

## Article

# The Paradox of Urban Environmental Paradigms: A Theory of Legitimacy, Dominance, and Operational Divergence

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## Abstract

Why do some urban environmental paradigms become globally dominant while others remain marginal despite substantial convergence in their environmental foundations? This question captures a central paradox in contemporary urban environmental planning: sustainable, resilient, low-carbon, circular, regenerative, and related formulations continue to proliferate, yet their institutional trajectories differ markedly. This study addresses that paradox by developing a theory explaining how urban environmental paradigms are defined, institutionally produced, legitimated, diffused, and operationalized across planning, policy, certification, and development systems. Rather than treating environmental labels as equivalent to paradigms, the study conceptualizes urban environmental paradigms as institutionally recognized organizing frames that structure problem interpretations, normative priorities, legitimate interventions, and evaluative expectations. Drawing on institutional theory, legitimacy theory, diffusion of innovations, policy mobility, market signaling, experimental governance, and bounded rationality, the analysis integrates scholarly and institutional evidence to develop a four-pillar institutional ecosystem operating through six cross-cutting mechanisms and self-reinforcing diffusion architectures. It further identifies configurational conditions associated with institutional dominance and advances the proposition that paradigms converge upstream in shared environmental logic families while diverging downstream through heterogeneous governance, implementation, and operational conditions. The resulting theory explains why conceptually convergent paradigms follow markedly different institutional and operational trajectories across contexts.

**Keywords:** urban environmental paradigms; institutional legitimacy; global diffusion; institutional dominance; upstream convergence; operational divergence



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## 1. Introduction

Since the late twentieth century, growing international recognition of the environmental, climatic, and developmental consequences of industrialization, rapid urbanization, and resource depletion has elevated sustainability to a central concern in urban policy and planning. Successive international agendas and agreements have progressively institutionalized this concern and have encouraged the development of new paradigms intended to guide more environmentally responsible forms of urban development [1–4].

These agendas have linked environmentally oriented urban development not only to environmental protection, but also to broader priorities involving energy security, water security, food security, economic competitiveness, infrastructure investment, and long-term risk management [3,4]. As a result, urban environmental paradigms have evolved

at the intersection of environmental governance, development policy, capital allocation, and strategic planning. Their emergence reflects not only ecological imperatives, but also institutional efforts to coordinate investment, reduce uncertainty, attract funding, and align urban development with globally recognized priorities [5,6].

This institutional landscape encompasses an expanding set of formulations, including eco-cities, sustainable communities, low-carbon districts, resilient communities, regenerative developments, positive energy districts, nature-positive neighborhoods, and related approaches. Comparative scholarship identifies substantial interconnection and overlapping environmental concerns alongside differences in organizing purposes and priorities [7–9]. Conceptual overlap and paradigmatic differentiation can therefore coexist: shared environmental concerns need not imply identical normative commitments, intervention priorities, or evaluative rules.

This coexistence produces a central paradox. **Why do some urban environmental paradigms achieve substantial institutional prominence while others remain comparatively marginal despite significant overlap in their environmental foundations?**

Addressing this paradox requires explaining how formulations acquire legitimacy, circulate internationally, and attain sustained relative influence over planning, policy, certification, and investment decisions. It also requires examining how that influence relates to operational realization across heterogeneous contexts. Institutional prominence and environmental performance are distinct outcomes whose relationship requires explanation.

Existing scholarship has generated important insights into sustainability assessment, resilience, regenerative design, and urban environmental governance [1,10–12]. Institutional and legitimacy theories explain how ideas acquire acceptance and authority [13–15]. Diffusion and policy-mobility research explains circulation and contextual translation [16–18], while research on standards and assessment examines how environmental purposes become evaluative requirements and how compliance relates to effectiveness [12,19,20]. The remaining explanatory problem is therefore not whether legitimacy, institutional similarity, policy circulation, or contextual translation occur independently, but how these processes become connected across analytical levels: how partly overlapping environmental frames are selectively institutionalized, acquire unequal authority, are translated into situated arrangements of implementation, and generate differentiated operational consequences and feedback.

These processes involve unequal capacities to define priorities, authorize knowledge, and mobilize resources. Financial evaluation can shape the meaning of resilience and investment priorities, while local actors can contest, reinterpret, or interrupt internationally promoted formulations [11,21]. Power, strategic interests, and contested legitimacy therefore form part of the explanation of institutional production and diffusion.

Published evidence provides complementary foundations for this inquiry. Comparative studies establish connections and distinctions among urban environmental formulations [7,9]. Cross-evaluation shows that the same developments can receive different judgments under different assessment systems, while implementation studies document differences between stated ambitions and realized outcomes [22–24]. The study integrates this scholarship with institutional documents and analyses of decision rules, implementation, and monitoring to develop its explanatory relationships.

To address this explanatory gap, the study asks the following core research question:

**How are urban environmental paradigms institutionally produced, legitimized, and diffused, and under what conditions do they attain institutional dominance and diverge operationally across contexts?**

This study develops a theory of how urban environmental paradigms emerge, acquire legitimacy, and attain institutional influence. It conceptualizes them as institutionally

recognized organizing frames that structure problem interpretations, normative priorities, legitimate interventions, and evaluative expectations, and can also coordinate action and mobilize resources as legitimacy devices. The contribution connects mechanisms supporting differential institutional influence with contextual conditions governing operational realization, explaining how shared environmental foundations coexist with unequal authority and differentiated enactment.

The study develops its explanation through three complementary analytical outputs. The theory specifies proposed relationships, mechanisms, boundary conditions, and propositions; the explanatory framework organizes the institutional roles, diffusion domains, conditions, and analytical levels through which those relationships are examined; and the conceptual model represents their connections and recursive feedback [25,26].

Four contributions develop this account. First, the study specifies how institutional selection and reproduction differentiate paradigms that share environmental concerns. Second, it develops a four-pillar institutional ecosystem and six cross-cutting mechanisms to explain their production and stabilization. Third, it connects five interacting diffusion domains with seven configurational conditions associated with institutional dominance, distinguishing international circulation from sustained relative authority. Fourth, it advances the proposition of upstream convergence and downstream divergence, linking recurring environmental logics to differentiated governance, implementation, and operational conditions. This proposition preserves differences among paradigms and connects institutional differentiation with contextual translation. Together, these relationships explain why institutional dominance and environmental performance can follow different trajectories, while implementation and monitored outcomes can feed back into institutional recognition and rules.

The study further identifies a critical institutional tension: codification can enhance legitimacy, comparability, and diffusion while privileging dimensions that are more readily measured and standardized. Such selectivity may narrow the substantive breadth of the environmental purposes represented. Examining how selected criteria enter recognition, investment, and implementation decisions connects this tension to the distribution of institutional influence and the conditions of environmental delivery.

The core argument is organized into three interrelated parts. Part I (Sections 3–5) examines the definition and institutional production of urban environmental paradigms. Part II (Sections 6 and 7) explains global diffusion and the configurational conditions of institutional dominance. Part III (Section 8) develops the proposition of upstream convergence and downstream divergence through institutional differentiation and contextual translation. The Discussion draws out the theoretical implications, practical diagnostic use, scope conditions, and empirical research agenda.

## 2. Methodological Approach

### 2.1. Research Design and Evidence Base

This study adopts a conceptual theory-building design to develop an integrated explanation of how urban environmental paradigms are institutionally produced, legitimized, diffused, and translated into context-specific forms of enactment. Conceptual research is appropriate where the principal objective is not to estimate prevalence or effect size, but to connect dispersed concepts, theoretical perspectives, and empirical insights in order to clarify relationships that remain insufficiently explained [25,27]. The study produces three nested analytical outputs. First, the theory specifies the proposed explanatory relationships, mechanisms, boundary conditions, and propositions. Second, the integrated explanatory framework organizes the relevant role-domains, mechanisms, diffusion domains, configurational conditions, contextual mediators, and outcomes. Third, the conceptual model

visually represents how those elements connect across levels and through recursive feedback. Theory, framework, and model therefore denote different functions within the same inquiry rather than alternative claims about its empirical validation. Accordingly, the study does not employ a systematic- or scoping-review protocol and does not claim exhaustive coverage of all literature concerning urban environmental paradigms.

The evidence base comprises two complementary streams with distinct analytical functions. Scholarly evidence includes foundational theoretical works and peer-reviewed conceptual, review, and empirical studies on environmental paradigms and urban labels, institutional theory, legitimacy, bounded rationality, diffusion, policy mobility and translation, experimental governance, standardization and certification, professional networks, market signaling, implementation, and environmental performance. Foundational works were retained where they provided necessary explanatory constructs, regardless of date; recent scholarship examines contemporary concepts, translation, assessment, power, contestation, and the relationship between formal recognition and operational realization. Institutional and practice-oriented evidence includes international agendas, policy documents, standards and assessment systems, professional and network documentation, organizational reports, and financing or development frameworks. These sources are used to document the existence and formal characteristics of institutional arrangements, rules, evaluative infrastructures, and modes of recognition; claims of environmental achievement require separate outcome evidence.

The analysis draws on scholarly and institutional sources selected purposively for their contribution to the explanatory problem. Contemporary scholarship emphasizes 2016–2026 alongside foundational works and relevant project histories. Retrieval combined concept, title, author and DOI searches, reference following, and access through ScienceDirect, Wiley Online Library, SAGE Journals, SpringerLink, institutional repositories, and official websites. Search concepts connected urban environmental formulations with legitimacy, diffusion, policy mobility, codification, standards, implementation, and performance. Inclusion required identifiable provenance, substantive analytical relevance, and compatibility between source scope and intended inference. Contrasting findings and interrupted programmes were retained; unverifiable identities and unsupported promotional claims were excluded.

## 2.2. Evidence Analysis and Construct Development

Source analysis extracted conceptual definitions, explanatory arguments, institutional mandates, assessment rules, resource arrangements, implementation processes, and reported outcomes. Each analytical entry links the relevant material and its source location to an interpretation, an explanatory contribution, and its scope. Theoretical perspectives were integrated according to the relationships they illuminate: institutional authority and legitimacy, circulation and translation, incentives and strategic choice, and implementation and feedback. Comparison across the two evidence streams examined how theoretical relationships are expressed, qualified, or challenged in documented institutional settings.

