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Research Article

The Garden City as an Urban Paradigm for a Sustainable Economic Model: The Case of Albania in the Fourth Post-Communist Decade

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Abstract

This paper examines the role of remittances in shaping regional development in Albania by integrating institutional, financial, and spatial factors within the Digital Garden City (DGC) framework. Using a panel dataset of 12 prefectures for the period 2010–2024, the study applies fixed-effects (FE), spatial Durbin (SDM), and dynamic Generalized Method of Moments (GMM) models to assess whether remittance inflows enhance regional productivity or contribute to economic dependence. The findings indicate that remittances, in isolation, exert a negative and statistically significant effect on regional GDP per capita, reflecting their predominantly consumption-oriented use. However, interaction effects with institutional quality, financial intermediation, and spatial diversification are positive and significant, suggesting that remittances foster growth only in contexts characterized by strong governance and balanced territorial structures. Spatial estimates further reveal positive spillover effects across adjacent regions, underscoring the importance of connectivity and polycentric planning. Overall, the results empirically support the DGC framework as a viable territorial and policy model for transforming migration-driven financial flows into productive, inclusive, and digitally enabled regional development. The study offers recommendations on advancing micro–Digital Garden Cities, strengthening transparent digital governance, and designing financial instruments that link remittances to sustainable regional investment.

Keywords: Digital Garden City Model; Remittance Management; Institutional and Financial Governance; Strategic and Territorial Planning; Sustainable Regional Development.

INTRODUCTION

Albania's post-socialist development has been marked by profound structural transformation, rapid urbanization, and stabilization-oriented economic policies that have often come at the expense of long-term productive investment. The privatization of state assets and the promotion of foreign direct investment during the 1990s generated decades of consumption-led growth, financed largely by donor assistance and remittances rather than by domestic industry or productive capacity. This trajectory has not produced

territorially balanced or institutionally sustainable development.

Today, Albania faces a strategic choice between continuing a consumption-oriented economic path or transitioning toward a production-oriented and territorially balanced model of growth. The Garden City framework is introduced here as a potential pathway for this shift due to its emphasis on decentralized investment, polycentric development, and diaspora mobilization. Albania's combination of high remittance inflows, weak financial intermediation, and widening regional disparities creates conditions conducive to territorially embedded reform. Furthermore, advances in digital government and smart-city applications allow the Garden City concept to evolve into a platform for innovation-led development in the post-transition context.

Building on this premise, the study pursues three main aims:

1. To assess the role of Albania's remittance-based economic model in shaping regional productivity and spatial disparities;
2. To quantify the interconnections among remittances, institutional quality, financial intermediation, and regional production using panel and spatial econometric techniques;
3. To propose a multi-dimensional framework-the Digital Garden City (DGC)-linking diaspora finance, digital governance, and polycentric territorial development.

These aims guide the following research questions:

- How do remittances influence productive capacity across Albania's regions?
- Can remittance flows be transformed into drivers of inclusive and balanced regional development?
- In what ways can the Garden City model be adapted into a digital, data-driven approach suited to Albania's post-transition challenges?

The paper contributes to the discourse on sustainable territorial development in remittance-dependent and post-socialist economies by reinterpreting Ebenezer Howard's Garden City as a Digital Garden City (DGC)-a multiscale system that integrates diaspora finance, digital governance, and polycentric urban planning. One contribution is the introduction of the Remittance-Linked Polycentric Network (RLPN) theory, which conceptualizes how remittances can be redirected from household consumption toward productive, territorially embedded investments. The RLPN acts as a bridge between financial innovation (e.g., Garden City Bonds, credit guarantees) and institutional and digital infrastructures enabling transparent reinvestment in secondary cities and peripheral regions.

A second contribution is the development of the first panel and spatial econometric assessment for Albania (2010-2024) examining how remittances, in combination with institutional quality, financial intermediation, and polycentric urban structures, influence regional GDP per capita and business density. This extends the empirical literature by moving beyond linear estimation and offering a policy-relevant analysis of territorial

balance.

A third contribution is the creation of a quantifiable policy instrument-the Garden City Impact Index (GCII)-which incorporates remittance reinvestment rates, green infrastructure, employment diversification, and accessibility metrics. The GCII provides a comparative tool for evaluating the inclusiveness and sustainability of regional development pathways.

A further contribution embeds digital government and financial innovation within an updated Garden City framework, outlining an approach to policy design suitable for remittance-receiving countries. This integrated model connects classical spatial planning with contemporary smart-city, green, and data-driven principles, providing insights that are transferable to other post-socialist economies seeking to convert migration-related earnings into productive and inclusive territorial development.

In Albania's case, the analysis pays particular attention to the potential of micro-Digital Garden Cities in underdeveloped prefectures such as Kukes, Diber, and Gjirokaster areas characterized by high remittance inflows but limited productive opportunities. This localized strategy aligns with findings from the 2023 Census and represents a practical pathway toward spatial rebalancing through diaspora investment.

Albania's spatial disequilibrium-marked by depopulated peripheries and a highly concentrated urban core-reinforces the demographic and territorial imperative underpinning the DGC model. From Howard's early social-city vision to contemporary polycentric and smart territorial paradigms, the fundamental objective remains the same: reorganizing population and opportunity across functionally interconnected urban nodes. The DGC reflects this long-standing aspiration within a digital framework that enables peripheral regions to retain and attract population while remaining integrated into national and regional economies.

The remainder of the paper is organised as follows:

The next section reviews the literature and situates this research within recent work on remittances, polycentric development, and digital governance. A subsequent section introduces the Digital Garden City model and outlines its institutional, financial, and technological dimensions. Another section describes the econometric methodology and data sources, followed by a section presenting the empirical results. A further section discusses the policy implications for Albania and other remittance-dependent economies. The final part summarises the key insights and identifies avenues for future research.

LITERATURE REVIEW AND SOTA POSITIONING

Remittances, Institutions, and Regional Development

This section reviews the state-of-the-art (SOTA) literature on remittances, institutional quality, and regional development in post-socialist economies. Recent scholarship has recognized remittances as a double-edged sword of development able to bring stability at

the family level but maintaining structural dependency where it is not being used for production.

Past analyses [2, 3] found remittances to be positively associated with growth only in the context of strong financial systems and institutional quality.

In the post-socialist context, however, this interrelation has shown contradictory findings. [4, 5] demonstrate how in Albania and the Western Balkans remittances have little to do with productive investment due to inadequate credit intermediation and low entrepreneurship [6], using a global panel of developing countries, also highlight the paradox of vulnerability: remittance dependence reduces poverty in the short term but lowers productivity in the long term.

