# Shaping regional futures in times of sustainability transitions: Territorial capital, transformative capacity and prosilience

## *Térségi jövőképek alakítása a fenntarthatósági átmenetek idején: területi tőke, transzformatív kapacitás és proziliencia*

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ABSTRACT: Sustainability transitions are fundamentally reshaping regional and local economic development trajectories by challenging cities and regions to not only adapt to external shocks but also actively shape their futures. This study connects three emerging approaches of regional and urban development – territorial capital, transformative capacity and prosilience – to better understand how cities and regions may position themselves as agents of, as well as arenas for, sustainability transitions. In this study, territorial capital is understood as comprising both the hard and soft elements of the economic and social 'landscape', which significantly affect the way regional and urban economies are shaped, as well as the structural substrate from which transformative capacity is cultivated. Transformative capacity is defined here as the dynamic competences through which regional and local actors can change current socio-economic systems towards more sustainable configurations, as well as is regarded as a unique perspective of how regional and local development institutions map their future in different 'frontiers' to fit the changing terrain of the economic and social 'landscape'.

In this study, prosilience captures the normative horizon towards which the dynamic interaction of territorial capital and transformative capacity is directed. Drawing on existing research on territorial capital, transformative capacity and prosilience, the study contributes to policy practice by articulating how regional and local development institutions can cultivate the combinatorial constituents of territorial capital and transformative capacity to shape regional futures rather than merely react to external disturbances. Through this lens, shaping regional and local economic development trajectories is perceived as a generative and path-shaping process rather than a reactive adjustment to exogenous pressures. The study contributes to current debates in regional studies and sustainability science by offering a nuanced understanding of how cities and regions can move beyond resilience towards proactive future-making, with implications for place-based development strategies and sustainability-oriented regional policy.

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*KULCSSZAVAK: fenntarthatósági átmenetek; fejlődési pálya kijelölése; területi tőke; transzformatív kapacitás; jövőformálás; proziliencia; regionális és helyi fejlesztés intézményei; regionális és helyi gazdaságfejlesztés*

*ABSZTRAKT: A fenntarthatósági átmenetek alapvetően formálják át a regionális és helyi gazdaságfejlesztési megközelítéseket azáltal, hogy kihívás elé állítják a városokat és a régiókat: nem csupán alkalmazkodniuk kell a külső sokkokhoz, hanem aktívan alakítaniuk is jövőjüket. Jelen tanulmány a regionális és városfejlesztés három kibontakozó megközelítését – a területi tőkét, a transzformatív kapacitást és a prozilienciát – kapcsolja össze annak jobb megértése érdekében, hogy a városok és régiók miként pozicionálhatják magukat egyrészt a fenntarthatósági átmenetek szereplőiként, másrészt azok színtereiként. A területi tőke magában foglalja a társadalmi-gazdasági rendszer azon „kemény" és „puha" tényezőit, amelyek jelentős mértékben befolyásolhatják a regionális és városi léptékű folyamatok formálását, valamint azt a strukturális alapot képezik, amelyből a transzformatív kapacitás létrehozható. A transzformatív kapacitást azon dinamikus kompetenciákként lehet definiálni, amelyek révén a regionális és helyi szereplők fenntarthatóbb konfigurációk felé terelhetik a jelenlegi társadalmi-gazdasági rendszereket; emellett olyan egyedi perspektívaként is tekinthetünk rá, amellyel a regionális és helyi fejlesztési intézmények „feltérképezik" jövőjüket a különböző „új horizontokhoz" igazodva annak érdekében, hogy alkalmazkodjanak a gazdasági és társadalmi rendszer változó kihívásaihoz.*

*A proziliencia azt a normatív „látóhatárt" jelenti, amelyre a területi tőke és a transzformatív kapacitás dinamikus kölcsönhatása irányul. A területi tőke, a transzformatív kapacitás és a proziliencia meglévő kutatásaira támaszkodva a tanulmány szakpolitikai gyakorlati hozzájárulást nyújt annak kifejtésével, hogy a regionális és helyi fejlesztési intézmények miként formálhatják a területi tőke és a transzformatív kapacitás egyesített összetevőit a regionális jövők alakítása érdekében, ahelyett, hogy csupán reagálnának a külső zavarokra. Ezen optikán keresztül a regionális és helyi gazdaságfejlesztési megközelítések formálása generatív és a fejlődési pályát alakító folyamatként jelenik meg, nem pedig a külső hatásokra adott reaktív alkalmazkodásként. A tanulmány a regionális tudományok és a fenntarthatóságtudomány aktuális vitáihoz azzal járul hozzá, hogy árnyaltabb megértést nyújt arról, miként léphetnek túl a városok és régiók a reziliencián a proaktív jövőteremtés irányába, finomítva ezzel a helyalapú fejlesztési stratégiákat és a fenntarthatóság-orientált regionális politikát.*