Construct development combined theory-informed deduction with interpretive comparison of these analyses. Categories were distinguished by explanatory function: institutional capacities, mechanisms of action, diffusion domains, enabling conditions, contextual mediators, and outcomes. Functional assessment examined the explanatory consequences of removing a component or merging it with another at the same analytical level. This procedure supports the four institutional pillars, understood as functional role-domains, six cross-cutting mechanisms, five interacting diffusion domains, and seven configurational conditions. Relationships were examined across analytical levels, including reciprocal influences and feedback from implementation.

Comparative materials were selected for distinct analytical functions rather than assembled as a single case sample. The four environmental formulations used for conceptual comparison were selected for contrasting organizing logics, documented institutional reproduction beyond a single project or author, and sufficient environmental overlap for meaningful comparison. The City Resilience Framework 2024 and the February 2024 LEED cities guide were paired to examine overlapping city-scale concerns expressed through different goal and assessment structures [28,29]. Comparison retains each document's object, boundary, time basis, metric, and decision rule.

The 21-city comparison retains the sample reported in the 100 Resilient Cities evaluation [30]. Secondary re-tabulation summarizes baseline–final changes across its 12 planning and operations constructs, retaining ordinal categories and within-city dependence. Published city histories help interpret the observed changes. This comparison describes institutional trajectories within a shared programme rather than environmental performance or programme effects.

Published city and project evidence was retained where it documented a relevant institutional arrangement, implementation process, operational outcome, or challenge to a proposed relationship. The selected material includes continuing and interrupted support, reported environmental gains and shortfalls, and corrective learning. These cases ground and qualify constituent relationships through illustration and analytical comparison; they are not used as a dedicated empirical test of the four propositions. The Supplementary File details the selection rationale and the contribution and evidentiary scope of these comparisons.

An illustrative mathematical model examined how baseline uptake tendencies and feedback generate alternative diffusion trajectories. Equilibrium and stability analysis identified conditions for threshold-dependent uptake, growth toward saturation, contraction, or a stable interior equilibrium. The parameters are analytically specified to examine conditional dynamics.

### *2.3. Proposition Development and Analytical Assessment*

Explanatory assessment considered competing accounts, including coercion, resource asymmetry, political authority, strategic ambiguity, and local agency. Comparisons examined diffusion with limited codification, institutional recognition with weak implementation, effective local realization without wider dominance, and divergence through successful adaptation. Power and contestation were examined through their effects on authorization, rule-making, resource allocation, interpretation, and resistance. These checks informed the refinement and qualification of the proposed relationships.

Four propositions organize the resulting explanation: institutional differentiation; configurational dominance; upstream convergence and downstream divergence; and dominance–performance non-equivalence. Each is specified through a unit of analysis, proposed relationship, observable traces, competing explanations, and potential challenges. Analytical sufficiency required a distinct explanatory function, traceable support, an explicit scope, and consideration of a rival explanation or limiting case.

Institutional change, assessment judgments, projected targets, and realized outcomes retain separate evidentiary roles. The propositions provide theoretically grounded relationships for subsequent comparative and longitudinal examination. Figure 1 summarizes the connections between the evidence, analytical procedures, and theoretical outputs.

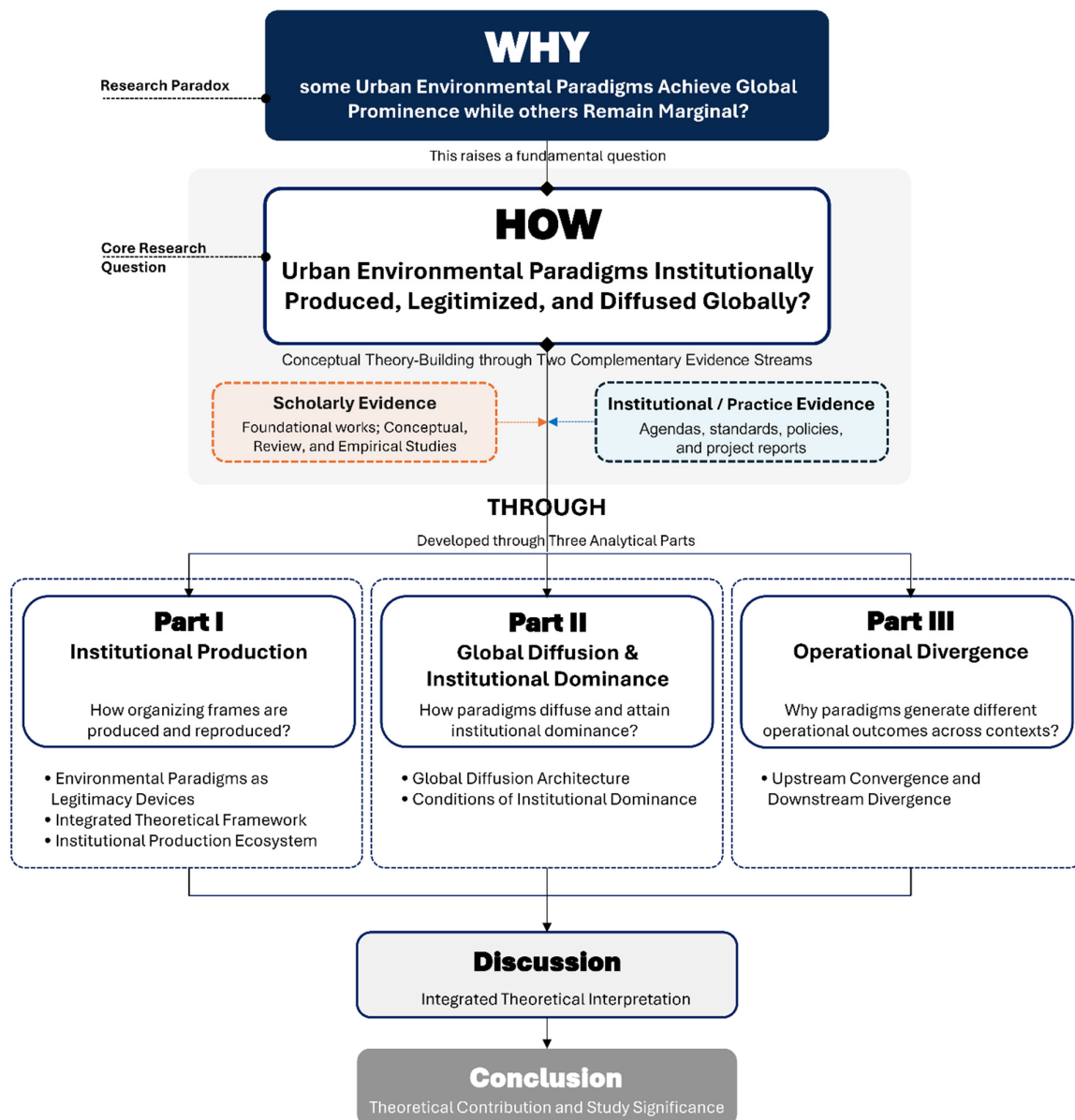


**Figure 1. Conceptual Map and Analytical Progression of the Study.** Provides an integrated visual synthesis of the study’s conceptual and methodological logic. It connects the research paradox and core theoretical question with two complementary evidence streams and three analytical parts, culminating in the integrated theoretical interpretation and contribution. Source: Author’s conceptualization and synthesis.

The Supplementary File provides source documentation and reference verification, extended comparative analyses, conceptual and mathematical derivations, and proposition-specific evidence and scope conditions. Together, these materials make the connections between evidence, analytical decisions, and theoretical claims transparent and traceable, complementing the central explanatory argument presented in the main text.

### 3. Conceptualizing Urban Environmental Paradigms

#### 3.1. Defining the Urban Environmental Paradigm: From Scientific to Policy and Planning Paradigms

The term paradigm requires clarification before being applied to environmentally oriented urban development. In the philosophy of science, Kuhn [31] used paradigms to describe shared assumptions, exemplars, methodological commitments, and evaluative

standards through which scientific communities define legitimate problems and acceptable solutions. The present study does not treat sustainable, low-carbon, resilient, regenerative, and related urban formulations as Kuhnian scientific paradigms in the strict epistemological sense. Kuhn's relevance here lies in their organizing function: structuring problem interpretations, priorities, and legitimate responses, without presupposing mutually exclusive worldviews, revolutionary replacement, or incommensurability.

Hall [32] extended this organizing interpretation into public policy, conceptualizing a policy paradigm as a framework of ideas and standards shaping problem definitions, policy objectives, and legitimate instruments. This interpretation is relevant to urban environmental planning, where formulations connect environmental problems with normative priorities, intervention repertoires, and evaluative expectations. They provide vocabularies through which governments, professionals, assessment bodies, investors, and development organizations coordinate and justify action.

Comparative urban scholarship documents a proliferation of interrelated environmental labels and concepts with overlapping concerns and differentiated emphases [7–9]. To specify their analytical roles in this study, Table 1 distinguishes labels, concepts, frameworks, models, and urban environmental paradigms. Accordingly, an urban environmental paradigm is defined here as follows:

**Table 1.** Functional distinctions among labels, concepts, frameworks, models, and urban environmental paradigms.

| Analytical Term                     | Primary Function                                         | Defining Characteristics                                                                                                                                  | Analytical Boundary                                                                                            |
|-------------------------------------|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <b>Label</b>                        | Identification and communication                         | Names an environmental orientation, initiative, or approach.                                                                                              | A designation alone establishes neither conceptual independence nor institutional reproduction.                |
| <b>Concept</b>                      | Interpretation and normative orientation                 | Articulates an idea, principle, aspiration, or understanding of an environmental problem.                                                                 | An articulated idea can precede implementation arrangements and institutional recognition.                     |
| <b>Framework</b>                    | Organization of analysis or action                       | Arranges concepts, dimensions, criteria, and relationships for analysis, evaluation, or implementation.                                                   | A structured framework does not by itself establish paradigmatic status or dominance.                          |
| <b>Model</b>                        | Representation of specified relationships                | Represents selected relationships or processes conceptually, visually, or formally, with stated scope or assumptions.                                     | A representation does not itself establish empirical validation or institutional influence.                    |
| <b>Urban environmental paradigm</b> | Organizing interpretation and institutional coordination | Connects problem framing, normative priorities, legitimate interventions, and evaluative expectations through institutional reproduction across settings. | Paradigmatic status permits overlap and contestation; it does not establish dominance or achieved performance. |

Source: Author's conceptual synthesis based on [7,9,25,31,32].

An institutionally recognized organizing frame through which a particular interpretation of urban environmental problems, normative priorities, legitimate intervention families, and evaluative expectations becomes sufficiently coherent, communicable, and

reproducible to influence planning, policy, professional, certification, and development practices across multiple settings.

