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Idle Land Revitalization through PPP: A Comparative Analysis of Operational Models and Financial Sustainability in East Asian Urban Regeneration

Jyh-Harng Shyng[1,a,*]

[1]*Life Sciences College, Zhaoqing University, Zhaoqing, Guangdong, China*
[a]*hidosing@outlook.com*
**Corresponding author*

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Abstract: Idle land and brownfield sites constitute a growing urban challenge across East Asian cities confronting post-industrial transition and fiscal constraint. Public–private partnership (PPP) models have emerged as a promising mechanism for revitalizing such sites, yet operational architectures and financial sustainability vary considerably across institutional contexts. This study conducts a comparative analysis of three PPP models deployed in East Asian urban regeneration: China's government-zero-investment BOT model (exemplified by the Shipaili Cultural and Creative Block), Japan's disaster-mitigation community-driven redevelopment model, and Korea's public corporation-led urban regeneration PPP. Drawing on project financial data, institutional analysis, and the Value-for-Money (VFM) framework, the paper compares government investment share (0% to 45%), private IRR (4.3% to 6.5%), payback periods (14 to 18 years), and VFM outcomes. A horizontal four-stage financial sustainability assessment framework—Revenue Streams → Cost Structure → Net Cash Flow → Sustainability Thresholds—is proposed and applied. Findings reveal that operational model selection is primarily institutionally driven, with each model exhibiting distinct sustainability profiles: the Chinese model is viable but fragile, the Japanese model achieves the most balanced risk–return profile, and the Korean model generates the highest absolute VFM but requires the strongest institutional capacity. Policy implications for matching PPP models to local institutional maturity are discussed.

1. Introduction

Urban idle land—previously developed sites whose functions have ceased and which remain underutilized—represents both a chronic urban blight and a wasted resource across East Asian cities. Deindustrialization, demographic shifts, and fiscal constraints have slowed government-led redevelopment, leaving an estimated 60,000 hectares of idle urban land in China alone. Public–private partnerships have been increasingly adopted as alternatives to traditional procurement, mobilizing private capital and operational expertise to transform derelict sites without exhausting public budgets.

PPP models for idle land revitalization in East Asia exhibit substantial cross-national variation. China's Shipaili Cultural and Creative Block transformed abandoned factory dormitories under a 20-year BOT concession with zero government capital expenditure. Japan's Disaster Mitigation Zone Implementation Program combines national subsidies with community-driven redevelopment to revitalize disaster-vulnerable districts [1]. Korea's urban regeneration PPPs, led by public corporations such as the Korea Land and Housing Corporation (LH), redevelop station-area brownfields through mixed-use, state co-investment models.

Despite growing deployment, systematic comparative analysis of these operational models and their financial sustainability remains scarce. Existing studies have primarily examined PPPs within single-country frameworks[2][3][4], while cross-national work interrogating why different models emerge and how they perform financially is notably absent. This study addresses this gap through a structured comparison guided by three research questions:

(1) What distinguishes the operational architectures of PPP models for idle land revitalization in China, Japan, and Korea?

(2) How do these models differ in financial sustainability outcomes?

(3) What institutional conditions explain cross-national variation?

2. Literature Review

PPP operational models are conventionally classified along a spectrum of private sector involvement, from service contracts at the low-risk end to full privatization at the high-risk end [5]. Each model represents a configuration of CAPEX responsibility, revenue rights allocation, and risk-sharing mechanisms. Idle land revitalization introduces additional complexities absent from greenfield infrastructure PPPs: legacy liabilities (contamination, unclear property rights), revenue uncertainty in cultural and tourism uses, and public interest dimensions (heritage preservation, affordable space) that constrain pure profit-maximization logic [4].

Financial sustainability in PPP projects is conventionally assessed through the debt service coverage ratio (DSCR $\geq$ 1.2), internal rate of return exceeding the weighted average cost of capital (IRR > WACC), payback period within the concession horizon, and Value-for-Money (VFM = PSC − PPP $\geq$ 0) [1][2]. Critical success factors identified across multiple studies include a clear regulatory environment, transparent procurement, equitable risk allocation, and robust stakeholder engagement [3][9]demonstrated that business environment quality—including rule of law, financing accessibility, and government credibility—significantly moderates PPP outcomes, suggesting that financial sustainability indicators must be contextualized within institutional environments rather than treated as universally applicable benchmarks.

The three countries examined share structural features (strong state capacity, dense populations, post-industrial transitions) but diverge in PPP governance. China's PPP market, exceeding 14,000 registered projects by 2022, operates under a fragmented regulatory framework with substantial subnational variation in government capacity [6][7]. Japan's framework, refined through post-disaster reconstruction since the 1995 Kobe Earthquake, emphasizes consensus-building, incremental project formulation, and targeted subsidies [1]. Korea institutionalized PPPs through the Act on Public–Private Partnerships in Infrastructure, relying on public corporations as lead partners for large-scale integrated regeneration[8][9].

3. Operational Models Typology

Based on the institutional and empirical review, we propose a three-type typology (Figure 1).

Figure 1. Typology of PPP Operational Models for Idle Land Revitalization in East Asia.

Type I: Government-Zero-Investment BOT (China).

The private partner bears all CAPEX and OPEX; the government contributes land-use rights and administrative facilitation. Revenue is generated entirely through user-pays mechanisms (tenant rent, ticket sales, service fees). This model emerges where governments face acute fiscal constraints but possess commercially viable land assets.

Type II: Community-Driven Redevelopment with Subsidies (Japan).

