

# **Green Capital, Grey Future? The Paradox of Green Dedicated Investments (GDI) and Regional Energy Poverty in the CEE Region**

**1. Introduction and Objectives** The transition to a carbon-neutral economy is not merely a technological or financial challenge but a profound regional development issue. As highlighted by the conference theme, green finance has moved beyond isolated funding mechanisms to play a structural role in shaping regional resilience. The Green Dedicated Investment (GDI) indicator has proven effective in quantifying national green investment rates. However, the macro-level success of GDI often masks micro-level social failures. This study aims to empirically investigate the realization of the "Just Transition" principle in Central and Eastern Europe (CEE). Our central research question is: Does green capital flow to where the social and adaptation needs are greatest, or does it reinforce the dominance of existing economic centers? We introduce the concept of the "Green Scissors" to describe the widening gap between investment-rich industrial hubs and investment-poor, socially vulnerable peripheries.

**2. Theoretical Framework: Market Logic vs. Social Need** The theoretical foundation of the research contrasts the logic of market-based green finance with the principles of cohesion policy.

- **Market Logic:** Private green capital (green bonds, corporate loans) seeks the highest risk-adjusted returns. In the V4 region, this directs capital toward large-scale industrial projects (e.g., gigafactories in Hungary and Poland), inflating the regional GDI.
- **Social Need:** Vulnerability to climate change and energy price shocks is highest in rural, peripheral regions characterized by poor building energy efficiency and low incomes (energy poverty). Our hypothesis is that market mechanisms alone fail to address this mismatch. Instead of a "trickle-down" effect, we observe "green gentrification" or enclave formation, where high-tech green industries operate in isolation from the local socio-economic fabric.

**3. Methodology and Data** The study adapts the GDI methodology to the regional (NUTS2) level for the period 2019–2024.

- **Regionalizing GDI:** We decompose the national GDI into regional components by geolocating major greenfield investments (FDI) and tracking the regional absorption of EU Cohesion Funds and Recovery and Resilience Facility (RRF) payments related to climate objectives.
- **Social Vulnerability Index (SVI):** We construct a composite index using Eurostat and national census data, incorporating: (1) Energy poverty rate (share of income spent on utilities), (2) Building stock quality (energy efficiency rating), and (3) Risk of poverty and social exclusion (AROPE).
- **Analysis:** We employ cluster analysis to categorize regions into four quadrants based on "Green Investment Intensity" (GDI) and "Social Vulnerability."

**4. Empirical Results: The Investment Asymmetry** The analysis reveals sharp territorial disparities across the V4 region.

- **The "Battery Belt" Phenomenon:** Regions with the highest GDI growth (e.g., Debrecen in Hungary, Silesia in Poland) show a weak correlation with improvements in

local social resilience. While GDP per capita rises, indicators of energy poverty often remain stagnant or worsen due to rising housing costs associated with industrialization. The "Green Scissors" open wide here: high investment volume but low social diffusion.

- **The Adaptation Trap:** Peripheral regions (e.g., Eastern Slovakia, North-East Hungary) fall into the "low investment – high vulnerability" trap. Here, private GDI is negligible. The transition depends entirely on public (EU) funds, which are often bureaucratic and slow to deploy for residential energy retrofits.
- **Labor Market Mismatch:** We find that high-GDI regions often rely on imported labor (guest workers) rather than reskilling the local long-term unemployed, undermining the "inclusive growth" narrative.

**5. Discussion and Policy Recommendations** The findings suggest that maximizing GDI at the national level is an insufficient policy goal if it exacerbates regional inequality. The "invisible hand" of green finance does not automatically fix social vulnerabilities. **Recommendations:**

- **Socially Weighted GDI:** Policymakers should introduce a "Social Impact Weighting" for green investments. Public incentives (tax breaks, interest subsidies) should be higher for projects located in high-vulnerability regions.
- **Place-Based Just Transition:** EU funds must shift focus from large infrastructure to decentralized, community-led energy projects (e.g., energy communities) that directly reduce energy poverty.
- **Resilience Metrics:** Regional monitoring systems must integrate GDI with social indicators to provide an early warning system for "unjust" transition pathways.

**6. Conclusion** Green finance is a powerful tool, but without spatial and social direction, it risks creating a "two-speed Europe" regarding sustainability. This study provides evidence that for the transition to be truly resilient and inclusive, we must bridge the gap between where green capital goes and where it is most needed.