This definition distinguishes having a label from acquiring paradigmatic status. Nominal differentiation alone does not demonstrate conceptual independence or paradigmatic distinctiveness. Comparative scholarship identifies connections among formulations alongside differences in their purposes and organizing priorities [7,9]. Shared environmental concerns can therefore coexist with distinctive problem framings and institutional expressions.

The distinctions in Table 1 are functional rather than hierarchical. A label can name a framework, and a model can represent selected relationships within a paradigm. These functions do not entail a compulsory developmental sequence. The framework and conceptual model developed by this study organize and represent its proposed theory; urban environmental paradigms are the institutional organizing frames that the theory explains.

Paradigmatic status is examined through five documentary dimensions: problem interpretation; normative priorities; legitimate intervention repertoires; evaluative expectations; and institutional reproduction across settings. The first four must form a traceable organizing relationship, while the fifth requires documented use of that relationship in institutional rules, procedures, or practices beyond a single author or project name. Relevant evidence includes policy mandates, assessment requirements, professional guidance, and recurring planning or investment procedures. These dimensions are assessed together as a qualitative profile. Repetition of a name alone does not establish the institutional reproduction of its organizing frame.

Coherence permits contested interpretations and changing instruments. Formulations can coexist and hybridize while recognizable problem framings, priorities, and evaluative commitments remain traceable through their recombination. A change in governing objectives or problem interpretation requires examining whether the frame itself has been transformed, rather than inferring continuity or displacement from terminology alone [11,17,32].

Conceptual distinctiveness, paradigmatic status, institutional dominance, and operational performance concern different properties. A formulation may acquire an institutional organizing role without becoming dominant over alternatives. Dominance is therefore a relative institutional outcome requiring explanation, rather than a defining property of a paradigm. Institutional recognition also leaves open questions about contextual appropriateness and achieved environmental outcomes.

Table 2 illustrates the definition through four purposively selected contrasts within the wider field: sustainable, low-carbon, resilient, and regenerative formulations. They were selected to maximize analytical contrast while retaining sufficient environmental overlap for comparison, representing integrative, mitigation-oriented, adaptive, and regenerative organizing logics with documented institutional reproduction. The comparison is illustrative rather than representative or exhaustive and shows how the five-dimensional definition differentiates among these formulations. The Supplementary File documents the supporting evidence and selection logic.

Shared concerns can acquire different operational representations within such expressions. For example, the energy-services goal in the City Resilience Framework combines clean supply, affordability, and reliability, while the emissions-management prerequisite in the LEED cities planning guide specifies projected annual emissions, accounting boundaries, and recognition requirements [28,29]. These selected provisions illustrate how overlapping concerns are organized differently within tools that themselves span several environmental priorities. Structural convergence and paradigmatic differentiation can therefore coexist.

**Table 2.** Illustrative application of the five dimensions defining an urban environmental paradigm.

| Environmental Formulation            | Problem Interpretation                                                     | Normative Orientation                                                                      | Response Repertoire                                                                                  | Evaluative Expectations                                                                                                                       | Evidence of Institutional Reproduction                                                                                                                                              |
|--------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sustainable city/community</b>    | Interdependent environmental, resource, social, and development pressures. | Integration of environmental responsibility with urban well-being and durable development. | Integrated planning; resource efficiency; infrastructure; environmental management.                  | Assessment across environmental and development dimensions, using the criteria of the particular system.                                      | The 2030 Agenda connects urban development with wider sustainability goals; LEED cities guidance translates selected goals into assessment rules [4,29].                            |
| <b>Low-carbon city/district</b>      | Urban emissions and carbon-intensive development.                          | Emissions mitigation and transition towards lower-carbon systems.                          | Energy efficiency; renewables; lower-carbon mobility; emissions inventories and investment planning. | Emissions targets and inventories with specified boundaries, baselines, and reporting periods.                                                | The EU Cities Mission connects climate-neutrality commitments with sector roadmaps, investment plans, and reviewed recognition [6].                                                 |
| <b>Resilient city/community</b>      | Shocks, chronic stresses, vulnerability, and disruption.                   | Continuity, adaptation, recovery, and transformation under disturbance.                    | Risk assessment; redundancy; preparedness; adaptive governance; service continuity.                  | Capacity to withstand disruption, sustain services, adapt, and address vulnerability in context.                                              | The City Resilience Framework organizes goals for strategy, master planning, and investment; 100RC research documents contextual adoption and contestation [11,28].                 |
| <b>Regenerative city/development</b> | Ecological degradation and the limitations of harm reduction alone.        | Renewal of living systems and positive human–ecological relationships.                     | Ecological restoration; regenerative resource flows; place-based integration.                        | Ecological renewal and positive contributions; the Living Community Challenge articulates water and energy ambitions beyond self-sufficiency. | Regenerative scholarship supplies a living-systems rationale. Living Community Challenge guidance and project examples remain available after closure of new registrations [10,33]. |

Source: Author's analytical synthesis.

Paradigmatic recognition also differs from operational accomplishment. Cross-evaluation and implementation studies document differences in assessment judgments and difficulties in securing intended outcomes [22,23].

### 3.2. Urban Environmental Paradigms as Institutional Legitimacy Devices

This study argues that institutionally reproduced urban environmental paradigms can additionally function as institutional legitimacy devices. Their substantive organizing content provides a basis for making environmental commitments recognizable, justifiable, and actionable across institutional settings. This function involves two distinguishable directions of legitimation.

Legitimation of a paradigm concerns how relevant audiences come to recognize a formulation as a credible and appropriate organizing frame. Policy endorsement, professional interpretation, standard-setting, and repeated institutional use can contribute to that recognition. Legitimacy is constructed and reproduced through these relationships, and its extent may differ among governmental, professional, financial, and community audiences [14,15].

Legitimation through a paradigm concerns how actors invoke an already recognized frame to justify policies, projects, investments, or organizational positions. The EU Cities Mission illustrates a formal pathway: climate-neutrality commitments are organized through Climate City Contracts, reviewed for the Mission Label, and connected to financial advice and investor networks [6]. The documented arrangement links recognition to support infrastructure; subsequent financing and environmental delivery remain separate outcomes. The two directions of legitimation can reinforce one another as applications reproduce or challenge the authority of the frame.

Four interrelated functions explain the institutional usefulness of paradigms. As legitimacy devices, they connect actions with accepted priorities. As cognitive simplification mechanisms, they organize complex problems into recognizable categories. As coordination frameworks, they supply shared vocabularies and expectations for interdependent actors. As symbolic signals, they communicate environmental commitment or strategic positioning to particular audiences [5,14,34]. These functions describe uses of a paradigm; the institutional pillars developed below identify capacities involved in its production and reproduction.

Recognition and coordination remain politically consequential and contested. In Greater Miami, financial evaluation participates in shaping the meaning and investment priorities of resilience [21]. In New Orleans and Medellín, international recognition coexists with local reinterpretation, resistance, and changing political support [11]. These studies show why institutional reproduction must be examined through the actors, interests, and audiences that authorize particular interpretations. Section 4 develops the integrated theoretical basis for this explanation.

## 4. Integrated Theoretical Framework

The framework integrates institutional theory, legitimacy theory, diffusion of innovations, policy mobility, market signaling, experimental governance, and bounded rationality around a common explanatory object: the environmental organizing frame and its relationships with institutional authority, recognition, circulation, and situated enactment.

Institutional theory explains how rules, routines, and professional expectations stabilize and reproduce organizing frames, including through coercive, mimetic, and normative pressures within organizational fields [13,15]. Legitimacy theory explains how relevant audiences judge those frames as appropriate, credible, or desirable [14]. Reproduction and legitimacy are interdependent but distinct: institutional arrangements can sustain a formulation whose acceptance varies between audiences, while endorsement need not secure durable organizational embedding. Their conjunction directs attention to both the infrastructures sustaining a paradigm and the constituencies authorizing or contesting it.

Bounded rationality adds an account of choice under limited attention, information, and processing capacity [34]. Applied to urban environmental paradigms, it suggests that recognizable frames can organize complex concerns into manageable problem definitions and response repertoires. The same selectivity can privilege familiar interventions while leaving competing interpretations or consequences outside decision-makers' attention.

Diffusion of innovations theory addresses communication, adoption, and the expansion of institutional reach, while also recognizing reinvention during adoption and implementation [16]. Policy mobility foregrounds the actors, institutional settings, and political relations through which traveling ideas are selected, translated, and reassembled [17]. Together, these perspectives connect the reach of circulation with the transformations it entails: a paradigm may remain recognizable across jurisdictions while its priorities, instruments, and organizational expression change through situated interpretation.

Experimental governance identifies urban interventions as sites where technical arrangements and governing authority are reworked [1]. Within the present framework, experiments can generate demonstrations and learning, with wider uptake depending on how their lessons are interpreted and connected to institutional support. Signaling theory addresses communication under information asymmetry, distinguishing signalers, signals, and receiving audiences [5,35]. Applied here, recognized formulations and certifications can communicate environmental commitments to public authorities, investors, and developers; their influence depends on credibility and audience interpretation. Visibility and reputational value remain analytically distinct from achieved environmental performance.

Power operates through these relationships. Actors differ in their capacity to define problems, authorize standards, establish evaluative criteria, and allocate resources. Financial evaluation can help constitute what resilience means in institutional decisions, as Cox's [21] analysis of Greater Miami demonstrates. Local actors can also contest and reshape internationally promoted formulations, as Naef [11] documents. Power therefore conditions whose priorities become authoritative and actionable; it operates across institutional domains through unequal capacities, strategic interests, and negotiation.

The framework's distinctiveness lies in connecting these antecedents around the institutional and operational trajectories of urban environmental paradigms. Meyer and Rowan [36] explain how formally legitimate structures can become decoupled from ongoing organizational activity. DiMaggio and Powell [13] explain how coercive, mimetic, and normative pressures can produce organizational similarity within institutional fields. Peck and Theodore [37] conceptualize policy mobility through the situated reconstruction and mutation of travelling models. Building on these explanations, the present study specifies how partly overlapping environmental frames acquire unequal institutional authority and how that authority connects to differentiated operational realization. The contribution therefore concerns the relationships linking institutional selection, relative dominance, contextual enactment, and operational feedback. Decoupling, isomorphism, and policy mutation provide the theoretical foundations; the proposed relationships explain how environmental commonality, unequal authority, and heterogeneous realization can coexist across contexts.