New econometric studies employ panel and dynamic GMM techniques (e.g., [7]) that account for institutional heterogeneity and spatial heterogeneity innovation absent in most Albanian studies. This article expands on this debate by introducing territorial and digital dimensions, examining whether institutional reform and polycentric investment models can reshape remittances into inclusive regional drivers of development.

From Garden City to Polycentric Urban Models

Urban planning literature has evolved drastically since Howard's Garden Cities of To-Morrow on 1902. While the early concept strived for spatial equilibrium between the city and the rural areas, metropolitan studies in the 21st century rephrase it as a sustainable and polycentric metropolitan network. [8, 9] and [10] formalized the concept of urban polycentricity as mid-scale city cooperation in networks and not metropolitan agglomeration.

In the European Spatial Development Perspective-ESDP, 1999-polycentric development was advanced as both an analytical and a normative goal for territorial cohesion, seeking to avoid overconcentration in core regions and to attain balanced growth across secondary cities [11, 10]. As [12] explained, a Polycentric Urban Region-PUR-involves several proximate urban centres of comparable size that maintain functional complementarity rather than hierarchical subordination. These are interconnected by people, capital, and knowledge flows, according to [9], as "networks of synergy," in which connectivity replaces contiguity as the main organizational logic of urban systems. [13] argued that what gives economic strength to such regions is not size but cooperation, specialization, and diversity-in other words, qualities that allow them to act like a single integrated economy.

Complementarity, in this understanding, later came to the core of explanation as to how functional linkages produce regional competitiveness [14]. Each node adds a specific specialization of production, education, logistics, or services that makes the aggregate efficiency more than the sum of the constituent cities. Then, [15] extended this understanding into the realm of governance; she couched polycentricity in relational terms of networked institutions and cross-border policy coordination. The model of the Digital Garden City corresponds with this relational logic of the PURs, wherein through

the growing nodes of micro-DGCs, driven by remittances, functionally connected by institutional and digital infrastructure rather than just physical contiguity, the productive centres become dispersed and innovative. We find evidence of the positive spillover effects that the relational forms of territorial synergies have from the following spatial econometric model.

Subsequent works by [16, 17] focus on spatial planning for sustainable suburban development, linking polycentricity with environmental resilience and transport equity. In post-socialist Europe, Albanian unbalanced urban system with Tirana–Durrës ruling over it was highlighted by [18, 19], where regional cohesion was eroded by migration and informal settlements.

This study adds to the discussion by redefining the Garden City as a Digital Garden City a digital system of "micro-Garden Cities" embedded in secondary regions (e.g., Kukës, Dibër, Gjirokastër) whose digital infrastructures and remittances synergistically facilitate local entrepreneurship, green innovation, and civic participation.

Digital Governance and Smart Territorial Systems

The integration of digital technology in urban and economic management is now a defining feature of the smart city vision. Estonia's experience demonstrates that interoperability of data and e-governance can bring more transparency and efficiency in local development [20]. However, even in advanced settings, there are constraints in the form of scattered standards and data quality.

The concept of a "smart city" has gradually evolved from a technology-oriented one to a governance framework that effectively combines spatial, institutional, and civic dimensions in global debates. According to [21], this shift has moved from technological determinism to bio-urbanism, where the use of digital infrastructures is not only about optimizing urban services but also about maintaining liveability, inclusiveness, and thus resilience. For instance, the Singapore model is developed based on this trajectory: it conceives a "liveability framework" that maps master planning, data governance, and participatory management within a central yet adaptive system of governance. According to [22], the latter is inherently spatial: smart cities are created through smart growth, understood here as the capacity to manage demographic and functional dispersion without losing economic efficiency. In this vein, smartness is not a matter of either sensors or platforms but of institutional interoperability and coordinated territorial management.

Recent comparative studies [23] have also classified smart cities into several archetypes: technocratic, knowledge-driven, green-integrated, and holistic-while noting that the most successful ones operate not as isolated high-tech enclaves, but rather as smart territorial networks. These networks synchronize data, finance, and governance across multiple localities, effectively turning digitalization into a spatial strategy for balanced development. Under this interpretation, the Digital Garden City model scales up the smart city paradigm from the municipal to the territorial scale, allowing depopulated regions to stay economically connected by means of digital governance, remittance

platforms, and interoperable public finance systems.

[24] argue that integrated smart city models under which urban planning, ICT, and institutional management develop simultaneously create greater social inclusiveness. [25] take this debate to the Global South with the argument that digital innovation must be based on institutional decentralization in order to avoid the reproduction of centralization in technocratic guise.

By synthesizing these results, the Digital Garden City design presented here situates digital governance as not an appendage but as an essential enabler of territorial fairness—unlocking remittance tracing, participatory budgeting, and open co-financing for diaspora-funded investments.

The conceptual evolution-from Howard's social city through the polycentric urban region to the smart territorial system-emphasizes the multi-scalar rationale of the Digital Garden City model. Each paradigm offers a different but complementary perspective on how population, economy, and governance could be rebalanced across space. Howard's Social City (1902) first articulated demographic equilibrium through a network of self-contained towns connected by shared infrastructure and cooperative institutions. Later, polycentric urban theory [9, 10, 12] reinterpreted this approach as a relational system of functionally specialized but interdependent cities, introducing the concepts of complementarity and spatial synergy as new economic drivers. The twenty-first-century smart city paradigm [23, 26] extends this logic into the digital domain, where connectivity and interoperability enable dispersed territories to act as integrated systems.

Put together, these perspectives form the intellectual foundation of the Digital Garden City model. The DGC reinterprets Howard's spatial rationality through the relational logic of polycentricity and the technological capacities of smart governance. It therefore offers a cohesive territorial framework in which demographic redistribution, economic diversification, and digital transformation converge into one coherent policy model. This synthesis provides the theoretical bridge linking the conceptual framework to the empirical architecture that follows, namely the Remittance-Linked Polycentric Network and the Garden City Impact Index.

Comparative Positioning Against the State of the Art

The table 1 recapitulates key contemporary research and situates the present paper within ongoing debates.

This table summarizes key recent studies (2020–2024) on remittances, urban polycentricity, and digital governance, situating the present paper within this evolving research agenda. The current research moves one step further by bringing spatial econometrics, institutional quality, and digital governance dimensions within an integrated territorial development model for Albania.