## Introduction

The early twenty-first century confronts cities and regions worldwide with a fundamental imperative: navigating *sustainability transitions* while fostering economic competitiveness as well as economic and social cohesion (OECD 2023) in a period that can be characterised by discrete shocks and disturbances, such as climate change and biodiversity loss (Krueger et al. 2022; Frantzeskaki et al. 2025), demographic shifts (Burgalassi, Matsumoto 2022), digitalisation and intensifying socio-economic inequalities (Balestra, Ciani 2022), as well as geopolitical volatility (UN 2026).

Contemporary scholarly literature asserts that deep or radical systemic change is required for cities and regions to become sustainable (McCormick et al. 2013; Wolfram 2016; Castán Broto et al. 2019; Ziervogel 2019), raising questions about what should transform in cities and how, going well beyond narrowly environmental measures (Harms, Hofer, Artmann 2024). Accordingly, sustainability

transitions represent systemic transformations and reconfigurations that 'reach into' the deepest layers of how cities and regions reshape production systems, governance arrangements and everyday practices (Coenen, Benneworth, Truffer 2012; Doci et al. 2025; Raven et al. 2026).[1] Thus, the key question is no longer whether cities and regions can recover from shocks and crises, but whether they can deliberately reorient their trajectories towards sustainable futures (Kochskämper et al. 2025).

Regional development theories have increasingly recognised that places are not passive recipients of global forces; instead, they are arenas of strategic action, institutional experimentation and innovations, as well as collective reflection and social learning. The shift towards *endogenous and place-based approaches* in regional and urban economics (Barca, McCann, Rodríguez-Pose 2012; Bartik 2020; Garcilazo, McCann 2025) has foregrounded the importance of localised assets, locally embedded factors and social practices (cf. Camagni, Capello 2013; MacKinnon et al. 2022), human capabilities and agency (cf. Sen 1993; Grillitsch et al. 2022), as well as untraded interdependencies and embeddedness (cf. Storper 1995; Suwala et al. 2025), strengthening their relevance and influence for regional and urban development in modern times. Within the spectrum of relevant theories, the concept of *territorial capital,* which has sought to comprehend the heterogeneous place-specific assets that shape the competitive advantage of regions (Camagni 2008; Camagni, Capello 2013; Camagni 2019), holds particular significance. Besides, *evolutionary approaches* have spotlighted path dependency and path creation, as well as the role of agency in redirecting regional trajectories (cf. Nelson, Winter 1982; Martin, Sunley 2006; Boschma 2015), and *resilience thinking* has brought attention to adaptive capacity, robustness and transformability in the face of shocks and crises (cf. Pike, Dawley, Tomaney 2010; Simmie, Martin 2010; Bristow, Healy 2014). Furthermore, *transition studies* have illuminated the multi-level dynamics through which incumbent socio-technical regimes give way to niche innovations (cf. Geels 2002; Dolata 2009; Markard, Raven, Truffer 2012; Wolfram, Borgström, Farrelly 2019). Among the pertinent theoretical constructs in regional science, the framework of *urban transformative capacity* (hereinafter referred to as *transformative capacity*) emerges as especially noteworthy, which indicates to build institutional, governance, and organizational capacity by enhancing the ability of place-focused stakeholders to improve their power to make a difference in the qualities of their place and implement change for sustainability (Wolfram 2016).

Despite their complementary foci, these research traditions have remained surprisingly siloed. Resilience studies have been criticised, for instance, for their conservatism when applied to social relations, lacking transformative potential, remaining primarily reactive-oriented in response to existential threats, as well as privileging the recovery of prior states over the pursuit of transformative change rather than proactively shaping transition trajectories (Davoudi 2012;

MacKinnon, Derickson 2013; DeVerteuil, Golubchikov 2016). The concept of territorial capital has been criticised, for instance, for undertheorising capacity utilisation among local structural elements (cf. Martinoia, Pompili 2015; Ferretti et al. 2022; Lino et al. 2022). Transition studies have been challenged for neglecting the mobilisation of local resources and territorial capital as constitutive dimensions of transition pathways (cf. Glaas et al. 2019; Withycombe Keeler et al. 2019; Shahani, Pineda-Pinto, Frantzeskaki 2022). Evolutionary economic geography, meanwhile, has struggled to adequately theorise normative directionality, the idea that not all trajectories are equally desirable from a sustainability perspective (Hassink, Isaksen, Trippl 2019).