Within this account, codification selects which environmental purposes become institutionally legible and consequential. Recognition and reproduction can strengthen the authority of these representations, while contextual translation connects them to local rules, resources, and responsibilities. Monitoring creates a potential return path when operational findings inform authorized correction or institutional revision. These relationships can operate concurrently and recursively rather than as compulsory stages. Institutional dominance concerns sustained relative authority, whereas operational divergence concerns differentiated realization under situated conditions. Arrangements supporting recog-

dition and circulation may therefore differ from those sustaining implementation and corrective learning.

Medellín illustrates the distinction between recognition and organizational anchoring. Continuing international visibility coexisted with weakened municipal support; the resilience office moved outside municipal government in 2017 and was reintegrated by 2021 [11,30]. This trajectory documents a changing relationship between recognition and operative authority, while environmental performance requires separate evidence.

## 5. Institutional Production Ecosystem

### 5.1. Institutional Role-Domains and Actors

Institutional production concerns how urban environmental formulations acquire recognizable content, authority, and capacity for reproduction across settings. A formulation may originate with an individual or organization; its wider institutional reproduction involves actors that authorize priorities, develop rules, interpret knowledge, and mobilize resources. Building on Section 4, the analysis follows how these capacities interact to make an environmental organizing frame consequential in planning and development practice [1,15,36].

Four role-domains distinguish public authorization, responsibility for evaluative rules, knowledge mediation, and control of development resources. The synthesis retains these capacities because merging them would obscure different sources of institutional leverage: endorsing a priority, defining its assessment requirements, interpreting experience, and enabling action. They identify functional positions rather than mutually exclusive sectors or an exhaustive organizational taxonomy. Scott's [15] regulative, normative, and cultural-cognitive bases explain a different dimension of institutional order and can operate within each role-domain.

R1. Public and Intergovernmental Governance Systems encompass international organizations, national and regional governments, municipalities, and public planning and regulatory bodies. They authorize agendas, assign responsibilities, and embed environmental priorities in mandates and consequential public decisions. Shared international commitments and contextual implementation responsibilities occupy connected but distinct governance levels [3,4].

R2. Standardization, Certification, and Assessment Infrastructures encompass the institutions and arrangements that define, maintain, and apply evaluative rules. Standards bodies and assessment organizations act through criteria, manuals, rating systems, and certification protocols. Their choices give environmental purposes an assessable institutional form while selecting what becomes visible and eligible for recognition [12,19,29].

R3. Knowledge, Professional, and Network Intermediaries encompass researchers, professional associations, consultants, city networks, and knowledge platforms. They develop evidence, interpret experience, translate guidance, and mediate learning across settings. Their influence includes selecting which practices and interpretations circulate; professional endorsement remains distinct from independent verification of environmental results [17,38].

R4. Market, Development, and Financial Systems encompass developers, investors, development banks, public and philanthropic funders, and financial intermediaries. Investment criteria, risk representations, and resource conditions can shape the environmental responses considered investable, not merely support an already established frame. Resource allocation and continuing support also affect whether commitments become actionable and remain institutionally embedded [21,30].

Organizations may occupy several domains. Civic actors likewise contribute knowledge, negotiate priorities, and contest implementation rather than serving only as recipients;

their roles depend on the activity examined [11,39]. The joint development of LEED for Neighborhood Development by the Congress for the New Urbanism, U.S. Green Building Council, and Natural Resources Defense Council illustrates the intersection of professional and environmental knowledge with rule-making [40]. Such instruments are institutional expressions through which organizing frames are reproduced, not equivalents of an entire paradigm.

### 5.2. Cross-Cutting Mechanisms and Power Relations

The six mechanisms specify actions through which these capacities operate, rather than additional actor categories.

M1. Agenda-Setting and Normative Framing elevates particular problem interpretations, priorities, and preferred responses within institutional agendas and decision arenas [4,32].

M2. Technical Codification and Standardization translates selected purposes into categories, criteria, evidence requirements, and evaluative procedures [19,29].

M3. Knowledge Exchange and Professional Translation communicates, interprets, and adapts knowledge across organizational and geographical settings [18,38].

M4. Policy Embedding and Institutionalization incorporates an organizing frame into mandates, plans, assigned responsibilities, and recurring decisions [30,41].

M5. Reputational Recognition and Validation confers visible approval or standing through environmental categories. Validation here denotes institutional endorsement, not empirical verification of achieved outcomes; its relationship with legitimacy depends on the audience [11,14].

M6. Financial and Market Reinforcement connects adoption and continuation with funding eligibility, resource commitments, incentives, and development opportunities [21,30].

These distinctions preserve different explanatory tasks: creating a rule differs from embedding it in a consequential decision; exchanging knowledge differs from conferring recognition; and recognition differs from allocating resources. Their relationship with role-domains is many-to-many. A municipality can frame priorities, set requirements, and provide funding, while a professional network can translate knowledge and confer recognition. Standards, contracts, awards, and demonstrations are vehicles through which several mechanisms may operate concurrently or recursively. Table 3 summarizes illustrative connections. The source comparisons and functional derivation are documented in the Supplementary File.

The EU Cities Mission illustrates this cross-domain organization. Commission-defined objectives establish an agenda (R1); Climate City Contracts and their review organize commitments and recognition (R2); NetZeroCities supplies implementation support (R3); and the Climate City Capital Hub connects recognized cities with financial advice and investors (R4). A city plan thus links several institutional capacities, although access to financial assistance is distinct from funding received and the Mission Label recognizes the plan rather than achieved climate neutrality [6].

HafenCity provides a complementary distinction between codification and embedding. According to the developer's published chronology, certification became a condition for awarding planning options on building plots in 2010. M2 supplies assessable criteria, whereas M4 connects compliance to a consequential land-development decision. The example documents an institutional arrangement, not its independent environmental effect [42].

Power is exercised through these relationships. Rule owners determine admissible evidence, authorities authorize or block embedding, financial actors attach resource consequences, and intermediaries influence which experiences circulate. In Greater Miami,

credit-rating practices participate in defining investment-relevant resilience [21]. In New Orleans, funding opportunities and partnerships influenced which elements of a broad resilience agenda became implementable [11]. Unequal access to expertise, resources, and policy circuits shapes these processes without eliminating local negotiation or resistance [18]. Public and civic interventions can also contest market-oriented priorities; a single political logic cannot be assumed across trajectories [43].

**Table 3.** Institutional role-domains and cross-cutting mechanisms in urban environmental paradigm production.

| Institutional Role-Domain                                                 | Representative Actors and Vehicles                                                                                                                                                                                                                                                        | Mechanism Links | Distinctive Institutional Leverage                                  | Analytical Significance                                                                        |
|---------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| <b>R1. Public and Intergovernmental Governance Systems</b>                | Actors: public authorities and intergovernmental bodies.<br>Vehicles: agendas, mandates, plans, and regulations.<br>Illustrative examples: European Commission (public authority); EU Cities Mission (programme).                                                                         | M1, M4, M5, M6  | Authorize priorities, assign responsibility, and embed commitments. | Connects environmental priorities with public authority and implementation responsibility.     |
| <b>R2. Standardization, Certification, and Assessment Infrastructures</b> | Actors: standards, assessment, and certification organizations.<br>Vehicles: criteria, manuals, rating systems, and protocols.<br>Illustrative examples: U.S. Green Building Council (actor); LEED-ND (rating system).                                                                    | M2, M3, M5      | Define, maintain, and apply evaluative requirements.                | Explains how environmental purposes acquire an assessable and recognizable institutional form. |
| <b>R3. Knowledge, Professional, and Network Intermediaries</b>            | Actors: researchers, consultants, professional and city networks.<br>Vehicles: guidance, exchanges, training, and demonstrations.<br>Illustrative examples: Arup (knowledge intermediary); City Resilience Framework (guidance framework).                                                | M1, M3, M4, M5  | Develop and interpret knowledge; mediate learning and translation.  | Explains how formulations are interpreted, revised, and reproduced across settings.            |
| <b>R4. Market, Development, and Financial Systems</b>                     | Actors: developers, investors, banks, public and philanthropic funders.<br>Vehicles: investment criteria, funding arrangements, and risk ratings.<br>Illustrative examples: International Finance Corporation (financial actor); Climate City Capital Hub (financial-advisory interface). | M1, M4, M5, M6  | Shape investable priorities and resource access or continuity.      | Explains how investment rationales and resource control condition adoption and continuation.   |

Source: Author's analytical synthesis.

Repeated interaction can stabilize terminology, criteria, and commitments, but institutional reproduction also involves correction and interruption. Arup [28] reports practitioner input into the revision of its City Resilience Framework, documenting a return from use to guidance. The 100 Resilient Cities evaluation records discontinuities in support and changing municipal arrangements alongside continuing practices [30]. Stabilization therefore

depends on continuing institutional work, not an automatic progression from recognition to durable implementation.

**Institutional Differentiation Proposition.** Partly shared environmental foundations acquire distinct institutional consequences when actors select priorities, codify evaluative rules, and connect particular representations to legitimacy, authority, and resources. Recurring institutional roles do not require identical actor configurations. Figure 2 synthesizes the theoretical and institutional relationships developed across Sections 3–5.