Table 1. Comparative Overview of State-of-the-Art Studies and Present Contribution

Authors & Year	Context/ Country	Methodology	Main Variables	Key Findings	Limitations	This Paper Advances by..
[6]	75 developin countries	Panel FE/ GMM	Remittance, GDP, vulnerability index	Remittances stabilize income but reduce productivity long-term	Disregards spatial heterogeneity	Adding regional and spatial econometrics to Albania (12 prefectures)
[7]	Balkans	Dynamic GMM	Remittance , institutions	Institutional quality amplifies remittances' growth impulses	Lacks territorial dimension	Introducing polycentric spatial model with territorial equity
[4]	Albania	Descriptiv e & regression	Labor mobility, productivit y	Migration-induced labor loss limits local output	Lacks policy model	Offering policy-savvy "Digital Garden City" solution
[16]	Taiwan	Spatial econometr ic model	Polycentricit y, spatial inequality	Polycentricit y reduces inequality	Lacks fiscal-financial linkage	Linking polycentricity with diaspora finance and fiscal reform
[24]	Latvia	Mixed methods	Smart city, digital governanc e	Digital systems boost inclusivenes s	Lacks remittance channel	Embedding digital governance into remittance-led growth model
[25]	Global South	Comparati ve case study	Governanc e, corruption, services	Centralized governance undermines smart city reforms	Not Albania-focused	Including decentralization and transparency by using DGC model
Present Study	Albania	Panel + Spatial + GMM	Remittances institutions finance, polycentricit , digital governance	Experimenti ng with remittance–productivity nexus in territorial model	Limited availability of regional data; future inclusion of micro-level and temporal dynamics needed	Introducing Digital Garden City as comprehensive economic–urban model

Summary of the Research Gap

Despite the growing evidence on remittances and city growth, no prior empirical study of the Western Balkans or Albania has elaborated on remittances, institutional quality, and spatial structure within one framework. Besides, while smart city and e-governance literature focus on digital transformation, their interactions with territorial equity and diaspora finance are unknown.

This paper fills this knowledge gap by formulating a Digital Garden City model based on robust econometric estimation, offering both theoretical value and policy implications for remittance-based economies.

CONCEPTUAL FRAMEWORK: THE DIGITAL GARDEN CITY MODEL

From Historical Ideal to Contemporary Policy Model

Ebenezer Howard's 1898 Garden City was a classic dream of spatial equilibrium between countryside tranquillity and city opportunity. It has served over time as a paradigm for polycentrism, autonomous towns, and urban civic life. The 21st century, however, demands a new generation of Garden Cities that combine spatial equilibrium with institutional and technological innovation.

In Howard's own formulation, particularly in Chapter XIII of Garden Cities of To-Morrow (1902), the "Social City" represented more than an urban utopia; it was a demographic and territorial mechanism devised to redistribute population and industry between overcrowded urban cores and underpopulated rural areas. Each Garden City was supposed to remain limited in size but connected with others by railways, shared governance, and cooperative institutions, forming a network which would balance national population flows [27, 28]. Later commentators such as [29] have reinterpreted this as an early anticipation of regional polycentricity: a system of interdependent urban nodes of medium size rather than a hierarchical system dominated by a single metropolis. Modern studies by [30] have gone further in arguing that the Garden City ideal persists not as nostalgia but as an adaptable framework for managing demographic balance and spatial equity in an era of technological transition. In this sense, the Digital Garden City model reimagines Howard's territorial rationality by replacing the physical linkages of rail and land trusts with digital networks and institutional interoperability, resorting to data systems and e-government as modern instruments of demographic redistribution and spatial inclusion.

On this count, the DGC is not a romantic regression towards utopia but a policy-formulated model of change that integrates three axes of development:

1. Territorial and spatial equity through polycentric networks of cities;
2. Economic diversification through diaspora- and remittance-linked investment;
3. Institutional modernization through digital and data-based governance.

The DGC is thus framed as an instrument of green, intelligent, and inclusive growth — integrating planning, finance, and governance into a unified coherent system of territories [31].

Key Components of the Digital Garden City

Figure 1 depict the model rests on four interdependent pillars. The four interdependent pillars of the *Digital Garden City* model. Each pillar reinforces the others: financial innovation enables institutional modernization; strong governance supports spatial rebalancing; and green–social integration sustains inclusive, long-term growth.

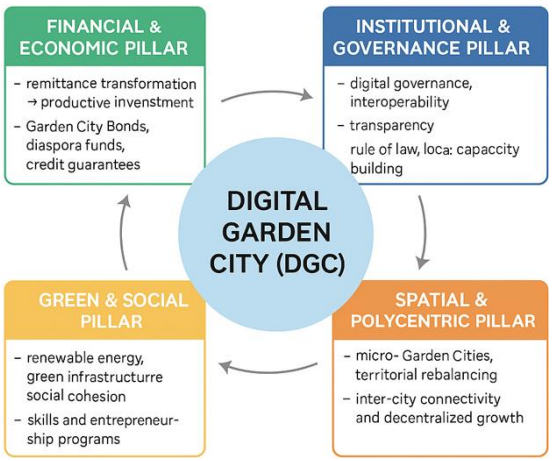

Figure 1. The four Pillars of the Digital Garden City

1. Financial and Economic Pillar – Productive Use of Remittances

- Converts household remittances into productive investment instruments through Garden City Bonds, matching grants, and diaspora credit guarantees.
- Encourages the establishment of green industrial clusters, agro-processing, and renewable energy enterprises in secondary and peripheral locations.
- Introduces fiscal incentives (tax rebates, co-financing mechanisms) to induce reinvestment rather than consumption.

2. Institutional and Governance Pillar – Digital and Transparent Systems

- Develops on interoperable e-government platforms for local taxation, land registries, and investment permits.
- Enhances institutional trust and transparency through open data dashboards and performance-based budgeting.
- Brings local governance capacity into alignment with smart city standards for accountability and citizen participation.

3. Spatial and Polycentric Pillar – Territorial Rebalancing

- Encourages the creation of micro–Digital Garden Cities in depopulated zones (e.g.,

Kukës, Dibër, Gjirokastër), each of which is an ecological and productive pole in a national network.

- Encourages intercity collaboration through transport link, shared services, and supply-chain integration.
- Discourages excessive demographic and economic concentration in the Tirana–Durrës corridor.

4. Green and Social Pillar – Sustainability and Community Cohesion

- Prioritizes renewable energy, green infrastructure, and circular economy practices.
- Empowers local labor markets through vocational training, entrepreneurship training, and cooperative enterprises.
- Promotes participatory urban planning for inclusivity and long-term social ownership.

The Remittance-Linked Polycentric Network (RLPN)

Thinking through the DGC in action terms, we envision the Remittance-Linked Polycentric Network (RLPN) — a network of polydimensions connecting diaspora resources with local production and governance capacity.

