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Bridging the Cognitive Gap: A Public Participation Framework for Evaluating Sustainable Urban Investment

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Abstract: Sustainable urban investment increasingly depends on the mobilization of cross-border capital to address pressing environmental and social challenges. Yet, critical investment decisions are frequently hindered by a profound cognitive gap between external international investors and the nuanced, locally embedded sustainability opportunities available on the ground. To bridge this divide, this paper proposes an innovative public participation framework designed to convert dispersed, qualitative signals—such as community preferences, localized expert judgment, and early-stage project feasibility assessments—into highly structured, actionable market intelligence. This intelligence is specifically optimized for rigorous investment screening and strategic capital allocation. Methodologically, the study systematically synthesizes interdisciplinary literature spanning participatory governance, impact measurement, and advanced market research. It translates these theoretical principles into a robust, operational evaluation architecture composed of three integrated data channels: venture-grade project submissions, comprehensive public-facing engagement feedback, and rigorous expert panel scoring mechanisms. The empirical results indicate that these participatory signals can be systematically standardized into highly comparable quantitative indicators. This standardization significantly improves overall market transparency, substantially reduces information asymmetry between local stakeholders and foreign investors, and supports highly repeatable, data-driven decision workflows. Ultimately, the paper concludes that public participation should no longer be viewed merely as a procedural legitimacy tool. Instead, it functions as a powerful analytical instrument that meaningfully strengthens due diligence quality, enhances comparability across highly heterogeneous projects, and significantly improves the interpretability of sustainable urban investment theses for diverse cross-border stakeholders.

Keywords: sustainable investment; public participation; market intelligence; impact investing; information asymmetry; cross-border capital

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1. Introduction

Cross-border capital has emerged as a significant force in driving sustainable urban development, yet investors often encounter substantial uncertainty when assessing projects that aim to balance financial viability with public value. This uncertainty is not merely technical but also cognitive in nature. International decision-makers frequently lack the contextual knowledge necessary to understand local needs, gauge social acceptance, evaluate policy feasibility, and anticipate practical implementation constraints. Simultaneously, local innovators often struggle to articulate their value proposition in a manner that aligns with institutional investment logic. Consequently, many high-potential opportunities remain underfunded, while capital tends to flow toward projects that are easier to explain rather than those that may be more impactful or resilient in the long term. This paper seeks to address this issue by introducing a public participation framework for evaluation—a structured approach that integrates community signals, expert assessments, and venture-grade project data into a cohesive model for screening and prioritizing sustainable urban investments [1]. The central argument posits that participation, when systematically designed as a measurement and

analysis process, can transform diffuse social information into investment-relevant indicators. This transformation reduces information asymmetry and enhances the quality of allocation decisions, ultimately fostering more effective and sustainable urban development outcomes.

Problem Framing: The Cognitive Gap in Sustainable Urban Investment – Sustainable urban investment operates at the intersection of infrastructure, technology, governance, and community life. However, one of its primary challenges extends beyond technical uncertainty to encompass significant information asymmetry [2]. Investors typically evaluate projects based on formal disclosures, financial models, policy signals, and projected cash flows. Yet, much of the critical information in urban settings remains fragmented, informal, or deeply embedded within local contexts. Factors such as community attitudes, patterns of everyday use, neighborhood trust, and institutional frictions are often visible to residents and local actors long before they become apparent in investment documents. This disconnect results in investors receiving incomplete or delayed signals regarding a project's practical viability, while communities often lack transparency about how investment decisions are made and why certain risks are prioritized over others. Bridging this gap requires a nuanced understanding of the interplay between formal investment criteria and the informal, localized knowledge that shapes urban dynamics.

A second source of tension arises from the divergence between community perception and capital judgment. Investors typically focus on whether a project can scale, whether its unit economics are stable, and whether governance risks can be managed across jurisdictions. In contrast, local stakeholders are more likely to evaluate a project based on lived experience, considering factors such as accessibility, fairness, usability, and alignment with neighborhood needs. What may appear investable from a portfolio perspective could be perceived locally as disruptive, exclusionary, or poorly adapted to daily realities. Conversely, a project with strong local legitimacy may be viewed by investors as too small, overly context-specific, or challenging to standardize for institutional capital. This divergence creates a cognitive gap wherein the same project is interpreted through distinct logics of value, evidence, and risk. Addressing this gap necessitates a framework that reconciles these differing perspectives, ensuring that both community insights and investment criteria are integrated into decision-making processes [3].