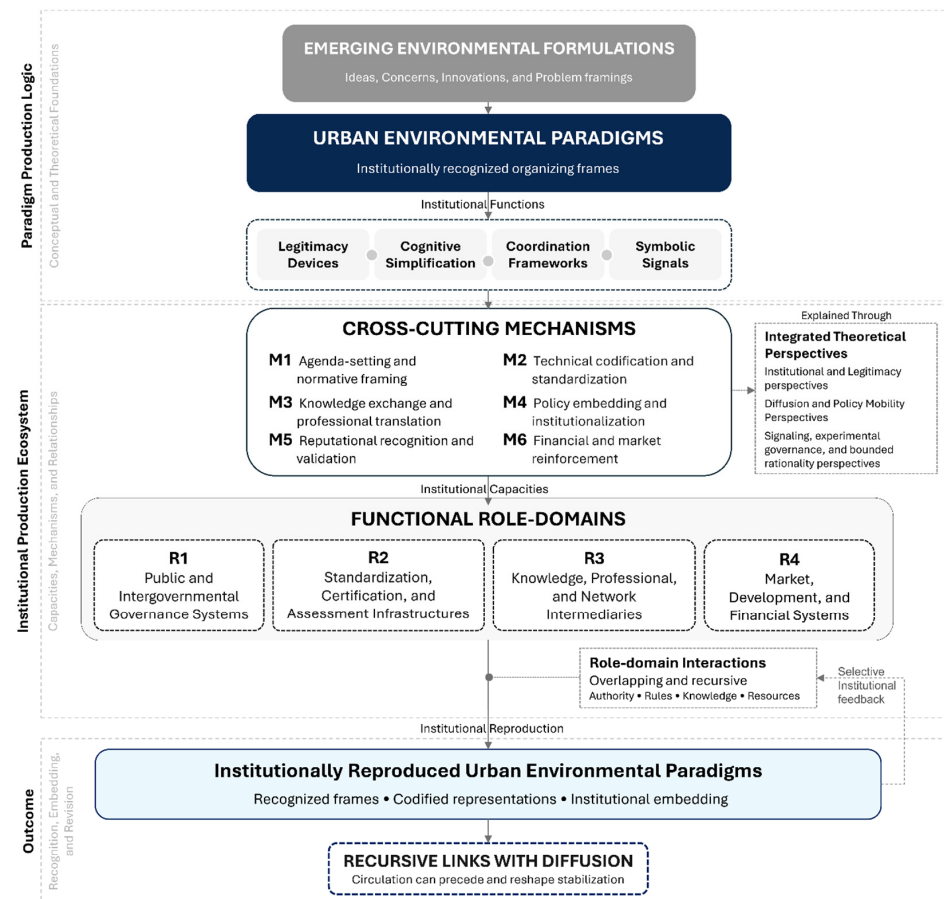


**Figure 2. Integrated Conceptual and Institutional Framework for the Production of Urban Environmental Paradigms.** The figure connects paradigm functions, seven theoretical perspectives, six cross-cutting mechanisms, and four functional role-domains. Their concurrent and recursive relationships support institutional reproduction and circulation; recognized frames and codified representations do not establish achieved environmental performance. Source: Author’s analytical synthesis.

## 6. Global Diffusion Architecture

Global diffusion refers here to transnational and cross-jurisdictional circulation, not universal worldwide adoption. Building on Section 5, institutional production and circulation are recursively connected: formulations can travel before becoming fully stabilized, while circulation can prompt reinterpretation, codification, and renewed institutional support. The relevant infrastructure includes policy systems, standards, professional and city networks, demonstrations, publications, and funding arrangements [16,17].

Five interacting diffusion domains organize this infrastructure: agenda anchoring, reusable specifications, demonstration settings, translation networks, and strategic and material support. They identify settings and arrangements; role-domains identify capacities, and mechanisms describe actions. Separating specifications from their interpreters, and demonstrations from support for their uptake, preserves distinct explanatory functions.

The derivation draws on agenda documents, assessment guidance, and implementation accounts [4,29,30].

Circulation entails interpretation, adaptation, and recombination [17,18]. As defined in Section 3.1, continuity depends on reproducing the organizing relationship among problem interpretation, normative priorities, response repertoires, and evaluative expectations. Repeated labels alone are insufficient. Hybridization can preserve or transform this relationship; replacement indicates transformation or displacement rather than unchanged reproduction.

Access to these domains is selective. Expertise, funding, and opportunities to publicize exemplars are unevenly distributed, while local actors can negotiate, resist, or redirect circulating formulations [11,38]. Financial evaluation can also shape the content considered investable, rather than merely reward an already established frame [21]. Strategic and reputational advantages can thus enter adoption alongside environmental purposes, without making a single political or market logic universal.

Table 4 links diffusion domains (D1–D5) with institutional role-domains (R1–R4), mechanisms (M1–M6), and observable traces. Links are illustrative; domains are not chronological stages, and no route must traverse all five. The outcome row distinguishes circulation from relative authority.

**Table 4.** Interacting diffusion domains and institutional outcomes of urban environmental paradigms.

| Diffusion Domain                                                                       | Settings and Vehicles:<br>Illustrative Examples                                              | Illustrative Links            | Distinctive Diffusion<br>Function                                                          | Observable Outputs<br>and Traces                                                                |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-------------------------------|--------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| <b>D1.<br/>Agenda Anchoring<br/>and Institutional<br/>Framing</b>                      | Agendas, mandates,<br>and programmes; the<br>2030 Agenda.                                    | R1<br>M1, M4, M5              | Connect a formulation<br>to authorized priorities<br>and reference frames.                 | Agenda references,<br>programme objectives,<br>and adopted<br>commitments.                      |
| <b>D2.<br/>Codification and<br/>Transferability<br/>Infrastructure</b>                 | Standards, manuals,<br>and assessment<br>protocols; the LEED<br>cities guide.                | R2, R3<br>M2, M3, M5          | Provide representations<br>and requirements that<br>can be interpreted<br>across settings. | Rule versions,<br>guidance, assessment<br>requirements, and<br>permitted adaptations.           |
| <b>D3.<br/>Demonstration,<br/>Experimentation, and<br/>Professional<br/>Validation</b> | Pilots, monitored<br>projects, and<br>professional review;<br>BedZED.                        | R1, R3, R4<br>M3, M4, M5, M6  | Make applications<br>available for scrutiny,<br>learning, and<br>professional appraisal.   | Project reports,<br>demonstrated<br>constraints, lessons,<br>and endorsements.                  |
| <b>D4.<br/>Network Circulation,<br/>Policy Mobility, and<br/>Translation</b>           | City networks and<br>professional exchanges;<br>100RC exchanges.                             | R1, R3, R4<br>M1, M3, M4, M5  | Connect actors and<br>mediate movement,<br>adaptation, and<br>reinterpretation.            | Exchange records,<br>translated practices,<br>altered priorities, and<br>refusals.              |
| <b>D5.<br/>Strategic, Financial,<br/>and Market<br/>Reinforcement</b>                  | Funding, advisory, and<br>promotion<br>arrangements; World<br>Habitat post-award<br>support. | R1, R3, R4<br>M4, M5, M6      | Connect uptake and<br>continuation with<br>resources and strategic<br>opportunities.       | Support eligibility,<br>commitments,<br>allocations, transfer<br>assistance, and<br>withdrawal. |
| <b>Institutional outcomes<br/>(not a diffusion<br/>domain)</b>                         | Specified jurisdictions,<br>decision arenas, and<br>periods.                                 | Cross-domain<br>relationships | Distinguish circulation<br>and local embedding<br>from sustained relative<br>authority.    | Reach and uptake;<br>recurring decision<br>influence compared<br>with alternatives.             |

Source: Author's synthesis.

The 100 Resilient Cities evaluation illustrates cross-domain circulation. A shared resilience agenda and strategy guidance connected with professional exchanges and sponsored officer positions, linking D1–D2, D4, and D5. Local interpretations nevertheless differed: Boston broadened its resilience framing, while Belfast emphasized climate concerns. The evaluation also records valued professional networks alongside uneven implemen-

tation and interrupted support [30]. These histories show institutional connections and contextual translation rather than a compulsory sequence through all domains.

Demonstration can generate transferable learning without every component succeeding. The BedZED project-partner report describes how operational experience informed subsequent One Planet Living practice, connecting practical experimentation with professional translation, including lessons from operating difficulties [44]. At the level of an institutional vehicle, World Habitat's stated housing-award process connects assessment and recognition with promotion, mentoring, grants, and policy-transfer support [45]. This provides a documented route between demonstration, networks, and resources, not evidence that each award produces further adoption.

Channels can also separate rather than reinforce one another. New registrations for the Living Community Challenge have closed while its guidance remains available for visioning [33]. Availability preserves a route for conceptual reuse; it does not measure continued uptake. Together with the 100RC histories, this distinction separates programme continuity, circulation opportunities, and the persistence of institutional practices.

Credibility, usable rules, portability, and continuing resources can generate cumulative advantages when activities across domains reinforce one another. Recognition can open support channels; supported applications can supply examples that attract further endorsement. Such reinforcement depends on continuing institutional work [19]. Corrective learning, contestation, or withdrawal can redirect these relationships, so feedback cannot be inferred from repeated labels or visibility alone.

## 7. Configurational Conditions of Institutional Dominance

Institutional dominance concerns sustained, disproportionate influence over consequential decisions relative to competing formulations within a specified arena and period, rather than international reach alone. The explanation connects the institutional configuration that makes a formulation credible and actionable with its perceived relevance to consequential problems. These dimensions interact: institutional actors can shape both the available response and the problem regarded as requiring it. Substantive relevance therefore remains part of the account without becoming a separate, universally necessary entry condition [2,11,14].

Seven configurational conditions are derived through theory-informed comparison: acceptance, rule availability, adaptability, resources, comprehension, mandate fit, and perceived necessity. Their derivation assesses the explanatory loss from merging or removing each condition. The Supplementary File documents the source comparisons; the synthesis neither ranks effect sizes nor establishes universal necessity or joint sufficiency.

The conditions describe properties of a formulation's relationships with actors and settings, not additional mechanisms or attributes inherent in a label. Technical codification is an activity; operational codification denotes the resulting availability of rules. Normative legitimacy concerns perceived appropriateness, whereas strategic alignment concerns fit with an actor's active priorities; salience concerns the importance attributed to the problem. Cognitive accessibility concerns understanding, not approval, while portability concerns adaptation, not the number of adopters [14,17,34].

Power cuts across these relationships. Sponsors, rule owners, and financial actors can promote priorities and attach consequences to particular representations, while other audiences can contest them [11,21]. Leadership and implementation capacity affect how configurations operate; they are not treated here as an eighth formulation-level condition. Table 5 defines the seven conditions (C1–C7), their proposed explanatory roles, and observable traces.