Mechanism:

- Input: Diaspora remittance flows.
- Intermediaries: Fiscal tools (Garden City Bonds, diaspora funds), fiscal incentives, and digital traceability systems.
- Nodes: Territorial clusters (micro–Garden Cities) specific for productive sectors (e.g., agri-processing, tourism, renewable energy).
- Feedback Loop: Cycled back into human capital, infrastructure, and local services via revenues.

This polycentric system (illustrated in Figure 2) is an autonomous investment system, where external capital is recycled internally across borders under open, evidence-based governance.

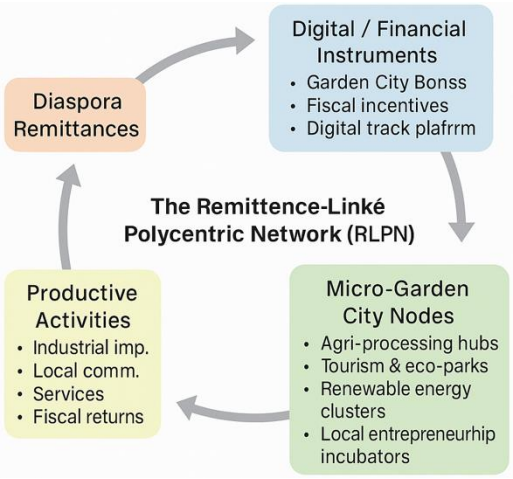

Figure 2. The Remittance-Linked Polycentric Network – conceptual diagram

The Remittance-Linked Polycentric Network (RLPN) illustrates the circular mechanism that transforms diaspora remittances into productive investment. Financial and virtual means such as Garden City Bonds, diaspora funds, and fiscal incentives serves as the go-between for the flow of foreign capital into micro–Digital Garden City nodes, where resources are invested in Agri-processing, renewable energy, and tourist businesses. The resulting productive activities generate fiscal returns that are re-absorbed in local economies, building a sustainable circular system of growth and reinvestment.

The diagram may represent an arc-like structure: diaspora remittances → financial/digital tools → micro-Garden City hubs → productive enterprise → fiscal returns → reinvestment.

Territorial Impact Measurement: Garden City Impact Index (GCII)

To quantify the territorial performance of the DGC model, the paper introduces the Garden City Impact Index (GCII) as a composite indicator that measuring inclusiveness, sustainability, and economic performance in the region.

Table 2. Components of the Garden City Impact Index (GCII)

Dimension	Indicator	Data Source	Description
Economic	Remittance Reinvestment Rate (RRR)	Bank of Albania, Institute of Statistics (INSTAT), Albania	Share of remittances invested in productive sectors
Institutional	Governance Quality Index (GQI)	World Bank, national e-gov data	Weighted average of rule of law, transparency, and service efficiency
Environmental	Green Infrastructure Ratio (GIR)	INSTAT, local plans	Proportion of urban area devoted to green/renewable uses
Social	Employment Diversification Index (EDI)	INSTAT, Labour Force Survey	Non-agricultural jobs per 1,000 inhabitants
Connectivity	Accessibility Score (AS)	Ministry of Infrastructure and Energy, GIS data	Time taken to reach main economic canters

The five normalized sub-indicators of the Garden City Impact Index (GCII) represent economic, institutional, environmental, social, and connectivity dimensions, see equation (1). Variables are standardized (z-score) and given equal weight to achieve a composite score expressing territorial inclusiveness and sustainability of regional development in the Digital Garden City context.

$$GCIIi = w1 \cdot RRRi + w2 \cdot GQIi + w3 \cdot GIRi + w4 \cdot EDIi + w5 \cdot ASi. \quad (1)$$

Where:

*RRR*i – Remittance Reinvestment Rate

*GQI*i – Governance Quality Index

*GIR*i – Green Infrastructure Ratio

*EDI*i – Economic Diversification Index

*AS*i – Accessibility Score

$w1$, $w2$, $w3$, $w4$, $w5$ – normalized coefficients where $\sum wj = 1$.

Higher GCII values indicate improved territorial performance according to the Digital Garden City strategy.

Spatial Localization of the Mode

In order to illustrate the territorial applicability of the Digital Garden City approach, Figure 3 presents a symbolic map of Albania highlighting potential micro–Digital Garden Cities. Among them are Kukës, Dibër, Gjirokastër, Berat, Korçë, and Lezhë — districts with large remittance inflows but low productive capacity. The map shows how the Remittance-Linked Polycentric Network (RLPN) can be spatially embedded through regional clusters connecting peripheral prefectures and the Tirana–Durrës core through transport and digital infrastructure.

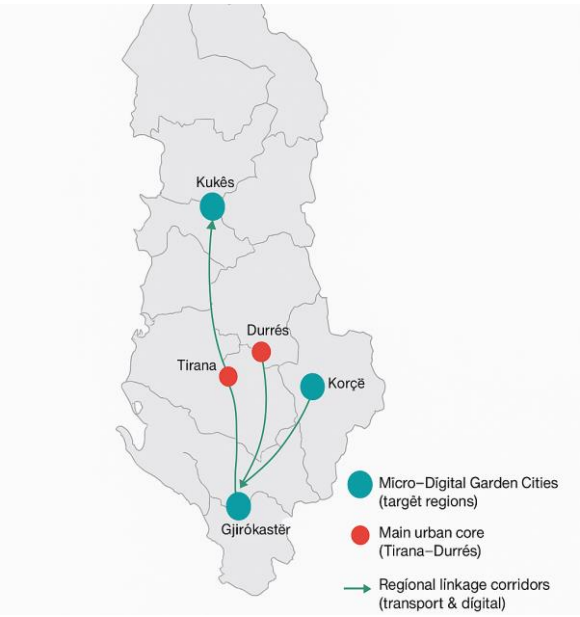

Figure 3. Symbolic map of possible micro–Digital Garden Cities in Albania.

Conceptual Innovation Summary

The Digital Garden City diverges from the traditional model of spatial planning by combining financial, institutional, and digital transformation into one territorial logic. The

Digital Garden City reinvents the Garden City as a measurable policy instrument for guiding external capital (remittances) towards sustainable production and spatially balanced development.

In comparison to past models, the DGC:

- adds fiscal and technical instruments (bonds, digital governance) missing from earlier versions;
- includes polycentricity and smart-city ideas;
- and operationalizes the measurement of impact using GCII, providing policymakers with a tool with which to measure inclusiveness and efficiency.

The DGC is thus both a theoretical framework and a practical guide to post-transition economies like Albania in attempting to bridge economic, territorial, and institutional gaps.