For this reason, investment decision-making in sustainable urban development increasingly requires the incorporation of social signals alongside technical and financial metrics. Early-stage initiatives are particularly vulnerable to information asymmetry, as quantitative data is often limited, and competing narratives can shape expectations before performance is verified. In such contexts, social signals—including public acceptance, behavioral readiness, community participation, local institutional trust, and perceived fairness—offer critical insights into a project's likelihood of gaining traction, encountering resistance, or generating durable impact. These signals should not be relegated to secondary reputational concerns; rather, they are decision-relevant indicators that significantly influence adoption, implementation, and long-term value creation [4]. By systematically integrating these signals into evaluation frameworks, investors can better anticipate challenges and opportunities, thereby improving the alignment between capital allocation and sustainable urban development goals.

At a structural level, the cognitive gap in sustainable urban investment is perpetuated by three key constraints [5]. First, sustainable urban opportunities are highly heterogeneous, encompassing areas such as energy efficiency, mobility, resilient housing, circular economy services, and community-based innovation. This heterogeneity weakens comparability, often leading decisions to favor familiar categories over socially grounded opportunities. Second, many of the benefits generated by these projects manifest as externalities—such as public health improvements, reduced emissions, enhanced accessibility, and strengthened local resilience—that are challenging to price consistently within conventional investment frameworks. Third, while social legitimacy is crucial for

implementation success, it remains difficult to quantify and is frequently treated as an afterthought rather than as a proactive input into valuation and risk assessment. Overcoming these constraints requires a paradigm shift in evaluation methodologies, emphasizing the integration of social dimensions into investment criteria without compromising analytical rigor.

Bridging this gap demands more than improved communication or enhanced project branding. It necessitates the development of a repeatable evaluation method capable of reducing information asymmetry, translating community-level signals into investment-relevant evidence, and incorporating the social dimension without sacrificing analytical rigor. Such a method must enable local realities to be expressed in forms that are credible to cross-border capital while remaining faithful to the contexts in which sustainable urban projects succeed or fail [6]. By systematically addressing the cognitive gap, this approach can foster more equitable and effective investment decisions, ensuring that capital flows toward projects that are not only financially viable but also socially impactful and resilient in the face of urban challenges.

2. A Public Participation Evaluation Framework

2.1. Design Principles: From Participation as Consultation to Participation as Measurement

A comprehensive framework for public participation must prioritize its role as a critical input to analytical processes rather than treating it as a mere procedural formality [7]. This approach necessitates adherence to three foundational design principles. Participation must first be structured, ensuring that feedback is gathered through standardized prompts that align with specific evaluation criteria. This consistency facilitates meaningful comparisons across various projects and timeframes, enhancing the reliability of the data collected. Second, participation must be interpretable, requiring the implementation of coding rules or scoring rubrics that preserve the integrity of qualitative feedback while minimizing ambiguity. Such measures ensure that the insights derived are both actionable and precise. Third, participation must be explicitly linked to decision-making processes, with the signals collected directly informing key investment considerations, such as the risks associated with adoption, alignment with stakeholder interests, and the feasibility of operational execution.

Under this framework, public input is not solicited to simply "approve" investments in a superficial manner. Instead, participants contribute valuable evidence regarding critical dimensions such as usability, trust, perceived value, and social compatibility. These factors often play a decisive role in determining whether a proposed solution can be successfully scaled and implemented. By adopting a measurement-oriented design, the framework safeguards against the risk of participation becoming a performative exercise [8]. It ensures that the outputs of public engagement are systematically integrated into due diligence processes, thereby enhancing the robustness of investment evaluations and decision-making outcomes.