**Table 5.** Seven Configurational Conditions: Definitions, Explanatory Roles, and Observable Traces.

| Configurational Condition                               | Bounded Definition                                                                      | Proposed Explanatory Role                                                               | Observable Traces                                                                            | Source Basis |
|---------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|--------------|
| <b>C1. Normative Legitimacy</b>                         | Perceived appropriateness of the frame among specified audiences.                       | Provides an audience-specific basis for endorsing and sustaining frame-based decisions. | Stated reasons for acceptance or resistance; audience and date.                              | [11,14]      |
| <b>C2. Operational Codification</b>                     | Availability of explicit categories, requirements, and assessment procedures.           | Provides assessable expectations for consequential decisions.                           | Versioned rules, admissible evidence, responsibilities, and revision procedures.             | [19,29]      |
| <b>C3. Policy Portability</b>                           | Capacity for contextual adaptation while retaining identifiable organizing commitments. | Enables rearticulation across jurisdictions rather than identical replication.          | Borrowed and adapted provisions; retained commitments and documented barriers.               | [17,30]      |
| <b>C4. Resource Mobilization and Economic Relevance</b> | Access to continuing resources and fit with development or economic priorities.         | Connects uptake and continuity with public, philanthropic, and market support.          | Funding eligibility, commitments, allocations, and withdrawal; stated investment rationales. | [21,30]      |
| <b>C5. Cognitive Accessibility</b>                      | Comprehensibility of the frame and its relevance to users' decisions.                   | Reduces interpretive demands and supports communication and use.                        | Interpretation and usability evidence; misunderstandings, not name recognition alone.        | [14,34]      |
| <b>C6. Strategic Alignment</b>                          | Fit with active priorities and mandates of actors able to authorize or sustain action.  | Connects a formulation with operative policy and organizational commitments.            | Mandate–proposal correspondence; dated approval, budget, or planning requirements.           | [2,30]       |
| <b>C7. Problem Salience and Perceived Necessity</b>     | Perceived importance of a problem and the frame's relevance to addressing it.           | Supplies reasons for prioritizing action rather than treating it as discretionary.      | Problem recognition, issue attention, and stated adoption reasons.                           | [46]         |

Source: Author's analytical synthesis.

Configuration concerns how these properties work together. Clear rules can assist transfer, but rigidity can undermine contextual effectiveness when the problem is complex or locally variable [20]. Recognition can open support channels, but continuing application also depends on resources and operative authority. Salient need provides reasons to act, while crisis can simultaneously disrupt the capacity to respond [30]. Public salience is associated with climate-policy adoption in US states, but that finding does not establish salience as a necessary condition for urban paradigm dominance [46].

Documentary comparisons make these connections concrete. In HafenCity, certification requirements became linked to planning-option allocation, connecting codified criteria with an authoritative development decision [42]. In Athens, monitoring priorities were adjusted for national funding eligibility; Can Tho's loss of support for its resilience-officer position supplies an interrupted resource pathway [30]. The contrast identifies rule–authority and alignment–resource relationships, not a comparative test of dominance or an estimate of each condition's effect.

Operational codification makes selected environmental qualities consequential through recognition, eligibility, and funding rules. Selection reflects political priorities, feasibility, and evaluative choices as well as measurability, and may include qualitative or procedural requirements [23,29]. The resulting tension concerns institutional usability versus substantive breadth and contextual adequacy. It complements explanations of diffusion–impact tensions and opacity-dependent effectiveness without implying that codification necessarily damages performance [20,47].

Reinforcement becomes consequential when support generates practices or rules that shape subsequent decisions, rather than merely increasing visibility [19]. Different configurations may sustain influence; resources do not automatically substitute for acceptance, comprehension, or adaptation. Loss of support or changing priorities can weaken previously established arrangements, while authority acquired through earlier decisions can

itself reshape the conditions. Their temporal relationships therefore require tracing rather than being inferred retrospectively from prominence.

The supplementary model derives threshold-dependent growth, growth without an interior threshold, contraction, and stable intermediate uptake under specified baseline and feedback assumptions. These illustrate possible uptake dynamics, not empirical thresholds, diffusion-speed estimates, or tests of configurational dominance.

**Configurational Dominance Proposition.** Sustained relative institutional influence is more likely when acceptance, usable and portable rules, resources, cognitive accessibility, strategic alignment, and perceived necessity form mutually supporting relationships that repeatedly connect a formulation to consequential decisions. Alternative configurations and interruptions remain possible. Evaluation requires separately observed conditions, repeated decision influence or default-reference use relative to alternatives, and comparison with rival explanations such as prior performance, coercion, and concentrated sponsorship. Figure 3 connects the diffusion domains, configurational conditions, alternative institutional trajectories, and feedback from implementation.

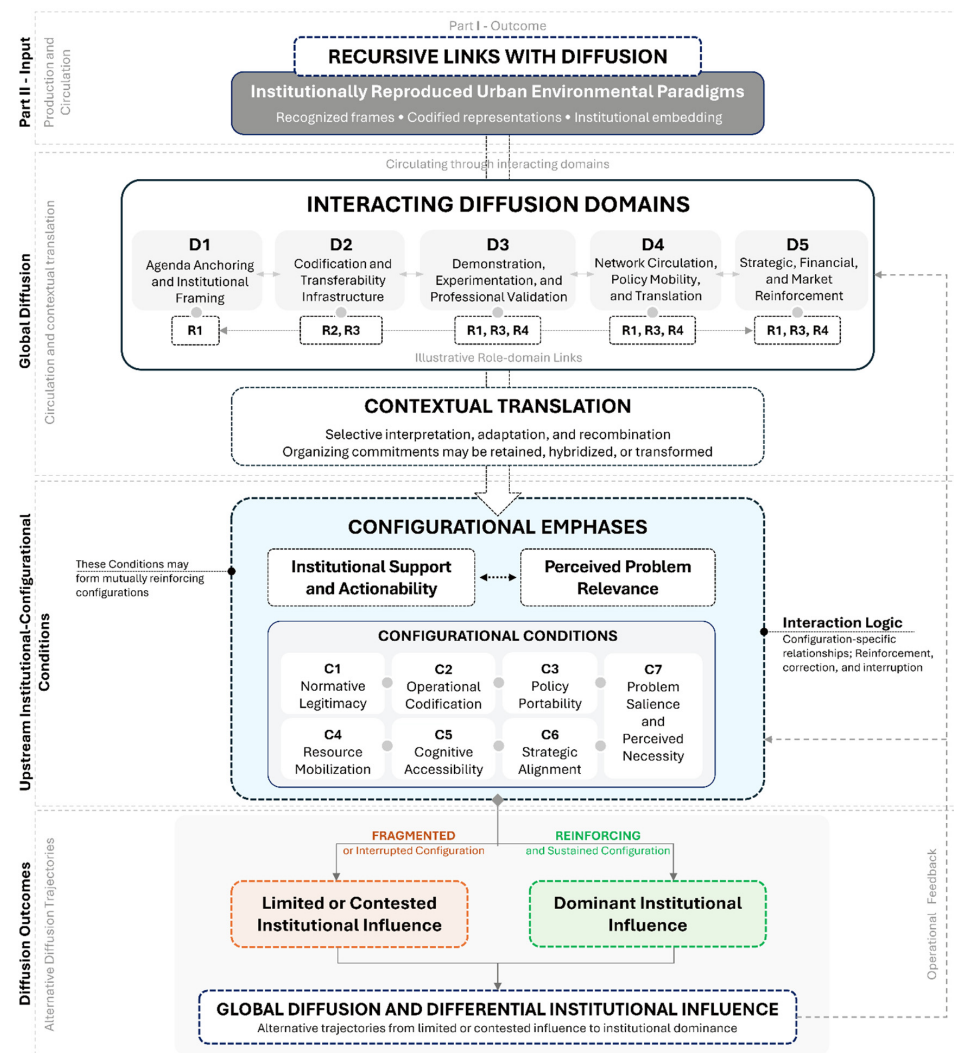


**Figure 3. Global Diffusion, Institutional Dominance, and Transition to Operational Divergence of Urban Environmental Paradigms.** Five interacting diffusion domains connect with seven configurational conditions and alternative institutional trajectories. The domains are not chronological stages, and the two analytical emphases are not additional entry conditions. Limited or contested influence and dominance can both coexist with contextual enactment. Operational feedback can revise the institutional relationships. Source: Author's analytical synthesis.

## 8. Upstream Convergence and Downstream Divergence

Urban environmental paradigms combine overlapping environmental foundations with differentiated institutional and operational trajectories. Sustainable, low-carbon, resilient and regenerative formulations can share concerns such as resource efficiency, impact reduction and ecological integrity while organizing them around different priorities [7,10]. The explanatory problem is not simply that similar aspirations encounter different contexts, but how institutional production makes particular interpretations authoritative and transferable without securing equivalent realization.

Upstream convergence refers here to partial commonality in families of environmental concerns and organizing logics, alongside recurring institutional repertoires, together with the processes through which these are reproduced and stabilized. It does not imply identical values, interchangeable paradigms or equal institutional influence. Downstream divergence refers to the variability introduced when these paradigms are translated into specific governance structures, design decisions, implementation processes, monitoring systems, and long-term operational practices. The distinction is analytical rather than a necessary chronological sequence: institutional differentiation can begin before implementation, while situated experience can subsequently reshape upstream rules and expectations.

A target shortfall denotes non-attainment of a specified environmental objective for its stated assessment period and measurement boundary. Institutional differentiation concerns documented differences in priorities, rules, authority, resources, or responsibilities; reconfiguration concerns changes in these arrangements over time. Explaining operational divergence through these arrangements requires evidence connecting them to implementation and outcomes. A missed target alone does not establish that connection, and divergent enactments may involve successful adaptation as well as underperformance.

Principal proposition: upstream convergence and downstream divergence. Where formulations share environmental foundations, their operational realization is expected to vary with how institutional selection and contextual translation connect those foundations to consequential rules, local authority, resources, operating responsibilities and corrective feedback. Recognizable formulations can therefore persist and circulate while generating different situated outcomes. The evidence below grounds constituent relationships; their joint empirical examination requires matched formulations and enactments rather than labels alone.

The upstream comparison proceeds below vocabulary. Six selected concerns recur in the City Resilience Framework 2024 and the February 2024 LEED cities planning guide: energy, water, materials, ecology, mobility and hazard response [28,29]. In the matched energy provisions, a qualitative goal concerning reliable, affordable and clean services differs from a prerequisite and points schedule based on projected annual per capita emissions. Shared environmental concern thus coexists with different objects, time horizons and decision rules. This focused comparison establishes partial commonality, not an exhaustive taxonomy or a demonstrated historical trend towards increasing similarity.

Building on the institutional differentiation proposition developed in Section 5, the following cross-evaluation [23] illustrates this distinction: broadly unchanged developments receive different judgments under different assessment systems. Their separate analysis of 97 LEED-ND pilot scorecards also identifies selective credit uptake consistent with weighting incentives, although cost and feasibility remain alternative explanations. Codification therefore makes environmental purposes consequential through specific rules rather than merely attaching a label to an already equivalent model.