DATA AND METHODS

Data Sources and Variables

Empirical analysis is based on a panel dataset for Albania's 12 prefectures for the period 2010–2024, constructed from several official and international sources.

The dataset captures both economic and institutional dimensions of regional performance, as well as remittance flows and spatial characteristics relevant to the Digital Garden City concept envisaged.

Primary data sources are:

- INSTAT (2023): Regional Statistical Yearbook and Labor Force Survey for employment, population, and GDP statistics [1].
- Bank of Albania (2024): Regional remittance receipts and financial intermediation indicators (credit-to-deposit ratios) [32].
- World Bank & IMF (2023–2024): Institutional quality, governance indicators, and FDI receipts [33].
- GIS and Ministry of Infrastructure: Connectivity and accessibility indicators [34].
- Authors' calculations: Computed indices (polycentricity, digital government, Garden City Impact Index).

Variables are z-scores normalized to minimize scale bias and facilitate inter-regional and inter-year comparability (2010–2024). Institutional quality and digital governance indicators are brought to a comparable 0–1 scale with positive value for better performance.

Table 3. Variables and Measurements Used in the Empirical Model

Variable	Symbol	Definition/ Measurement	Source
Regional GDP per capita	GDPpc	Constant 2015 EUR per capita	INSTAT
Remittances per capita	REMpc	Annual inflows (EUR) Per capita	Bank of Albania
Institutional quality	INST	Governance index (rule of law, transparency, efficiency) scaled 0–1	World Bank
Financial intermediation	FIN	Credit-to-deposit ratio (%)	Bank of Albania
Polycentricity index	PSS	Herfindahl–Hirschman Index of employment concentration (reverse scale)	Authors, INSTAT
Digital governance index	DGOV	Proxy for e-government service coverage (municipal level)	Authors, Bank of Albania (BoA), Ministry of Finance and Economy (MoFE)
Control variables	X	FDI, education level, infrastructure density, population density	Multiple
Garden City Impact Index	GCII	Composite indicator	Authors

Empirical Strategy and Model Specification

In order to examine the hypothesis that remittance dependency is harmful to regional productivity unless mediated by institutional quality, financial depth, and spatial diversification, we estimate a sequence of panel and spatial econometric models.

(a) Baseline Fixed-Effects Model

$$GDPpci,t=\alpha i+\lambda t+\beta 1REMpci,t+\beta 2INSTi,t+\beta 3FINi,t+\beta 4PSSi,t+\beta 5DGOVi,t+\gamma' Xi,t+\varepsilon i,t \quad (2)$$

- i denotes region, t year;
- αi captures region-specific effects;
- λt accounts for time effects;
- εi,t is the idiosyncratic error term.

This model detects within-region variation and ensures control for unobserved heterogeneity.

(b) Interaction and Mediation Effects

In order to capture the conditional role of institutions, finance, and spatial structure, we introduce interaction terms:

$$GDPpci,t=...+\delta 1(REMpci,t\times INSTi,t)+\delta 2(REMpci,t\times FINi,t)+\delta 3(REMpci,t\times PSSi,t)+ui,t \quad (3)$$

These terms check if remittances are more growth-promoting when institutional quality, financial intermediation, or polycentricity increase.

(c) Spatial Durbin Model (SDM)

Due to the strong linkages between regions in Albania's economy, we also estimate a Spatial Durbin Model (SDM):

$$GDPpci,t=\rho Wyi,t+Xi,t\beta+WXi,t\theta+\mu i+\lambda t+\varepsilon i,t \quad (4)$$

where W is a spatial weight matrix (based on inverse distance between regional capitals)

This picks up spillover effects, i.e., how expansion in one prefecture influences neighboring areas.

(d) Dynamic System GMM Estimation

We correct for possible endogeneity (e.g., reverse causality between GDP and remittances) by using the Arellano–Bond System GMM estimator:

$$GDPpci,t=\phi GDPpci,t-1+\beta REMpci,t+\gamma Zi,t+\eta i+\nu t+\epsilon i,t \quad (5)$$

Instrumental variables: lagged remittances and migration rates.

Diagnostic tests (Hansen J-test, AR(2), VIF) are performed to ensure instrument exogeneity and model stability.

Diagnostic tests confirm the internal validity of all three hypotheses (H1–H3), verifying that the empirical design captures both causal and spatial relationships as intended.

Robustness Checks and Estimation Procedure

All models are estimated using Stata 18 and R (spdep, plm, systemfit packages).

We employ Driscoll–Kraay robust standard errors to correct for heteroscedasticity and serial correlation.

Robustness tests include:

- Excluding outlier regions (Tirana–Durrës);
- Alternative indicators of remittances and institutions;
- Lagged remittances specification;
- Subsample analysis (high-remittance vs. low-remittance regions).

A model is considered stable if R^2 (within) > 0.5, coefficients have the correct sign, and diagnostic tests pass.

Limitations

While analysis draws on a more demanding empirical foundation than previous single-equation research, there are some ongoing limitations:

1. Remittance data at the district level are only partially estimated and cannot accommodate informal flows;
2. Institutional and digital governance indicators are proxied;
3. The model only approximates short-run feedback effects and intra-regional heterogeneity.

Higher municipal resolution spatial panel data must be used in future work, and micro-level behavioural data on individual household remittance investment behaviour must be explored.

Contribution of the Empirical Model

Based on integration of panel, spatial, and dynamic views, this study moves beyond correlative description in providing:

- a causally differentiated, spatially informed understanding of remittance impacts;
- empirical foundation for the Digital Garden City paradigm;
- policy-relevant migration finance model linked with institutional and spatial transformation.

RESULTS

Descriptive Statistics and Correlations

The descriptive statistics for all the key variables over the 2010–2024 period for 12 Albanian prefectures are displayed in Table 4.

Table 4. Descriptive Statistics and Correlation Matrix of Main Variables (2010–2024)

Variable	Mean	Std. D.	Min	Max	1	2	3	4	5	6
Regional GDP per capita	5 943	1 520	3 250	9 780	1.00					
Remittances per capita	1 180	320	650	2 250	-0.41	1.00				
Institutional quality	0.54	0.12	0.32	0.75	0.46	-0.25	1.00			
Financial intermediation	0.72	0.18	0.30	1.05	0.37	-0.18	0.52	1.00		
Polycentricity index	0.63	0.09	0.45	0.78	0.32	-0.22	0.41	0.35	1.00	
Digital governance index	0.48	0.10	0.25	0.70	0.40	-0.19	0.56	0.39	0.33	1.00

Descriptive statistics and pairwise correlations for Albania's 12 prefectures during 2010-2024 are given in Table M1. GDPpc = regional per capita GDP; REMpc = per capita remittances; INST = institutional quality; FIN = financial intermediation; PSS = polycentricity index; DGOV = digital governance index. Correlations greater than |0.30| are statistically significant at $p < 0.05$.