Accordingly, this study argues that the scale and urgency of sustainability transitions require a conceptual move at the regional and local levels. To address this gap, this study presents the relationships among three emerging and partially complementary concepts, *territorial capital, transformative capacity* and *prosilience,* to underline that one may develop a more complete account of how regions and cities can become active shapers of sustainability transitions if the elements of territorial capital (Camagni 2008; Camagni, Capello 2013; Camagni 2019) with the constituents of transformative capacity framework (Wolfram 2016; Wolfram, Borgström, Farrelly 2019) are synthetised, as well as oriented towards the normative 'horizon' of prosilience (Aroca et al. 2021; Nijkamp et al. 2024; Fromhold-Eisebith, Fahl 2026). In this context, shaping regional and local economic development trajectories is perceived here as a generative and path-shaping process rooted in localised (endogenous) assets and capacities rather than as a reactive adjustment to exogenous shocks.

The remainder of this study is organised as follows. The next section reviews the conceptual background, situating the focal concepts within their respective literatures and identifying key gaps. The succeeding section connects territorial capital, transformative capacity and prosilience, identifies their relationship, as well as discusses governance implications. The last section concludes by reflecting on theoretical contributions, limitations and future research directions.

## New approaches to path setting and future-making at the regional and local level

Although there is no universal model or framework guaranteeing success for regional and local economic development, planning for the *future* can be seen as a task that emerge from the spirit of the past and present, forged by attitude, behaviour, capacity and actions at least on the short run or over an intermediate horizon. Contemporary thinking on future strategies of regional and local economic development has been evolving since the 1990s and have brought approaches and frameworks from management sciences and schools having

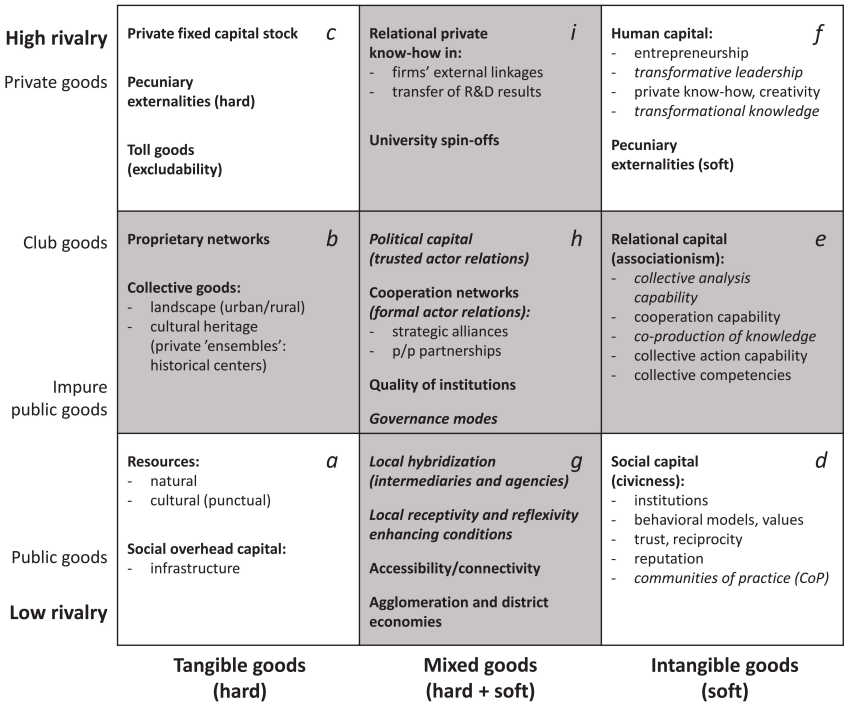
relevance to business and economic development strategy to the field of regional science and urban studies (Stimson, Stough, Roberts 2006). As discussed in the scholarly literature (e.g. Godet 1991; Porter 1991; Mintzberg 1994), while accurately predicting economic futures is difficult, advances in foresight, scenario-based approaches and future-oriented governance have improved our ability to anticipate alternative future developments and to prepare for and manage their potential consequences. According to Rosenberg (1994), if futures can be better anticipated, it will be possible to build better and more reliable *paths* to the future. In line with this concern, Stimson, Stough, Roberts (2006) pointed out that path setting requires understanding that futures may have many potential economic and social '*landscapes*' and '*frontiers*', and that the role of strategy formulation in regional and local economic development is to create paths through a series of evolving and transforming economic and social 'landscapes' and 'frontiers'.[2] It was concluded that the elements that form 'landscapes' and 'frontiers' might create new stages of opportunity at the regional and local levels.