Contextual translation extends this selection into practice. Local actors adapt, combine or contest circulating formulations through particular responsibilities, financing arrangements and technical systems [17]. The 100 Resilient Cities evaluation illustrates variation within a shared programme: re-tabulation records 142 improved, 101 unchanged and nine declined categories across 21 cities and 12 institutional constructs [30]. These 252 city–construct pairs are nested observations, not independent cases or environmental performance scores. The associated histories identify resource and authority pathways: Can Tho’s resilience-officer post was discontinued without replacement funding, whereas Medellín’s office moved outside municipal government before reintegration by 2021. Baseline ceilings and the absence of a counterfactual limit causal interpretation.

Civano provides a closely connected institutional–environmental illustration. Turner [48] shows that regulatory conflicts, development-industry practices, and broader institutional conditions favoured building-level water- and energy-saving technologies over some site-design strategies intended to achieve broader environmental goals. Turner and Galletti [49] report substantial reductions in potable-water consumption in both Civano phases. The first phase had lower surface temperatures and denser vegetation than the second. On these measures, the second phase also performed less favourably than the conventional comparison development. Read together, the two studies provide a within-case, mechanism-consistent account linking institutional constraints and selective implementation to differentiated environmental outcomes. Because they examine the same development and share an author, they should not be treated as independent replications, nor do they identify an isolated causal effect of institutional arrangements.

The One Planet Living cases connect performance assessment with identifiable operating arrangements. At One Brighton, an energy-services company held fuel-procurement and operating responsibilities and contracted maintenance. Reported emissions estimates were below the housing-stock benchmark but above design estimates, reflecting a lower biomass contribution in 2012–2013 than envisaged for 2020 [50]. This connects an identifiable operating arrangement to a documented energy pathway without isolating the institutional cause of the gap. At Elmsbrook, 2020/21 monitoring reported comparator savings alongside non-attainment of its zero-carbon aspiration, operational problems, and incomplete data [51]. Relative improvement, target attainment, and monitoring quality therefore remain distinct, while institutional attribution requires evidence of the decisions or practices shaping operation.

Divergence also crosses spatial and functional boundaries. In The Sustainable City, Dubai, sustainable internal mobility practices coexist with emissions-intensive external travel and limitations in connectivity and alternative transport [52]. This reflects a substantive integration problem rather than merely an inconsistency between rating systems. By contrast, a life-cycle assessment of three ecovillages found lower modelled resident impacts than the U.S. reference baseline [53], indicating that community-scale environmental commitments can achieve substantive environmental outcomes. These differently designed studies illuminate distinct relationships; they neither establish a common magnitude of divergence nor justify classifying entire paradigms as successful or unsuccessful.

These distinctions help explain why institutional recognition can persist despite uneven operational realization. Where legitimacy and resource access are tied to codified compliance, network position, or selected accomplishments, shortcomings outside those evaluative channels may not immediately erode institutional support [20,54]. This mechanism is consistent with means–ends decoupling and selective recognition rather than institutional indifference to performance. Medellín’s interrupted municipal anchoring alongside continued international visibility illustrates this separation; subsequent reinte-

gration supports interpreting the trajectory as interrupted rather than permanently collapsed [11,30].

Dominance–performance non-equivalence proposition. Relative institutional influence and realized environmental performance are analytically distinct but conditionally connected through rules, authority, resources, implementation, and monitoring. Institutional prominence may support effective delivery, but it is not itself a measure of performance. Strong influence with weak realization, and limited influence with strong realization, therefore remain theoretically possible rather than classifications assigned to whole paradigms. A positive average programme effect can coexist with heterogeneous outcomes across contexts and institutional conditions [55]. Institutional support may thus matter without producing uniform operational results, while programme participation does not constitute a direct test of paradigm-level dominance.

Observable channels connect institutional arrangements to environmental outcomes through intervening decisions and operating practices. Rules can shape design and technology choices; assigned authority can structure coordination, handover, and enforcement; financing can sustain staffing, maintenance, and equipment operation. Monitoring provides corrective feedback when findings enter an authorized decision, lead to an enacted response, and are followed by subsequent observation. Examining these channels requires linking mandates, budgets, contracts, or decisions to actual practices and comparable environmental observations, while considering technical, behavioural, and contextual alternatives.

Requirements, projected values, proxies, and observed conditions remain distinct evidentiary objects; missing observations do not establish failure [22]. At Western Harbour, unexpectedly high energy use in Bo01 was followed by stronger attention to energy efficiency in later development, with preliminary evaluation indicating that Fullriggaren moved closer to its targets [56]. The municipal account supports a reported learning pathway without isolating a causal effect or establishing complete target attainment.

Operational change also need not preserve the original organizational carrier. At Oberlin, the project incubated the Oberlin Food Hub before its central office closed in 2017; the hub later developed into a regional food network [57,58]. This documents continuity of a specific function, not achievement of every original environmental objective. Feedback may likewise reshape codification: practitioner consultation contributed to the restructuring of the City Resilience Framework from 12 goals and 56 indicators to 22 goals [28]. The relationship is therefore recursive and selective, as monitoring systems, reporting channels, decision rights, and continuing resources condition which operational experiences return to standards, priorities, and institutional support. Divergence may consequently represent adaptive improvement, persistent shortfall, or institutional reconfiguration rather than failure alone.

Table 6 distinguishes institutional conditions, intervening implementation traces, and outcome observations across the six analytical dimensions. Application requires a defined formulation, local enactment, observation period, and outcome boundary. The indicators identify observable relationships rather than constitute a validated composite index. A demanding empirical test would compare similar upstream commitments across different institutional arrangements and examine whether the proposed translation links account for resulting differences. Apparent divergence that disappears after harmonizing measures, or varies consistently without the proposed institutional links, would restrict the explanation.

Figure 4 synthesizes these relationships as an analytical structure rather than a deterministic sequence or a requirement that institutional dominance precede implementation.

**Table 6.** Analytical dimensions of upstream convergence and downstream divergence across urban environmental paradigms.

| Analytical Dimension                 | Upstream Convergence                                                              | Downstream Divergence                                                                                            | Sources of Variation                                                                | Potential Indicators/Observable Traces                                                                                                                                                    |
|--------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Conceptual Foundation</b>         | Overlapping environmental logics, concerns and intended benefits.                 | Context-specific interpretation, prioritization and recombination.                                               | Local environmental needs, normative priorities and institutional framing.          | Matched priority profiles; retained and excluded concerns; concordance of objects, boundaries and decision rules.                                                                         |
| <b>Institutional Production</b>      | Recurring institutional capacities and mechanisms of production and reproduction. | Different local actor configurations, authority and institutional embedding; differentiation may begin upstream. | Rule ownership, organizational capacity, resources and contestation.                | Assigned decision rights and rule ownership; continuity and dated changes in authority or resources linked to implementation decisions or interruptions.                                  |
| <b>Diffusion and Translation</b>     | Recognizable narratives, codified formulations and circulation channels.          | Selective uptake, modification, hybridization or refusal in specific settings.                                   | Portability, intermediary networks, regulatory traditions and strategic alignment.  | Dated adoption and revision records; retained or modified requirements; translation decisions and refusals.                                                                               |
| <b>Governance and Implementation</b> | Similar environmental aspirations and formal commitments.                         | Different responsibility allocations, delivery arrangements and implementation pathways.                         | Authority, finance, coordination, technical capability and contextual fit.          | Funded responsibilities; staffing and maintenance continuity; coordination and handover records linked to implemented design or operating practices.                                      |
| <b>Evaluation and Monitoring</b>     | Overlapping performance intentions and indicator domains.                         | Different assessment rules, reporting coverage, observation quality and feedback continuity.                     | Evaluation design, baselines, data access and accountability.                       | Reporting regularity and coverage; observed versus projected values; finding → authorized decision → enacted response → follow-up observation.                                            |
| <b>Operational Outcomes</b>          | Shared intended environmental outcomes.                                           | Different target attainment, operating continuity, adaptive changes and distribution of benefits.                | Maintenance, user practices, resources, response capacity and external integration. | Outcome-specific target attainment within comparable boundaries and periods; service continuity; pre/post-response observations; spatial and social distribution of benefits and burdens. |

Source: Author's analytical synthesis of scholarly and institutional evidence.