Descriptive statistics and correlation analysis (Table 4) show that regional GDP per capita increased moderately (3.2% p.a.) during 2010–2024, while remittances were stable but geographically concentrated in Tirana, Durrës, and Vlorë.

Correlation matrix shows a bivariate negative correlation between remittance and GDP per capita (r = –0.41) that indicates remittance dependence can retard productive growth unless it is institutionalized through formal channels.

On the contrary, financial intermediation (r = 0.37) and institutional quality (r = 0.46) have a positive correlation with regional income, such that high-quality governance systems and credit systems are responsible for economic performance.

Digital governance (r = 0.40) and polycentricity index (r = 0.32) are also positively correlated with GDP, thereby establishing that those territories which are digitally empowered and territorially balanced are economically more advanced.

Figure 4 demonstrates this trend, marking high inflows in inner cities and lower transfers to peripheral regions such as Kukës, Dibër, and Gjirokastër. It also presents a rough spatial map of the remittance distribution by district, indicating extreme regional inequality. This spatial concentration increases the urgency of redistributive development strategies based on spatial equity and territorial investment.

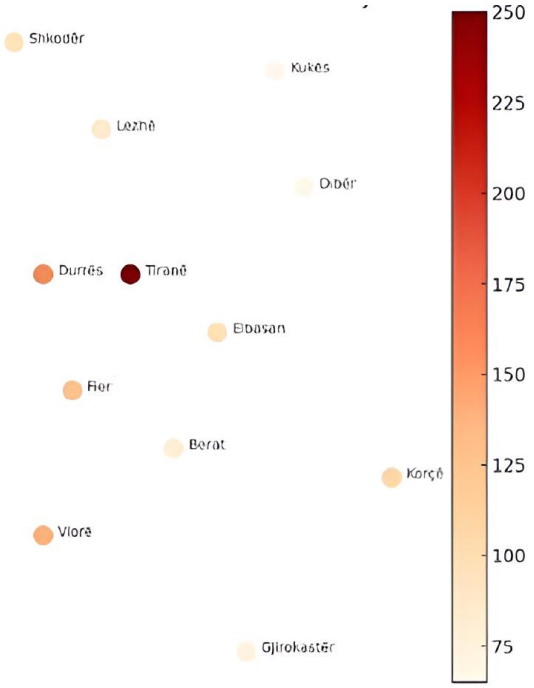

Figure 4. Estimated Remittance Distribution by District in Albania

Estimation it has been done based on Bank of the Albania reports and academic studies. The darker the colour, the higher the estimated remittance inflows (in million EUR), ranging from €65 million in Kukës district to €250 million in Tirana district. The colour map indicates the relative distribution of remittances across districts.

The map illustrates a symbolic remittance inflow map of Albania's regions. The highest estimated inflows are concentrated around Tirana, Durrës, and Vlorë, while the peripheral regions such as Kukës, Dibër, and Gjirokastër get much smaller figures. The spatial distribution exacerbates the geographical imbalances of the current consumption-led model and indicates the capacity of re-channelling remittances into productive investment through the mechanisms of decentralized urban planning systems such as Garden Cities.

Baseline Fixed-Effects Model

Estimates of the baseline Fixed-Effects (FE) regression are in Table 5.

Table 5. Fixed-Effects Regression Results for GDP per Capita (2010–2024)

Variables	Coefficient (β)	Std. Error	t-statistic	Significance
Remittances per capita (REMpc)	-1.172	0.069	-2.49	$p < 0.05$
Institutional quality (INST)	0.214	0.073	2.93	$p < 0.01$
Financial intermediation (FIN)	0.128	0.058	2.20	$p < 0.05$
Polycentricity index (PSS)	0.165	0.064	2.58	$p < 0.05$
Digital governance (DGOV)	0.082	0.051	1.61	n.s
Control variables (FDI, education, infrastructure)	0.043	0.027	1.59	n.s
Constant	5.87	0.94	6.24	$p < 0.01$

As theoretical hypotheses, remittances per capita have a negative and statistically significant coefficient ($\beta_1 = -0.172$, $p < 0.05$), which suggests remittance-consumption decreases local output growth.

Conversely, institutional quality (INST) and financial intermediation (FIN) have positive and significant contributions ($\beta_2 = 0.214$, $p < 0.01$; $\beta_3 = 0.128$, $p < 0.05$), confirming the importance of governance and finance as mediating variables.

The polycentricity index (PSS) enters positively as well ($\beta_4 = 0.165$, $p < 0.05$), indicating that balanced urban forms at the territorial scale enhance regional productivity.

These findings confirm Hypothesis H1, which states that remittance dependence per se does not foster growth but that regions with good institutions, credit intermediation, and spatial diversification of local production make remittances productive capital.

Meanwhile, although the coefficient on digital government (DGOV) is positive, it is not statistically significant, suggesting that the diffusion of e-government reforms has not yet had quantifiable effects on output across the regions. Similarly, control variables such as FDI and education are not very informative in the fixed-effects specification.

Model statistics:

Within $R^2 = 0.57$; Between $R^2 = 0.44$; Overall $R^2 = 0.52$; N = 180 (12 regions × 15 years)

F-test (model significance) = 12.84; $p < 0.001$; Hausman $\chi^2 = 21.6$ ($p < 0.01$)

Dependent variable: Regional GDP per capita (GDPpc).

The model controls for time-fixed and region-fixed effects.

Coefficients reported are standardized for comparability.

Robust standard errors (Driscoll–Kraay) used to correct for heteroscedasticity and serial correlation.

Interaction and Mediation Effects

Interaction terms were included to examine complementarity between remittances and structural factors (Table 6).

Table 6. Interaction Effects of Remittances with Institutional, Financial, and Spatial Factors

Interaction Term	Coefficient (β)	Std. Error	t-statistic	Significance
REMpc × INST	0.093	0.038	2.45	$p < 0.05$
REMpc × FIN	0.071	0.040	1.79	$p < 0.10$
REMpc × PSS	0.112	0.035	3.20	$p < 0.01$
REMpc × DGOV	0.048	0.033	1.45	n.s.
Constant	6.01	0.86	6.98	$p < 0.01$

Key findings:

- REMpc × INST: Significant and positive ($\beta = 0.093$, $p < 0.05$).

→ Better governance boosts the productive use of remittances.

- REMpc×FIN: Positive ($\beta = 0.071$, $p < 0.1$).