On the one hand, past events shaped many hard and soft elements of the 'landscape', which significantly affect the way regional and urban economies are shaped. Although both hard and soft constituents are beneficial, many of them might be lost with time, while others might transform many times. In this study, the regional (local) set of elements is labelled as *territorial capital*; accordingly, the term is used here to describe the conditions that give form to or shape the future.[3]

On the other hand, 'frontiers' are the outcomes of processes that are evolving nonstop. Accordingly, paths to the future need to undergo continuous transformation to fit the changing terrain of economic and social 'landscapes'. Hence, the role of strategy formulation and planning is to assist in changing the nature of existing 'landscapes' and repositioning paths for regional and local development institutions to harvest opportunities while avoiding pitfalls that may lead cities and regions to suboptimal outcomes and performance. In this study, *transformative capacity* is regarded as a unique perspective of how regional and local development institutions map their future in different 'frontiers'.[4]

Accordingly, the proposition is that regional and local development institutions, including development agencies, investment banks, technology transfer organisations and innovation intermediaries, need to learn to anticipate the future by building on both the constituents of territorial capital and transformative capacity that will define the economic and social 'landscape' and 'frontiers' in which cities and regions operate. As a detailed presentation of the relationship between territorial capital and transformative capacity is already available in the scholarly literature (Tóth 2024), it is not intended to discuss the interaction between their constituents in detail here. *Figure 1* illustrates the joint conceptual framework of the components of territorial capital enriched with the constituents of transformative capacity.

Figure 1: The joint framework: a theoretical taxonomy of the components of territorial capital enriched with the constituents of the transformative capacity
*Az egyesített keretrendszer: a területi tőke összetevőinek és a transzformatív kapacitás alkotóelemeinek elméleti osztályozása*




*Notes: Changes from Camagni's (2019) revised taxonomy of territorial capital are shown in italics. R&D: research and development; p/p: public-private. The four extreme classes (quadrants a, c, d, and f) are called the 'traditional square'. The five intermediate classes with grey coloring (quadrants b, e, g, h, and i) represent the 'innovative cross'.*
*Source: Tóth (2024) based on Camagni (2019) and Wolfram (2016)*

Central to this framework is the recognition that territorial (regional, local) assets are not simply additive stocks in a steady-state environment but form interdependent configurations whose value depends on complementarity and contextual embeddedness in an environment of dynamic change. This turn may be particularly important due to the following reasons, which can be robustly supported with arguments from the place-based development, planning and governance literature (e.g. Rodríguez-Pose, Wilkie 2017; Bartik 2020; Garcilazo, McCann 2025) as follows.

First, regional and local development institutions may clearly understand the changing conditions and 'frontiers' in the different 'landscapes' before setting a path for the future. To this end, special importance should be placed on those resources and capacity that the public and private sectors can direct towards regional and urban development. Second, in the face of sustainability

transitions, regional and local actors may better understand how regions and cities manage the reconfiguration of territorial assets, preserving valuable legacies while enabling the necessary transitions. The degree to which regional and local actors and decision-makers commit resources to the community determines the scope and scale of actions, potentially further enhancing the resource endowment and capacity of a city or a region. Furthermore, an important principle in regional and urban economic development is that it needs to be revolutionary in the sense of maintaining a focus on perpetual reinvention of strategy to position for competitive advantage. This also means that path setting is not absolute, but rather a task that steers cities and regions along economic paths that constantly evolve, while capturing opportunities for business, investment and development.

The relatively new notion of *prosilience* has been introduced to articulate the need for innovative and creative development strategies that would pursue a sustainable future of a system in transition (Aroca et al. 2021). It also indicates the need to prepare for the upcoming crisis response by connecting flexible adaption qualities with prognosis and prospective (predictive) adjustment to prepare in advance for a change (Fromhold-Eisebith, Fahl 2026).

The concept of prosilience has been proposed as a synthesis of *resilience* and *proactivity,* capturing the idea that effective responses to systemic (e.g. social, economic) challenges require not merely the capacity to absorb and recover from disturbance, but the foresight and agency to shape future conditions in ways that reduce vulnerability while advancing sustainability objectives (Nijkamp et al. 2024). According to Aroca et al. (2021), prosilience will be achieved if regional and local actors develop a commonly shared development vision.[5]

This requires intelligent transformation of a region or a city in decline. Nijkamp et al. (2024, 4) also underlined that *human intelligence* and *adaptability* are the driving forces behind prosilience, as well as stated that the essence of prosilince is the ability to *transform challenges to opportunities* to thrive in the aftermath of shocks: "[b]y embracing the concept of prosilience, regions and urban agglomerations are better equipped to manage uncertainty, turning setbacks into opportunities for renewal and growth".