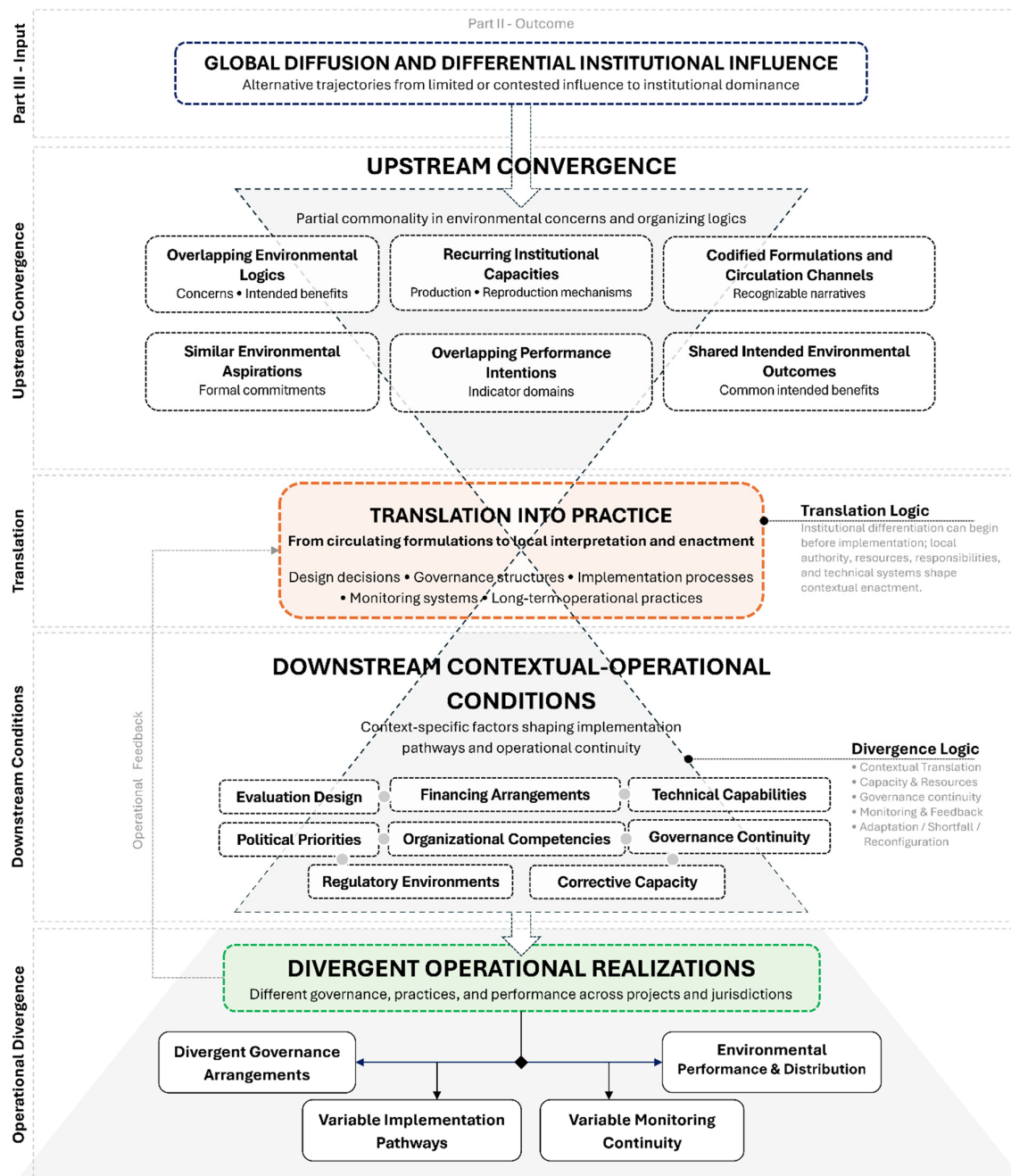


**Figure 4. Integrated Conceptual Model of Upstream Convergence and Downstream Divergence in Urban Environmental Paradigms.** The figure illustrates upstream convergence in partly shared environmental logics, institutional processes, and diffusion mechanisms, and downstream divergence as institutional selection and contextual translation shape governance, implementation, monitoring continuity, and long-term environmental performance across projects and jurisdictions. Operational feedback can reshape institutional rules, while local implementation does not require institutional dominance. Source: Author's analytical synthesis.

## 9. Discussion

The analysis presented in this study offers an institutional interpretation of urban environmental paradigms as organizing frames that acquire meaning and authority through their production, circulation and enactment. This perspective brings conceptual overlap, unequal institutional influence and variable operational outcomes into a connected explanation of how environmental commitments shape planning practice.

The proposition of upstream convergence and downstream divergence connects the institutional production of authoritative environmental commitments with the conditions sustaining their realization. Codification shapes which commitments enter consequential decisions, while local responsibilities and resources condition implementation. Operational evidence informs institutional revision when monitoring findings enter authorized decisions. The theoretical contribution specifies how these relationships reinforce or interrupt one another across institutional and operational settings.

This connection changes how institutional success is interpreted. Dominance concerns relative authority within a field, whereas operational performance concerns what is achieved under particular conditions. Institutional prominence may expand access to expertise, resources and coordinated action, but those advantages acquire practical value through locally sustained responsibilities and operating arrangements [30]. The distinction is functional rather than absolute: finance can support a paradigm's circulation or maintain a development's environmental systems. Accordingly, the question is not whether institutional influence guarantees performance, but how its advantages are translated into delivery, and where that connection becomes weak or interrupted.

The interpretation becomes particularly consequential in relation to codification. Standards and assessment procedures give broad purposes an actionable form, but they also select which qualities acquire weight in recognition and decision-making. Differences in assessment judgments and credit uptake illustrate why the content of rules matters alongside their adoption [23]. Codification therefore involves more than simplifying environmental complexity: it can direct attention and resources towards particular representations of that complexity. Its contribution depends on combining enforceable commitments with contextual responsiveness, rather than treating either rigid compliance or unrestricted adaptation as sufficient [20].

The consequences extend to the return of operational experience. Reporting categories help determine which outcomes enter institutional review, while authority and resources shape whether that evidence informs correction. Evolving standards demonstrate that codification itself requires continuing institutional work [19]. Read across the proposed relationships, this suggests that portability and corrective responsiveness need not develop together. A formulation may retain recognition when shortcomings remain outside influential evaluative channels, even while particular operations underperform. Equally, credible outcomes and responsive review can reinforce its authority. This is the deeper significance of selective feedback: the arrangements enabling a paradigm to circulate also condition how it can learn from enactment.

These arrangements are also sites of power and contestation. Unequal access to finance, expertise and transnational policy networks can privilege actors able to shape evaluative criteria and fund compliance, potentially marginalizing locally important needs [21,38]. Distribution enters through whose priorities become requirements, who can afford compliance, who benefits and who can demand revision. Public institutions and communities can contest these selections, while changing political priorities can redirect institutional support [11]. In this account, ideological change matters when competing views of state, market and community responsibilities redefine legitimate and fundable interventions [43]. Geographical asymmetry and ideological contestation thus enter through authorization, resources and feedback, without assuming a uniform North–South pattern or a single political logic. Interrupted support does not itself establish displacement of the organizing frame.

For planning practice, the framework connects paradigm selection to the arrangements needed to sustain environmental commitments. Choice matters because formulations prioritize different purposes; institutional recognition alone does not establish contextual

suitability. Tables 5 and 6 support a diagnostic appraisal of which purposes and populations are prioritized, which requirements need adaptation, what remains outside assessment, and who funds operation and initiates correction. A low-carbon commitment without funded maintenance responsibilities, for example, calls for repairing delivery arrangements rather than changing labels. Context-sensitive adaptation should preserve explicit environmental objectives and accountability, not obscure unmet commitments through retrospective target changes.

The explanation applies to institutionally reproduced organizing frames within specified arenas and periods. The documentary comparisons, secondary analysis of the published 21-city evaluation, and published project evidence support constituent relationships rather than jointly validate the theory. Formal and internationally visible English-language sources predominate, making less documented practices harder to observe. Application in non-Western and informal governance settings therefore requires examining locally performed functions rather than assuming equivalent organizations. The functional categories are not an exhaustive taxonomy, and the mathematical uptake model establishes possible dynamics rather than measured thresholds.

Comparative and longitudinal research should examine configurations of the seven conditions against independent measures of influence, follow similar formulations across contexts, and trace the operational signals that alter rules or resource decisions. Such tests must distinguish institutional effects from prior performance, selection, costs and capacity, using comparable outcome boundaries and periods. Relationships fully explained by these alternatives would restrict the proposed account. Subsequent indicators and scenario-based applications can build on this inquiry.

## 10. Conclusions

This study develops an integrated institutional explanation of why urban environmental paradigms with partly shared foundations acquire unequal authority and yield differentiated operational outcomes. It interprets these formulations as institutionally reproduced organizing frames whose influence is shaped by the configurations through which they are legitimized, codified and circulated. Their environmental purposes become operational through contextual arrangements of authority, resources and continuing responsibility.

The central cross-level contribution is the proposition of upstream convergence and downstream divergence. Its explanatory value lies in linking shared environmental concerns, selective institutional representation and contextual enactment without making paradigms interchangeable or dominance a prerequisite for implementation. The framework makes these connections examinable across institutional roles, mechanisms and conditions; the conceptual model integrates their alternative trajectories and recursive feedback (Figure 5).

This account distinguishes institutional dominance from environmental superiority while retaining the relationship between influence and performance. Codification makes commitments portable and actionable, but also selects what gains weight in assessment and what returns as evidence for revision. Recognition may consequently persist alongside uneven delivery when shortcomings remain outside influential evaluative channels. Credible outcomes and responsive learning can also reinforce institutional authority. These processes are shaped by unequal resources and contested priorities, and can be interrupted or redirected. Downstream divergence may therefore involve successful adaptation as well as underperformance, rather than failure by definition.

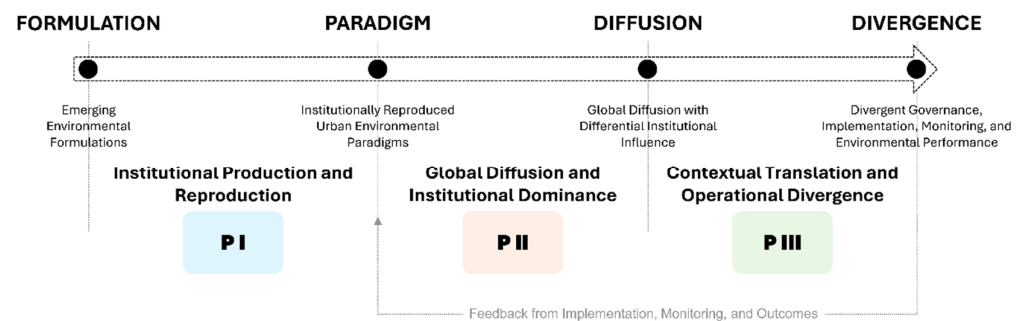


**Figure 5. From Concept Formation to Institutional Dominance and Contextual Operational Divergence.** The figure synthesizes the study’s integrated three-part explanatory framework, illustrating how urban environmental paradigms are institutionally produced, globally amplified, selectively dominant, and operationally differentiated across contexts. Source: Author’s analytical synthesis.

The documentary and comparative evidence grounds the proposed relationships without jointly validating the theory. Comparative and longitudinal research should test how institutional configurations relate to independently measured influence and outcomes, and which operational signals alter institutional decisions. For planning practice, the framework connects paradigm choice and contextual suitability to accountable implementation, monitoring and continuity, with achieved benefits assessed separately from recognition. The theoretical advance lies in explaining how the institutional conditions that secure authority for an environmental purpose interact with, but do not substitute for, the contextual conditions that sustain its realization.

**Supplementary Materials:** The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/su182010269/s1>, Figure S1: Four illustrative regimes of the bounded uptake model; Table S1-1: Representative query combinations and analytical purposes; Table S2-1: Scholarly evidence and analytical contribution; Table S2-2: Institutional and practice-oriented evidence; Table S3-1: Four illustrative environmental formulations; Table S3-2: Matched concerns and different operational representations; Table S3-3: Source basis and functional distinctions in the explanatory architecture; Table S4-1: Institutional sequences and contextual histories; Table S4-2: Directions of institutional category change; Table S4-3: Baseline–final institutional categories in 21 cities; Table S5-1: Conditional interactions and qualitative trajectory patterns; Table S6-1: Project evidence on operational translation and differentiated realization; Table S6-2: Operational specification of potential indicators; Table S7-1: Propositions and evidence that would support or restrict them. References [59–93] are cited in the Supplementary Materials.

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