2.2. Data Architecture: Three Channels of Structured Insight

To bridge the gap between local context and investment logic, the framework incorporates three distinct channels of information, each offering a complementary perspective to ensure a comprehensive analysis. The first channel focuses on venture-grade project information, which includes standardized submissions detailing critical aspects such as problem definition, target users, revenue logic, cost structure, operational plans, and measurable outcomes. This structured approach ensures that all foundational elements of a project are systematically evaluated. The second channel emphasizes public engagement information, capturing structured responses from community participants [9]. These responses address key dimensions such as relevance, accessibility, fairness, perceived risks, and the likelihood of adoption, providing a grassroots perspective that reflects societal sentiment and potential acceptance. The third channel involves expert assessment, where multi-disciplinary evaluations are conducted to assess feasibility, governance alignment, technical maturity, and risk mitigation strategies. This expert

input ensures that technical and strategic considerations are rigorously analyzed. Together, these channels form a robust framework for decision-making, integrating diverse insights to bridge the gap between theoretical models and practical applications.

The unique contribution of this architecture lies not in the mere existence of these channels, as many ecosystems already utilize tools such as pitch decks, feedback forms, and expert panels. Instead, its value is derived from the integration rule that governs how these channels interact and contribute to the decision-making process. The framework explicitly defines the weighting of each channel and establishes mechanisms for reconciling conflicts between them. For instance, a project might be technically feasible but socially fragile, or it could enjoy widespread public support while being operationally unrealistic [10]. The architecture translates such tensions into explicit descriptors of risks and opportunities, avoiding the oversimplification of reducing complex evaluations to a single score. This nuanced approach enables the creation of decision-ready profiles that provide actionable insights for both screening and portfolio construction. By addressing the interplay between technical, social, and operational dimensions, the framework ensures that decision-makers are equipped with a holistic understanding of each project's potential and challenges.

2.3. Indicator System: Translating Social Signals into Comparable Metrics

The framework employs an indicator system designed to balance breadth and precision, ensuring it captures the multifaceted nature of sustainability while maintaining comparability across diverse contexts [7]. Indicators are systematically categorized into four distinct domains. The first domain, economic viability, evaluates the feasibility of revenue generation, sensitivity to costs, and the operational trajectory toward sustainable practices. The second domain, impact plausibility, examines the mechanisms driving change, the identification of beneficiaries, and the quantifiable outcomes that align with established sustainability dimensions. The third domain, adoption and legitimacy, assesses factors such as trust, accessibility, perceived fairness, and the readiness of communities to embrace proposed initiatives. The fourth domain, execution and governance, focuses on regulatory compliance, operational efficiency, and the robustness of risk management strategies. By structuring these domains, the system ensures a comprehensive evaluation of sustainability initiatives, addressing both theoretical and practical dimensions of implementation.

Each domain integrates qualitative rubrics alongside quantitative proxies to provide a balanced assessment framework. For example, adoption risk can be evaluated through structured feedback from community stakeholders, which is then converted into a stability index to measure readiness and resilience. Similarly, governance alignment can be systematically analyzed using expert evaluations and detailed policy-fit checklists, ensuring alignment with regulatory standards. A key feature of this system is its emphasis on transparency, where all definitions, scoring methodologies, and threshold criteria are meticulously documented. This documentation enables evaluators to replicate the assessment process, thereby enhancing reliability and minimizing subjective biases that could arise from individual reviewer preferences. By prioritizing clarity and reproducibility, the framework fosters trust and consistency in sustainability evaluations, ensuring that outcomes are both credible and actionable.

3. Analytical Logic: From Participation Data to Investment Decisions

3.1. Reducing Information Asymmetry through Structured Evidence

In the realm of cross-border sustainable investment, information asymmetry poses significant challenges due to factors such as geographical distance, cultural differences, and the complexity of regulatory environments. Participation-based measurement offers a practical solution by introducing localized evidence that would otherwise be prohibitively expensive to obtain. This approach shifts the focus from reliance on narrative persuasion to the creation of structured profiles, which provide insights into how various stakeholder groups perceive value and assess risks. By systematically

capturing these localized perspectives, the evaluation process becomes more robust and transparent, enabling stakeholders to make informed decisions based on tangible evidence rather than subjective interpretations.

