination responsibilities would mitigate selective embedding across fragmented mandates.

For Western Balkan contexts pursuing EU alignment, the findings suggest that rhetorical adoption of EU GI frameworks is inadequate. Effective alignment requires translating multifunctional GI principles into enforceable spatial planning instruments rather than merely incorporating them symbolically into strategic narratives. More broadly, the case cautions against assuming that EU GI frameworks diffuse linearly into diverse governance contexts. Conceptual adoption without institutional recalibration may generate discursive convergence while leaving spatial allocation logics fundamentally unchanged.

Overall, the Struga and Vevchani cases demonstrate that Green Infrastructure (GI) in transitional spatial planning systems may stabilise in a fragmented but functional configuration, marked by selective conceptual translation and operational ambiguity. By critically synthesising theoretical plurality, statutory framing, and practitioner interpretation, the study contributes to a more nuanced understanding of how multifunctional infrastructure concepts are interpreted, narrowed, and institutionalised within spatial planning practice.

## 6 Conclusions

This study analysed how Green Infrastructure (GI) is understood, operationalised, and enacted within North Macedonia's spatial planning framework, with particular attention to the processes and practices observed in the municipalities of Struga and Vevchani, setting

the stage for a detailed assessment of institutional translation and operational embedding. Moving beyond binary assessments of policy presence or absence, the analysis advances a configurational account of GI institutionalisation within a transitional planning system.

The findings indicate that GI integration is shaped less by policy ambition than by institutional compatibility. While GI is discursively endorsed and aligned with European environmental agendas, its operational embedding occurs primarily through pre-existing sectoral and land-use categories. Protection-oriented framings prevail, whereas multifunctionality, connectivity, and cross-sectoral integration remain weakly codified in binding instruments. Regulatory ambiguity and aspirational policy language sustain a communicative-operative gap, enabling discretionary implementation. Simultaneously, distributive and equity-oriented dimensions are marginal in both policy texts and practitioner narratives, positioning GI as an environmental supplement rather than as a socially structuring spatial infrastructure. In transitional planning contexts, therefore, GI neither simply succeeds nor fails; it stabilises in forms compatible with entrenched regulatory cultures and administrative competences.

Theoretically, this study contributes by reconceptualising GI mainstreaming as a form of institutional translation rather than a linear process of policy diffusion. It introduces a configurational lens for analysing multifunctional infrastructure within hybrid governance regimes, illustrating how selective embedding can generate stability without structural transformation. By foregrounding small municipalities within an evolving European planning context, the study empirically extends debates that are often dominated by metropolitan and Western cases, thereby grounding the infrastructure turn in spatial planning within peripheral and institutionally fluid settings.

Several recommendations emerge for planning reform:

- *First*, Green Infrastructure (GI) should be explicitly codified within spatial planning legislation as a cross-sectoral infrastructure category, accompanied by mandatory provisions for connectivity and multifunctionality, thereby shifting it from rhetorical endorsement to binding spatial logic.
- *Second*, municipal statutory plans should incorporate ecosystem service-informed zoning criteria alongside measurable performance indicators in order to reduce interpretive discretion and strengthen enforceability.
- *Third*, clearer vertical and horizontal coordination mechanisms are required to mitigate institutional fragmentation across planning tiers.
- *Fourth*, monitoring frameworks should integrate spatially explicit and socially disaggregated indicators, ensuring that equity becomes an integral component of GI implementation.
- *Fifth*, interdisciplinary capacity-building is necessary to embed GI within operative planning routines rather than confining it to environmental chapters.

Without regulatory specificity and institutional alignment, GI is likely to remain communicatively legitimised yet structurally peripheral.

The scope of inference is shaped by several limitations. The qualitative multiple-method design – combining Critical Discourse Analysis (CDA) of planning documents with a

single exploratory practitioner workshop – prioritises analytical depth over generalisability. The purposive focus on two municipalities enhances contextual sensitivity but limits representativeness and does not provide a comparative baseline. The document corpus, while systematically defined, cannot exhaust all sectoral regulations, informal governance practices, fiscal instruments, or political-economic dynamics influencing Green Infrastructure (GI) implementation. As an interpretative approach, CDA necessarily entails analytical judgement, notwithstanding transparent coding procedures and triangulation, while workshop insights rely on self-reported practitioner perspectives that may reflect institutional positioning. The study does not incorporate quantitative spatial modelling, ecosystem service valuation, land-market analysis, or longitudinal tracking of implementation outcomes, nor does it systematically examine power asymmetries shaping infrastructure prioritisation. The findings further reflect a specific temporal planning cycle subject to legislative evolution. These constraints delimit transferability while clarifying the contextual boundaries of the configurational interpretation advanced here.

Future research should test the robustness of this interpretation through comparative analyses across transitional, post-socialist, and peripheral planning systems, examining whether selective accommodation constitutes a broader institutional pattern. Longitudinal studies are needed to assess how legislative reform, European integration processes, and climate adaptation imperatives recalibrate the communicative-operative gap identified in this study. Integrating institutional analysis with geospatial ecosystem service modelling would enable evaluation of whether multifunctional aspirations translate into measurable territorial coherence. Dedicated inquiry into the distributive and justice implications of Green Infrastructure (GI) – particularly in smaller municipalities – remains essential to address its persistent framing as environmentally technical rather than socially transformative. By situating GI within broader debates on institutional change, regulatory cultures, and the infrastructure turn in spatial planning theory, this study encourages a shift from normative advocacy towards a more precise understanding of how multifunctional infrastructure concepts are translated, stabilised, and potentially reconfigured across diverse governance regimes.

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