Government Subsidy Effectiveness in Platform-Based Construction Waste Transaction Governance: An ISM-Based Mechanism Model

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1. Introduction

Construction and demolition waste (CDW) remains a major challenge for urban sustainability. In China and other countries, subsidy policies have been used to promote recycling, but their effects are not stable across places and projects. Research on subsidy models shows that recycling performance is influenced by subsidy design, contractor behaviour, and recycling cost (Tan et al., 2023). City-level studies also show that local treatment capacity and governance capacity shape CDW management performance (Chen et al., 2025). Research on penalty and supervision further indicates that illegal disposal remains difficult to control when compliant treatment is costly and enforcement is weak (Jia et al., 2017; Liu et al., 2022). This suggests that subsidy effectiveness should be examined together with implementation, supervision, platform, and market conditions rather than only at the policy design level.

At the same time, platform-based governance is receiving more attention in CDW management. A multi-stakeholder digital platform can support data exchange, rule guidance, and supervision (Barakat & Srour, 2024). Related marketplace and recycled-product studies also show that market access, procurement support, product standards and certification, and local demand are important for the adoption of recycled materials (Caldera et al., 2020; Shooshtarian et al., 2020; Shooshtarian et al., 2022). However, these studies address different parts of the problem and do not show how they work together in a platform-based subsidy setting. This study develops an Interpretive Structural Modeling (ISM)-based mechanism model to explain how government subsidies affect platform-based construction waste transaction governance.

2. Material and methods

This study uses an ISM-based model development approach. Factors were first identified from studies on subsidy design, CDW governance, digital platforms, illegal dumping control, and recycled-material adoption. The platform was defined as an implementation and coordination carrier rather than as a subsidy recipient. Expert judgments were then used to assess the direct influence relationships among the retained factors. These judgments were organised through ISM to construct a four-level mechanism model. Finally, the model was interpreted through three mechanism routes: recovery, control, and adoption.

3. Results and discussion

The retained factors and outcome dimensions were arranged into a four-level ISM mechanism model. The foundational level includes subsidy design, local capacity, and platform data conditions. The platform support level includes data sharing, rule guidance, and supervision support. The implementation and market level includes compliant treatment cost, illegal dumping benefits, regulatory penalties, procurement support, market demand, market access, and product standards. The outcome level includes resource recovery, illegal disposal control, and engineering adoption of recycled materials.

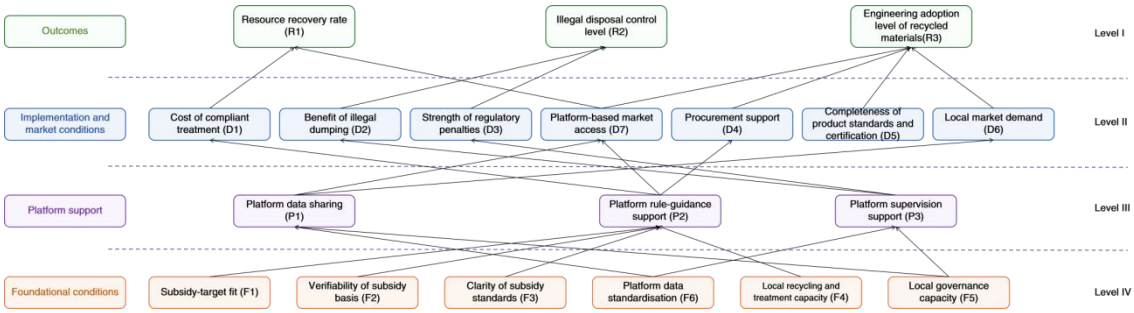

Figure 1. ISM-based mechanism model of government subsidies in platform-based construction waste transaction governance.

Note: F = foundational conditions; P = platform support; D = implementation and market conditions; R = outcomes.

The analysis identifies three main mechanism routes. The first is the recovery route. Subsidy-target fit, local recycling and treatment capacity, and platform rule-guidance support converge on the cost of compliant treatment, while platform data sharing supports platform-based market access. These two routes then connect to resource recovery rate. The second is the control route. Local governance capacity is linked to platform supervision support, which then connects to regulatory penalties, while the benefit of illegal dumping remains a competing pressure that weakens illegal disposal control. The third is the adoption route. Procurement support, product standards and certification, and local market demand are linked directly to the engineering adoption of recycled materials. The model shows that subsidy effects are not direct. They work through platform support, implementation conditions, and market conditions before reaching recovery, control, and adoption outcomes. These routes show that subsidy effects work through platform support, implementation conditions, and market conditions before reaching recovery, control, and adoption outcomes.

4. Conclusions

This study develops an ISM-based mechanism model for evaluating government subsidy effectiveness in platform-based construction waste transaction governance. The model shows that subsidy effects work through four levels: foundational conditions, platform support, implementation and market conditions, and final outcomes. The recovery, control, and adoption routes explain how subsidies affect resource recovery, illegal disposal control, and engineering adoption of recycled materials. The study therefore shows that subsidy effectiveness depends on the interaction between policy design, platform support, implementation conditions, and market response.

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