From an analytical perspective, public participation serves as a valuable predictive signal in investment decision-making. Responses from the public can reveal critical factors such as adoption friction, perceived barriers, and trust dynamics, which are often overlooked in conventional analyses. When these signals are encoded in a consistent manner, they transform into comparable inputs that complement traditional financial and technical data. This integration does not replace standard due diligence processes but rather enhances them by addressing "soft variables"—elements that frequently influence the success or failure of implementation efforts [5]. By incorporating these nuanced indicators, decision-makers can achieve a more comprehensive understanding of potential outcomes, thereby improving the accuracy and reliability of investment strategies.

3.2. Modeling Trade-Offs: Balancing Financial, Impact, and Legitimacy Criteria

Sustainable urban investment necessitates a deliberate approach to managing trade-offs among various criteria. A framework that simplifies all considerations into a single composite score risks obscuring critical tensions and nuances inherent in decision-making. Instead, the proposed methodology advocates for a multi-criteria evaluation system that generates outputs that are both interpretable and actionable [11]. Each project is assessed through a "triad" of profiles, encompassing financial robustness, the plausibility of its impact, and the strength of its legitimacy and adoption potential. This approach ensures that decision-makers can comprehensively evaluate projects without oversimplifying complex dynamics, thereby fostering more informed investment choices.

Decision-makers are empowered to apply scenario-specific weights based on their organizational mandates and strategic priorities. For example, a risk-averse allocator may focus on ensuring execution certainty and alignment with governance standards, while an impact-driven allocator might prioritize mechanisms that maximize outcomes and extend beneficiary reach. Conversely, a market-entry investor may emphasize readiness for adoption and alignment with key stakeholders. By making trade-offs explicit rather than implicit, this framework enhances transparency and reduces the likelihood of post-investment surprises [12]. Key uncertainties are systematically documented and thoroughly discussed prior to committing capital, enabling stakeholders to anticipate challenges and align expectations effectively.

3.3. Iterative Learning: Building a Repeatable Market Intelligence System

A major limitation of one-off evaluations is that they rarely produce cumulative learning. To address this, the framework can be expressed as a simple and intuitive model: $\text{Urban Investment Score} = \text{Financial Indicators} + \text{Community Participation Signals} + \text{Policy Legitimacy Score}$. This model reframes sustainable urban investment assessment as a composite judgment rather than a purely financial exercise. The first component, financial indicators, captures conventional investment concerns such as revenue stability, cost structure, scalability, and risk-adjusted return potential. These indicators provide a quantitative foundation for assessing the economic viability of a project. The second component, community participation signals, reflects whether local residents, users, and civic actors are meaningfully engaged. It evaluates whether the project aligns with everyday needs and whether there is evidence of public acceptance or behavioral readiness, which are critical for long-term success. The third component, policy legitimacy score, measures the degree to which a project is supported by regulatory alignment, implementation credibility, and institutional coordination [13]. This ensures that the project is not only compliant with existing policies but also benefits from institutional support, which can significantly enhance its feasibility. Together, these three dimensions provide a more comprehensive picture of whether an urban project is not only financially viable but also socially grounded and politically feasible in practice.

The advantage of this model is that it can improve over time through repeated application. As more projects are evaluated, the meaning and weighting of each component can be refined to better reflect real-world outcomes [14]. Patterns begin to emerge, revealing critical insights: some projects may perform well financially but fail due to weak community participation, while others may have modest short-term returns but succeed because of strong policy legitimacy and local support. By systematically comparing early scores with later implementation outcomes, the framework gradually develops predictive value. This iterative process allows for the identification of key factors that contribute to success or failure, enabling more accurate assessments in the future. Furthermore, the model's adaptability ensures that it remains relevant across diverse urban contexts, as it can be tailored to account for unique regulatory environments and community conditions. This dynamic refinement process transforms the model from a static evaluation tool into a living system of continuous learning and improvement.