Accordingly, prosilience implies a 'departure' from reactive approaches that prioritise the restoration of prior states towards anticipatory approaches that actively cultivate the conditions for desirable futures. However, prosilience does not replace resilience; rather, it extends and reorients it: cities and regions still require the capacity to absorb shocks, but also the capability to transform proactively. Nevertheless, as shown in *Table 1,* there are clear distinctions between the ideas of resilience and prosilience in terms of their focus, temporal orientation, normative directionality and vision on path setting.

Table 1: The main distinctions between 'resilience' and 'prosilience'
*A reziliencia és proziliencia közötti főbb eltérések*

| *Aspect of comparison* | *Resilience* | *Prosilience* |
|---|---|---|
| Focus | how regions and cities *respond to* disturbances and external shocks | how regions and cities *prepare for* and strategically *leverage* transformation |
| Temporal orientation | *post-shock adaptation*: rapid recovery from disturbances | *proactive future-making*: anticipatory governance and strategic foresight |
| Normative directionality, policy applications | frequently remains *conservative,* often *neutral* regarding system goals | explicitly *transformation-oriented:* navigates sustainability transitions |
| Path setting vision | often accommodates structural persistence, prioritises the *restoration of prior state(s)* and *pre-crisis configurations* | centres collective agency in shaping *new development paths*, actively cultivates the conditions of desirable futures |

*Source: Author's construction based on Davoudi (2012); MacKinnon, Derickson (2013); DeVerteuil, Golubchikov (2016), Aroca et al. (2021), Nijkamp et al. (2024)*

Prosilience, as conceptualised here, involves three interrelated dimensions of intelligent transformation. The first is *anticipatory intelligence,* which is defined here as the capacity to sense, interpret and act on signals of emerging challenges and opportunities before they 'crystallise' into crises. The second is *self-navigation ability,* which can be regarded as the ability to steer cities and regions towards preferred futures by shaping the 'milieu' for sustainability-oriented innovations and sustaining the transformative momentum over the intermediate or long horizon. The third is *reflexive adaptation,* which is understood here as the ongoing capacity to evaluate the consequences of transformative interventions, learn from experiences and failures, as well as adjust strategies to evolving circumstances. Accordingly, prosilience can be thought of as a proactive, anticipatory future-making approach to pursue *new development paths* and *sustainability transitions* simultaneously – not as a trade-off, but as a co-evolutionary achievement.

## Path setting and future-making in the face of sustainability transitions: the link between territorial capital, transformative capacity and prosilience. Governance implications

The theoretical foundations presented in the previous section may provide a conceptual basis and vocabulary to articulate how cities and regions can shape their futures in times of sustainability transitions. The three focal concepts share a commitment to understanding regional development as a process in which past decisions constrain and enable present options, present decisions constrain and

enable future options, and the relationship between structure and agency is recursive rather than deterministic. The argument developed here integrates these emphases by treating territorial capital as the *structural substrate,* transformative capacity as the *agential dimension*, and prosilience as the *normative orientation* needed to reduce vulnerability, enhance adaptability and navigate sustainability transitions.[6]

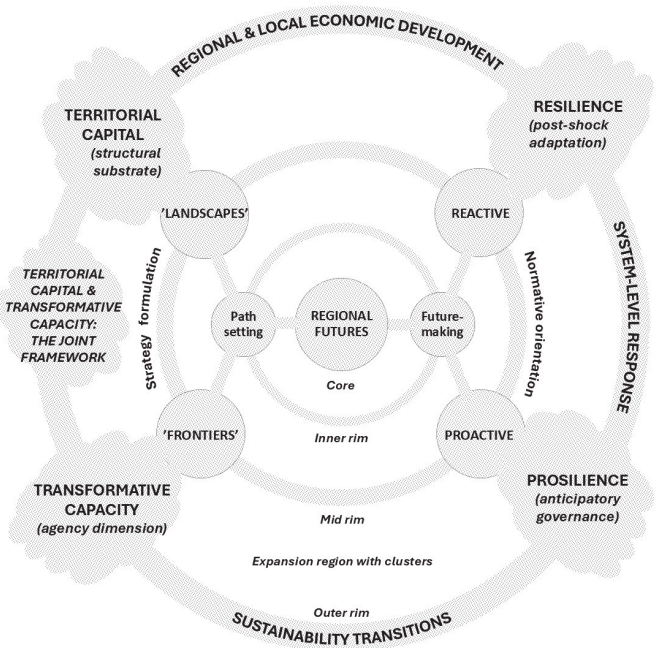
The relationship between the three concepts is *co-evolutionary*. Cities and regions that have strong institutions (an advantage in social capital; quadrant d in Figure 1), as well as rich knowledge and dense cooperation networks (a strong endowment of human capital and mixed goods; quadrants f and h in Figure 1), are more likely to exhibit prosilient dynamics. Yet being well-endowed with such resources alone is insufficient, as the resource endowment must be activated through deliberate strategies that intentionally reconfigure the existing socio-economic structural substrate in response to sustainability-oriented imperatives. Selected general examples are provided below.