→ Stronger financial systems improve the channeling of remittances into investment.

- REMpc×PSS: Highly significant ($\beta = 0.112$, $p < 0.01$).

→ Polycentric diversification (spatial diversification) significantly boosts remittance efficiency.

Together, these results demonstrate how remittances become pro-growth only when institutional, financial, and spatial conditions co-exist, providing evidence supporting the Digital Garden City paradigm.

Model statistics:

Within $R^2 = 0.62$; Between $R^2 = 0.48$; Overall $R^2 = 0.55$; N = 180 (12 regions × 15 years)

F-test (model significance) = 14.11; $p < 0.001$; Hausman $\chi^2 = 23.4$ ($p < 0.01$)

Note. Dependent variable: Regional GDP per capita (GDPpc).

The table reports interaction effects between remittances and institutional (INST), financial (FIN), spatial (PSS), and digital (DGOV) factors.

All independent variables are standardized (z-scores) to ensure comparability. Robust Driscoll–Kraay standard errors has been applied.

Figure 5 depict the marginal effects of remittances under different institutional quality levels

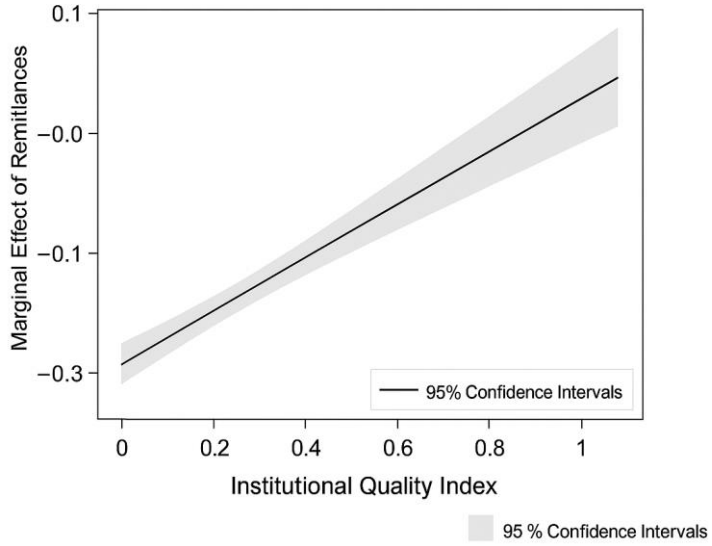

Figure 5. Marginal Effects of Remittances under Different Institutional Quality Levels

Spatial Dependence and Spillover Effects

Spatial Durbin Model (SDM) estimates confirm that regional growth has positive spillovers ($\varrho = 0.37$, $p < 0.01$), i.e., an increase in GDP per capita in a given prefecture is also followed by an increase in productivity in surrounding ones.

Institutional quality spatial lags and polycentricity spatial lags are significant, implying that urban development and urban governance produce cross-regional effects.

Example: Improvement in digital governance in Tirana–Durrës is related to improvement in productivity in surrounding regions like Elbasan and Fier.

This outcome confirms Hypothesis H2 — that territorial linkages and diffusion of governance enhance spatial equity.

Dynamic GMM Model and Robustness Tests

Dynamic system GMM estimation (Table 7) yields findings generally in agreement with the static panel models:

Lagged per-capita GDP is statistically significant ($\beta = 0.45$, $p < 0.01$), reflecting deep path-dependence.

The remittances coefficient remains negative ($\beta = -0.14$, $p < 0.05$).

Governance, financial depth, and polycentricity remain positive and robust in all specifications.

Diagnostic tests: Hansen J-test ($p = 0.32$), AR(2) = 0.48 → instruments valid, no serial correlation.

Robustness checks confirm the robustness of the model after the exclusion of Tirana–Durrës and when using different proxies for remittances (share of GDP) and institutions (World Governance Indicators).

Table 7. Dynamic System-GMM Estimation Results and Diagnostic Tests

Variables	Coefficient (β)	Std. Error	z-statistic	Significance
Previous-year GDP per capita (lagged GDPpc)	0.452	0.081	5.58	p < 0.01
Remittances per capita (REMpc)	-1.141	0.059	-2.39	p < 0.05
Institutional quality (INST)	0.207	0.066	3.14	p < 0.01
Financial intermediation (FIN)	0.118	0.054	2.19	p < 0.05
Polycentricity index (PSS)	0.133	0.047	2.83	p < 0.01
Digital governance (DGOV)	0.067	0.044	1.52	n.s.
Control variables (FDI, education, infrastructure)	0.038	0.025	1.51	n.s.
Constant	5.74	0.92	6.23	p < 0.01

Diagnostic tests:

Hansen J-test = 18.72 ($p = 0.32$) → instruments valid

Arellano–Bond AR(2) = 0.48 → no second-order serial correlation

Wald χ^2 (model) = 142.3 ($p < 0.001$) → jointly significant

Dependent variable: Regional GDP per capita (GDPpc).

The dynamic system GMM estimation accounts for endogeneity by instrumenting lagged dependent and endogenous regressors.

Robust two-step standard errors are reported.

All variables are standardized, and region/time dummies included.

Synthesis of Empirical Findings

The three conclusions are empirically validated:

1. Remittance dependency per se is not growth-promoting but renders the economy consumption-oriented.
2. Institutional quality, financial intermediation, and geographical balance alone render remittances productive capital.
3. Spillover effects confirm that places are linked and polycentricity renders them more resilient and inclusive.

Empirical facts attest to the Digital Garden City (DGC) model as confirming that the future development of Albania rests upon infusing diaspora finance, government reform, and territorial planning.

DISCUSSION AND POLICY IMPLICATIONS

Interpreting the Empirical Evidence

The empirical evidence presented in Section "Results" supports that remittance dependence is not itself inducing sustainable growth in Albania's regional economy.

Although remittances remain an essential source of income, their marginal negative contribution to GDP per capita confirms that remittance flows are primarily directed toward consumption rather than production.

However, the positive and significant remittances-institutional quality, financial intermediation, and spatial diversification interaction effects reveal that the effect of remittances is contingent upon structural and governance settings.

The empirical results confirm the theoretical hypotheses of the Digital Garden City (DGC) model, whereby remittances become growth-enhancing only if they flow through:

1. transparent and efficient institutions (INST),
2. inclusive and accessible financial systems (FIN), and
3. territorially balanced polycentric networks (PSS).

To this extent, the empirical results translate the DGC strategy into measurable evidence showing that finance, governance, and spatial structure are the missing links between external capital and sustainable territorial development.

Institutional and Governance Implications

The significance of institutional quality makes good governance not an afterthought but a catalyst for productive investment.