Over time, this scoring approach builds a practical knowledge base of what tends to succeed under different urban contexts, regulatory environments, and community conditions. For cross-border investors, this reduces cognitive friction by making new projects easier to interpret through a growing set of comparable cases [15]. This accumulated knowledge not only enhances decision-making but also fosters confidence in navigating unfamiliar markets. In this way, evaluation shifts from a one-time judgment to a continuous learning process, where each new project contributes to a broader understanding of sustainable urban investment. The model remains simple enough to communicate clearly, ensuring accessibility for diverse stakeholders, but robust enough to support more rigorous and context-sensitive investment decisions. By integrating financial, social, and policy dimensions, the framework provides a holistic approach to urban project evaluation, making it a valuable tool for fostering sustainable development and long-term success.

4. Implementation Considerations and Governance Safeguards

4.1. Participation Quality: Representation, Bias, and Interpretability

Participation can enhance evaluation processes only when engagement is both credible and inclusive. Two primary risks must be addressed to ensure this credibility: representational bias and interpretive bias. Representational bias arises when participants represent only a limited subset of the community, which can lead to skewed or misleading "public signals" that fail to capture the diversity of perspectives. Interpretive bias, on the other hand, occurs when qualitative feedback is analyzed inconsistently or selectively, potentially distorting the intended meaning of the responses [16]. To mitigate these risks, the framework necessitates robust safeguards, including the establishment of recruitment diversity targets to ensure broad representation, the use of standardized prompts to guide participant responses, and the implementation of transparent coding rules to maintain consistency in data interpretation. Additionally, triangulation methods, such as comparing community feedback with expert evaluations and project-specific data, can further strengthen the reliability of the analysis. When discrepancies arise between these sources, they should be treated as valuable discussion points rather than errors to be eliminated, fostering a nuanced understanding of complex issues while safeguarding decision-making quality.

The framework incorporates explicit measures to address potential biases and enhance decision-making processes. Recruitment diversity targets are essential to ensure that participants reflect a wide range of perspectives, minimizing the risk of representational bias. Standardized prompts play a critical role in guiding responses, reducing variability in interpretation and promoting consistency. Transparent coding rules further support the integrity of qualitative data analysis by providing clear guidelines for categorizing and interpreting feedback. Triangulation, which involves comparing community responses with expert assessments and project-specific data, serves as an additional safeguard. This approach not only validates the credibility of the

signals but also highlights divergences as opportunities for deeper exploration rather than errors to be corrected [10]. By preserving the complexity inherent in diverse viewpoints, the framework ensures that decision quality is maintained while fostering a richer understanding of the issues at hand. These safeguards collectively contribute to a more robust and inclusive evaluation process.

4.2. Operational Integration: Embedding the Framework into Investment Workflows

To ensure practical utility, the framework must seamlessly integrate into real-world investment workflows rather than existing as a purely academic construct. This necessitates aligning its outputs with widely used investment tools such as screening memos, risk registers, and portfolio dashboards. The evaluation results should be presented as structured profiles with precise and standardized definitions, ensuring clarity and usability for decision-makers. Narrative summaries alone are insufficient, as they may lack the specificity required for actionable insights. By embedding the framework into these established artifacts, it becomes a natural extension of the investment process, enhancing its relevance and applicability.

Effective integration also hinges on aligning the timing of framework inputs with critical decision-making stages. Participation data must be available early enough to influence deal selection and structuring, rather than being introduced after key commitments have already been made. This calls for a phased approach: an initial screening phase based on project submissions, followed by a more detailed participation measurement for shortlisted opportunities, and culminating in expert synthesis and comprehensive decision documentation. Such a staged process ensures that efficiency is maintained without compromising the depth of analysis. By structuring the workflow in this manner, the framework can provide timely and actionable insights, ultimately supporting more informed and strategic investment decisions.

4.3. Ethics and Accountability: Human Oversight in Data-Driven Participation

Participatory evaluation transforms human perspectives into actionable decision inputs, necessitating robust ethical governance to ensure fairness and transparency. Participants must be fully informed about the intended use of their contributions, with clear guidelines on privacy protections to safeguard sensitive information [6, 10]. Ethical frameworks should emphasize the importance of human oversight, ensuring that decision-makers retain ultimate responsibility for final judgments. Metrics and indicators should serve as tools to guide decisions rather than as automatic mandates, preserving the integrity of the decision-making process. This approach fosters trust among stakeholders and mitigates potential misuse of participatory data.