Regional and local economic development strategy formulation that neglects prosilience in pursuit of transformative ambition risks generating backlash from communities experiencing rapid economic disruption. Cities and regions that limit themselves to prosilience without cultivating transformative capacity risk path dependency, leaving them poorly positioned for longrun competitiveness. In other words, they may achieve incremental improvements while missing the needed fundamental transformations. Territories with abundant renewable energy resources (advantage in natural capital; quadrant a in Figure 1) but weak governance institutions (socio-institutional liability; quadrants g and h in Figure 1) may fail to capture the value of their natural endowments. Cities and regions with strong learning and networking capacities (transformative capacity advantage; quadrants e and f in Figure 1) but inadequate financial resources (resource mobilisation constraint; quadrant c in Figure 1) may generate numerous transition experiments without achieving systemic scale. Accordingly, understanding the combinatorial dynamics of territorial capital, transformative capacity and prosilience, as well as designing governance responses that address the specific asset-capacity mismatches facing different regions, is a central practical contribution.

Before considering the governance implications, the key terms and related concepts central to this study are collectively illustrated. *Figure 2* presents the 'cosmic system' model of shaping regional and local economic development trajectories, along with its elements discussed previously in this study. R*egional futures* (*'core'*) are defined in this conceptual model as the set of possible trajectories of regions and cities, arising from the dynamic interaction of path setting and future-making (*'inner rim'*). In this model, *path setting* refers to the selectively combined *'landscape'* features of regions and cities towards largely unexplored *'frontiers',* and future-making denotes a generative process (*prosilience*) and adaptive

process (*resilience*) in which regional and local actors construct their future (*'mid rim'*). Rather than adhering to fixed endpoints, it is suggested that regional and local development institutions should continuously redefine the path in response to emerging opportunities and challenges in times of sustainability transitions to strengthen regional and local economies (*'outer rim'*).

Figure 2: The 'cosmic system' model of shaping regional and local economic development trajectories with its elements
*Fejlődési pályák alakításának „kozmikus rendszer" modellje és főbb elemei a regionális és helyi gazdaságfejlesztésben*




*Source: Author's construction*

As the presence and type of governance significantly influence asset integration and development trajectory (Mozaffarian, Zandiatashbar, Reyes-Sanchez 2026), new modes of governance may play a pivotal role in shaping regional and local economic development trajectories; especially, *regional and local economic development institutions* occupy a strategically important position in prosilience-oriented governance (cf. Nijkamp et al. 2024). Governance modes that are *inclusive* – emphasising broad participation and equity (e.g. Wolfram 2016; Borgström 2019; Castán Broto et al. 2019; Ziervogel 2019; Sánchez-Soriano et al. 2024) –, *collaborative* – featuring multi-actor networks and public-private-civic partnerships (e.g. Glaas et al. 2022; Kovanen, Ulrich, Gailing 2023) –, as well as *adaptive* – incorporating novel policy tools and flexible institutions (e.g. Long et

al. 2023) – have been repeatedly identified as significant drivers of sustainability transitions, as well as regional and local economic development.

The distinctive value of the new mode of governance compared to its previous modes may lie in their capacity to operate across the boundaries between public and private, between policy design and operational implementation, as well as between current capabilities and factor endowments and future aspirations and opportunities at the same time. In the transition context, effective regional and local economic development institutions function not merely as funders or programme administrators but as *'system orchestrators'* that actively shape the direction and pace of regional transition dynamics. This orchestration role, or "balanced orchestration of governance" according to Nijkamp et al. (2024, 8.), may include the following criteria, as well as a necessary but not exhaustive list of tasks:

- building the institutional infrastructure needed for long-term transformative governance by insulating institutions from short-term political pressures and maintaining democratic accountability;
- creating leadership models that combine deep place-based knowledge with broad awareness of global transition dynamics, as well as maintaining smart strategic intelligence about global transition dynamics and their regional implications,
- brokering connections between regional and local actors and extra-regional knowledge sources, investors and policy networks;
- sponsoring experiments and demonstration projects that expand the imagination of what is possible;
- establishing evaluation frameworks that assess institutional performance in terms of long-run transformative contribution rather than narrow programme efficiency metrics.

Taken together, the main challenge for regional and local development institutions in the transition context is to develop *'institutional identities*' and '*operational cultures*' that can sustain transformative ambition over extended time periods while remaining responsive to evolving global, national and regional circumstances.