Better local governance, rule of law, and public financial transparency can:

- enhance remittances' absorption through formal channels,
- raise citizen confidence in local institutions,

- and drive participatory investment platforms, such as digital budget portals and municipal transparency dashboards.

Albania's municipalities can replicate an e-governance policy on the DGC model — harnessing e-government platforms to track and co-sponsor investments made by diaspora communities.

Such a policy is also in line with the EU's Digital Decade program as well as Albania's Public Administration Reform Strategy (2022–2030) and fiscal management principles [31].

Financial and Economic Policy Recommendations

The positive mediating role of financial intermediation shows that remittance flows can be translated into development finance through targeted instruments:

- Garden City Bonds: regional or local bonds that allow diaspora investors to finance green industries or infrastructure;
- Matching Grant Schemes: co-financing instruments that match all euro migrants invest in local enterprises;
- Credit Guarantee Facilities: risk-sharing instruments that allow banks to lend to SMEs in high-remittance areas.

These policies would divert remittances from household consumption to productive, circular reinvestment, reinstating the economic logic of the Digital Garden City.

Territorial and Spatial Development Impacts

The spatial econometric evidence shows that connectivity and polycentricity are pertinent: connected regions to secondary cities benefit more from remittances than isolated regions.

This demands a territory-spread investment strategy, with micro–Digital Garden Cities being first priority in localities such as Kukës, Dibër, Berat, Korçë, Lezhë, and Gjirokastër.

Through combined transport, energy, and digital infrastructure investments, these regions can become productive hubs that reconnect diaspora finance to local economies.

Therefore, in this sense, the DGC model allows for urban decentralization and spatial justice, converting migration-generated inflows into regional regeneration drivers.

Broader Regional Implications

Although the research focus is on Albania, the conclusions drawn have broader relevance to remittance economies in Southeast Europe [35].

These countries such as Serbia, North Macedonia, and Bosnia and Herzegovina share similar structural patterns high rates of emigration, low industrial variety, and regional imbalances.

Adopting the DGC strategy would help these economies transition to territorially integrated, digitally oriented, and environmentally sustainable development paradigms, as also underscored in recent studies on smart territorial systems [24].

Summary

In summary, the argument highlights that remittances are never development in character only developmental under the proper institutional and spatial context. Digital Garden City offers a practical blue-print for executing this transition: linking digital governance, diaspora finance, and polycentric territorial planning. The concluding section summarizes the paper by offering an overview of contributions, limitations, and future research directions. To translate these findings into specific interventions, Table 8 summarizes the key policy suggestions drawn from empirical evidence and conceptual framework. These interventions specify how Albania can apply the DGC principles both at the national and local levels, while also offering replicable interventions to other remittance-dependent economies in Southeast Europe.

Table 8. Policy Recommendations under the Digital Garden City Framework

Policy Area	Proposed Measure	Expected Outcome
Institutional Governance	Establish Digital Governance Portals at the municipal level to track remittance-financed projects and ensure transparency.	Increased institutional trust and citizens' participation; formalization of remittances.
Financial Intermediation	Add Garden City Bonds, Matching Grants, and Diaspora Credit Guarantees to mobilize remittances for productive purposes.	Increased channelling of remittances away from consumption into productive capital; more finance to SMEs.
Territorial Development	Set up micro–Digital Garden Cities in remittance-high but productivity-low regions (Kukës, Dibër, Berat, Korçë, Lezhë, Gjirokastër).	Regional balanced development; local employment and innovation pole establishment.
Digital Transformation	Implement e-government platforms with local budget and planning databases; utilize open-data dashboards to track projects.	Increased efficiency, transparency, and accountability in local development.
Green and Inclusive Growt	Prioritize investments in the circular economy, renewable energy, and green infrastructure in DGC nodes.	Reduced environmental footprint and improved community resilience.
Regional Cooperation	Share remittance-linked development best practices among Western Balkan countries under EU pre-accession tools.	Greater policy homogeneity and regional learning on sustainable territorial development.

Additionally, the table summarises the policy measures on the basis of the Digital Garden City model's empirical evidence and conceptual foundations. All the

recommendations are in alignment with Albania's National Strategy for Development and Integration (NSDI III, 2021–2030) and the EU cohesion and digitalisation objectives.

CONCLUSION

This paper has explored the complex relationship between remittances, institutional quality, financial intermediation, and spatial development in Albania through the lens of the Digital Garden City (DGC) model. The results confirm that while remittances remain a major financial inflow, their developmental potential depends critically on the institutional and territorial environment in which they operate. Empirical validation of the panel, spatial, and dynamic GMM estimates shows that remittances alone do not enhance regional productivity but that their effect becomes positive when combined with good governance, inclusive finance, and polycentric territorial governance. The results provide quantitative validation of the DGC framework, substantiating its theoretical premise that sustainable development in remittance economies requires the convergence of digital governance, fiscal innovation, and spatial equity. At the policy level, the research sets out a practical agenda for translating remittance receipts into productive investment. By utilizing instruments such as Garden City Bonds, matching grants, and diaspora guarantee funds, national and territorial institutions can divert external capital into green industries, entrepreneurship, and territorial regeneration. The development of micro–Digital Garden Cities in peripheral territories would not only stimulate local economies but also consolidate territorial cohesion and social inclusion. However, this study also identifies some limitations.

Regional remittance flows still need to be partly estimated, and the institutional and digital indices rely on proxies rather than direct measurement. Future research should therefore employ municipal-level data, include time-varying institutional indicators, and extend the comparative range to other Western Balkan countries.

In addition, micro-level household surveys would hopefully reveal how household remittance decisions relate to local policy incentives.

Despite these limitations, the paper has three principal contributions:

1. It reimagines remittance-led development from both an institutional and territorial point of view.
2. It suggests the Digital Garden City as a comprehensive framework bridging economic, spatial, and digital development.
3. It provides empirical and policy lessons that can guide Albania and similar economies toward more inclusive, data-driven, and sustainable regional development.

Additionally, the study calls for a paradigm shift from remittance dependence to remittance empowerment where migration capital is no longer a passive income source but an active driver of innovation, equity, and national growth.

AUTHOR CONTRIBUTIONS

Conceptualization, G.K. and A.K.; Methodology, G.K.; Validation, G.K., and A.K.; Investigation, G.K.; Resources, G.K.; Data Curation, A.K.; Writing – Original Draft Preparation, G.K.; Writing – Review & Editing, A.K.; Visualization, A.K.; Supervision, G.K.; Project Administration, G.K.

CONFLICT OF INTERESTS

The authors declare no conflict of interest.

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