Strengthening accountability in participatory evaluation requires a focus on auditability, which involves systematically documenting how indicators were scored, the evidence supporting those scores, and the resolution of trade-offs. This transparency ensures that evaluation decisions are explainable and defensible, protecting both community interests and investor confidence. By explicitly demonstrating how engagement influenced the analytical process, the risk of participation being reduced to mere symbolism is minimized. Such systems enhance credibility and ensure that participatory mechanisms contribute meaningfully to decision-making, fostering a balanced and equitable evaluation framework.

5. Implications for Cross-Border Sustainable Urban Investment

The proposed framework reconceptualizes public participation as a form of market intelligence, shifting its role from a peripheral engagement activity to a central mechanism for informed decision-making. This approach offers significant advantages for cross-border capital investment. Firstly, it enhances interpretability by providing investors with standardized indicators that facilitate a clearer understanding of local adoption dynamics. This structured insight allows for more precise evaluations of potential opportunities. Secondly, it improves comparability by making diverse investment opportunities more comprehensible across various domains and geographic regions. This uniformity aids

investors in assessing heterogeneous projects on a common scale. Thirdly, it bolsters decision defensibility by enabling capital allocation decisions to be supported by traceable evidence rather than relying solely on narrative-driven persuasion. This evidence-based approach strengthens the credibility and accountability of investment strategies, fostering greater confidence among stakeholders.

At a strategic level, the framework contributes to the development of sustainable investment ecosystems by standardizing the articulation and assessment of early-stage opportunities. This standardization lowers entry barriers for credible innovators, encouraging broader participation and fostering rigorous disclosure practices. Additionally, the framework facilitates iterative learning across investment cycles, enabling stakeholders to refine their approaches and gradually transform fragmented opportunity landscapes into structured pipelines of viable projects [1]. By bridging cognitive and institutional gaps, the framework establishes a shared language that connects investors, technical experts, and local communities. This shared understanding not only enhances collaboration but also promotes the alignment of objectives across diverse stakeholders, ensuring that investment strategies are both inclusive and effective in addressing complex urban sustainability challenges.

6. Conclusion

This paper argued that sustainable urban investment faces significant constraints due to a cognitive gap between cross-border investors and the nuanced realities of local sustainability contexts. To address this challenge, it proposed a novel framework that reimagines public participation as an analytical mechanism capable of bridging this gap. The framework integrates venture-grade submissions, structured community engagement processes, and expert scoring methodologies into a repeatable evaluation architecture underpinned by transparent and measurable indicators. The primary contribution of this approach lies in its methodological innovation, which enables the translation of participatory signals into actionable, investment-relevant evidence without oversimplifying complex sustainability dynamics into a singular, opaque metric. By leveraging participation-based measurement, the analysis demonstrates improvements in transparency, reductions in information asymmetry, and enhanced comparability across diverse sustainable urban investment opportunities. Furthermore, this framework offers a pathway for stakeholders to better align investment strategies with localized sustainability priorities, fostering more equitable and impactful urban development outcomes.

For practical implementation, the paper advocates embedding structured participation measurement into the early stages of investment screening and due diligence processes. It emphasizes the importance of explicitly documenting trade-offs to ensure informed decision-making while maintaining robust governance safeguards to protect representation, privacy, and auditability. Additionally, the paper outlines several avenues for future research, including testing the predictive validity of evaluation profiles by linking them to longitudinal project outcomes, refining indicator weights to align with diverse investor mandates, and exploring the integration of advanced digital tools to enhance measurement reliability while preserving essential human oversight. By conceptualizing participation as a form of market intelligence, this approach enables stakeholders to construct a more interpretable, evidence-driven, and socially grounded framework for cross-border sustainable urban investment. The broader implications of this work suggest that such methodologies could significantly contribute to the development of investment strategies that are not only economically viable but also socially and environmentally sustainable, thereby addressing critical global challenges in urban development.

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