The following proposal below suggests several principles for regional and urban governance that seeks to cultivate territorial capital, transformative capacity and prosilience concurrently in the face of sustainability transitions. The central implication is that governance strategies must be tailored to the *specific territorial capital configurations and transformative capacity profile of individual regions or cities.* Together, these may represent a widely applicable orientation that can shape the design of place-sensitive transition governance across diverse contexts.

The first principle is *asset configuration auditing*. Transition governance should begin with a comprehensive, forward-looking assessment of a city's or region's territorial capital configuration that identifies not merely current asset stocks but their transition-relevance, adaptability and accessibility. Such audits should go

beyond conventional economic analysis to encompass socio-institutional, cognitive and relational dimensions of territorial capital, and should be conducted through inclusive processes that surface the knowledge and perspectives of diverse community actors.

The second principle is *capacity investment sequencing.* Recognising that different regional and local economic development trajectories are constrained by different capacity deficits is crucial. Hence, governance interventions should prioritise investments that address the specific transformative capacity dimensions.

The third principle is *temporal horizon integration.* Prosilience-oriented governance requires explicit attention to the alignment and potential tensions between short-term defensive measures, medium-term adaptive adjustments, and long-term transformative investments. Governance arrangements that integrate these temporal horizons, for instance, through scenario planning, long-term investment frameworks and adaptive governance mechanisms, are more likely to generate coherent transition pathways than those that respond *ad hoc* to immediate pressures without considering long-run implications.

The fourth principle is *distributional intentionality*. Transitions generate 'winners' and 'losers' at multiple scales, and governance arrangements that neglect distributional consequences risk generating social and political backlash that undermines the transformative momentum. Prosilience-oriented governance should build distributional considerations into transition design from the outset; not as a compensatory afterthought, but as a constitutive dimension of what it means to achieve a just and sustainable transition.

## Conclusions

Sustainability transitions confront cities and regions with unprecedented challenges and opportunities in the early twenty-first century. The capacity to adapt is no longer sufficient; thus, cities and regions must cultivate the ability to anticipate and manage transformative change, as well as shape their futures. Sustainability transitions do not unfold uniformly across cities and regions; they are shaped, constrained and enabled by the extraordinary diversity of territorial capital configurations and transformative capacity profiles that characterise the regional and urban economies globally. Understanding this diversity as well as designing governance responses that leverage it rather than suppressing it, is one of the central intellectual and practical challenges of regional and local development scholarship nowadays.

This study can be regarded as a first attempt to connect territorial capital, transformative capacity and prosilience to provide a more comprehensive account of how regions can become active shapers of sustainability transitions. This study offered an additional contribution to the existing literature as follows.

By extending the joint framework of territorial capital and transformative capacity to incorporate prosilience, a significant gap was addressed in existing conceptualisations. On the one hand, prosilience, perceived here as the normative horizon towards which the dynamic interaction of territorial capital and transformative capacity should be directed, offers a more nuanced and dynamic account of regional futures than either resilience or transformative capacity alone can provide. On the other hand, the multi-dimensional concept presented here is more fully developed with recent insights from regional science research and transition studies about the role of place-based imaginaries in shaping development trajectories. Territorial capital, transformative capacity and prosilience explicitly connects structural substrate with agential dimension and normative orientation, addressing the critique that regional and local economic development frameworks have been insufficiently attentive to political economy. The multi-dimensional concept directs attention to the combinatorial dynamics between these dimensions which remains an important frontier for future research.

By proposing certain principles for regional and urban governance, a more coherent analytical lens can be created that addresses governance challenges as well as the multidimensional requirements of sustainability transitions in urban and regional contexts. In this sense, the principles are not intended as standalone normative claims but as an interpretive device for analysing how governance systems mobilise territorial assets while enabling transformative change under conditions of uncertainty. This integration responds to a gap in the literature, where these three strands are often treated in isolation despite their conceptual complementarity in addressing sustainability transitions.

Several limitations of the present study should be acknowledged.

First, the proposed approach remains primarily conceptual in its current form. While this is appropriate for the framework-building purpose of this study, future empirical work should develop the key dimensions of the framework and test the proposed relationships using local and regional datasets. The argument developed in this study may open new avenues for empirical research, including comparative studies of regions undergoing industrial restructuring, longitudinal analyses of policy experimentation, and the development of composite indicators for prosilience.

Second, the multi-dimensional concept presented here does not fully address the question of regional positionality in sustainability transitions. As decarbonisation, digitalisation, and resource geopolitics restructure global economic geographies, regions face transition challenges that are shaped not only by their internal characteristics but by their positions in global production networks, supply chains and investment flows. Future theoretical development should more explicitly integrate the global-local dynamics of sustainability transitions into the proposed approach.

Third, the distributional and justice dimensions of prosilience deserve more sustained theoretical development. The proposed governance principles identify distributional intentionality but does not fully theorise the relationships between prosilience, equity and the political economy of transition governance. Drawing more explicitly on environmental justice research and political economy perspectives would strengthen the argument about who benefits from, as well as who bears the costs of, prosilience-oriented transitions.

Fourth, the relationship between local-scale initiatives and broader multiscalar governance contexts requires more careful consideration in future research. While this study emphasises the importance of local action in sustainability transitions, transformative change cannot be assumed to emerge or be sustained solely at the local level, particularly when national or supranational institutional environments are unsupportive or contradictory (e.g. Wolfram 2019). Local experiments and institutional innovations may generate transformative potential, but their capacity to produce broader systemic change depends on interactions with higher governance levels, regulatory frameworks and political-economic structures. Accordingly, the effective institutionalisation of *doughnut economy* principles and localised *degrowth* strategies constitutes a prerequisite for advancing sustainable socio-economic transitions (cf. Martínez Alonso 2022; Schmid 2025).

The multi-dimensional conception developed in this study may contribute to meeting these challenges by providing a vocabulary and analytical structure for understanding how cities and regions can become proactive agents of sustainable futures rather than 'passive victims' of global transition pressures. In particular, the concept of prosilience captures an aspiration that is increasingly central to regional and local economic development practice: the ambition not merely to survive sustainability transitions but to use them as opportunities to build more resilient, equitable and flourishing regional and local institutions and communities.

The 'path' to regional prosilience is neither predetermined nor straightforward. It requires a sustained institutional basis, inclusive, collaborative and adaptive governance modes, and the political courage to challenge incumbent interests and imagine genuinely alternative futures. Identifying the conditions, mechanisms and governance arrangements that enable such achievements, and making this knowledge available to the full diversity of cities and regions facing sustainability transitions challenges, is a task to which regional scientists are uniquely positioned to contribute. For scholars and policymakers alike, embracing prosilience may offer a pathway towards more sustainable, inclusive and strategically oriented regional futures.

## Notes

1 Although certain strands of the literature conceptualise 'transitions' and 'transformation(s)' as distinct phenomena, both concepts largely refer to fundamental systemic changes towards sustainability. Accordingly, the boundary between the two concepts is blurred (cf. Olsson, Galaz, Boonstra, 2014; Fazey et al. 2018). Since the objective of this study is not to engage in this conceptual debate, the terms are used interchangeably throughout the study. Moreover, 'sustainability transitions' are understood here in a reformist sense, referring to substantial changes in government arrangements and planning practices that remain broadly compatible with existing socio-economic structures. While I acknowledge alternative perspectives and conceptualisations that emphasise deeper systemic change, as well as 'post-growth' and 'strong sustainability' perspectives (cf. Hopwood, Mellor, O'Brien, 2005; Scoones et al. 2020), my standpoint is situated within the reformist tradition of sustainability transitions.

2 According to Stimson, Stough and Roberts (2006), the major leading edge 'frontiers' are as follows: advanced technologies, building design, transport and communications, knowledge-based networks, social/cultural values including liveability and equity, sustainable development, as well as governance and institutional arrangements.

3 The concept of territorial capital entered the regional development discourse through Roberto Camagni's influential synthesis on localised assets (Camagni 2008; revised: Camagni 2019), which sought to move beyond narrow factor-endowment approaches by recognising a full range of material, non-material and mixed assets that differentiate regional development potentials.

4 According to the pioneer of the urban transformative capacity framework, Marc Wolfram, transformative capacity is the ability to reconfigure institutions, practices, and infrastructures in ways that enable fundamental sustainability transitions. This definition emphasises intentionality, systemic orientation and the capacity to work across multiple scales and domains simultaneously (Wolfram 2016).

5 On a more critical note, it should be acknowledged that building and maintaining such a vision is often challenging. Divergent interests, power asymmetries, competing priorities, as well as differences in perceptions of risks and opportunities can hinder consensus-building and collective action. Accordingly, a commonly shared development vision should be understood not as a sufficient condition for prosilience, but as an aspirational and ongoing governance process that requires negotiation, trust-building and institutional coordination among stakeholders.

6 Prosilience does not replace the normative dimension of transformative capacity but sharpens it into a more explicit guiding orientation for assessing and steering transformation processes. Therefore, the relationship can be seen as complementary rather than additive in a strict sense: transformative capacity refers to the agential and enabling conditions for change, while prosilience specifies the normative directionality of that change. The purpose of distinguishing the two is to avoid conflating the capacity for transformation with the normative question of what kinds of transformation are desirable.

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