Government subsidies cover 30–40% of project costs through national disaster mitigation programs. Mandatory community consensus-building mechanisms and small-scale incremental phasing reduce private risk exposure. The model reflects post-disaster institutional learning and Japan's emphasis on social consensus in urban planning.

Type III: State-Led Urban Regeneration (Korea).

Public development corporations serve as lead partners and equity co-investors (40–50% of total investment). Land readjustment mechanisms consolidate fragmented parcels. Mixed-use development cross-subsidizes public facilities through commercial revenues. This model leverages Korea's mature public corporation system and strong planning capacity, as shown as table 1.

Table 1. Comparative Parameters of East Asian PPP Operational Models for Idle Land Revitalization

Parameter	Type I: China	Type II: Japan	Type III: Korea
Government CAPEX share	0%	30–40%	40–50%
Private CAPEX share	100%	60–70%	50–60%
Revenue model	User-pays only	User-pays + subsidies	Mixed (cross-subsidy)
Concession period	20 years	15–25 years	20–30 years
Community participation	Minimal	Mandatory consensus	Moderate
Risk allocation	All risk → private	Shared	Balanced
Typical scale	1–3 ha	0.5–2 ha	5–50 ha
Institutional maturity required	Low	Medium	High
Exemplar	Shipaili, Zhaoqing	Tokyo DMZ districts	Seoul Station Redevelopment

4. Comparative Case Analysis

4.1. Shipaili Cultural and Creative Block (China)

The Shipaili project transformed 13,269 m^2 of abandoned state-owned factory dormitories in Zhaoqing, Guangdong, into a mixed-use tourism complex under a 20-year BOT concession with CNY 30 million (USD 4.2 million) in private investment. The government contributed land-use rights only; no equity, subsidies, or guarantees were provided. Annual operating revenue reached CNY 6.54 million (primarily tenant rent at CNY 80/m^2 across 6,227 m^2), against annual O&M of CNY 1.75 million. The after-tax project IRR was 4.3% with a financial IRR on capital of 4.23%. The PSC value, discounted at 10%, equaled CNY 23.47 million, while the PPP value was zero, yielding VFM = CNY 23.47 million. The DSCR of 2.74 comfortably exceeded the 1.2 threshold. Expert scoring (n = 5) yielded a composite VFM qualitative score of 69/100, above the 60-point Ministry of Finance threshold.

4.2. Disaster Mitigation Zone Redevelopment (Japan)

Japan's DMZ Implementation Program targets densely populated districts with aging, disaster-vulnerable wooden structures. The operational architecture features government subsidies of 30–40% of project costs, mandatory community consensus-building through neighborhood associations, and small-scale incremental phasing [1]. Private IRRs range from 5.5% to 7.0% across documented cases, with payback periods of 12–16 years. The subsidy functions as an implicit Viability Gap Funding mechanism, attracting private investment to districts that would otherwise be commercially unviable. Smaller, simpler project configurations were found to attract a broader developer pool than complex large-scale schemes.

4.3. Urban Regeneration PPPs (Korea)

Korea's model, operationalized through the Special Act on Urban Regeneration (2013) and administered by LH Corporation, targets station-area brownfields, former industrial zones, and declining commercial districts. LH provides 40–50% equity co-investment, with land assembly and infrastructure provision by the public sector reducing private pre-development risk. Mixed-use zoning cross-subsidizes public facilities through commercial and residential revenues. Private IRRs range from 5.0% to 6.5%, with payback periods of 14–18 years and positive VFM across all documented projects, though the magnitude varies with the commercial-to-public space ratio.

4.4. Cross-Model Financial Comparison

Figure 2 presents comparative financial indicators across the three models.

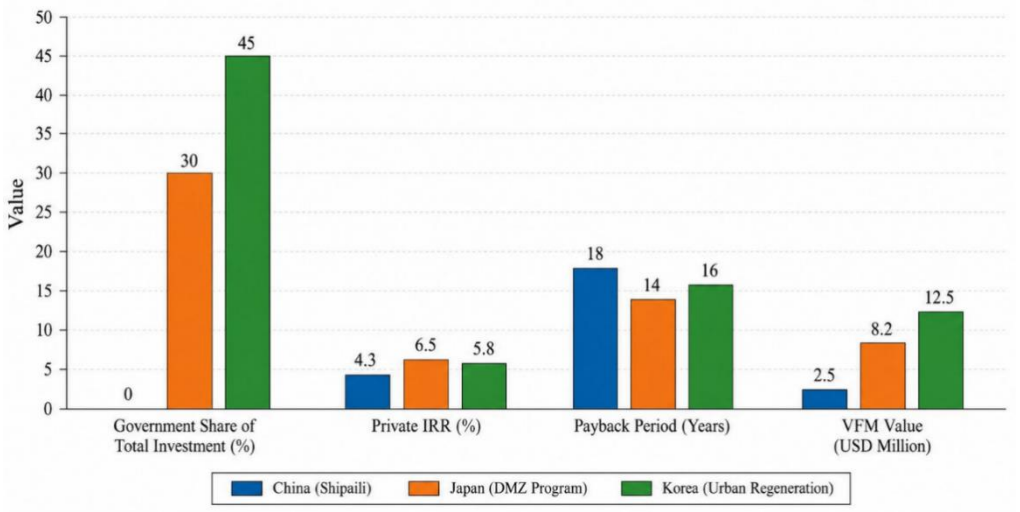

Figure 2. Comparative Financial Indicators Across Three East Asian PPP Models.

Government investment share ranges from 0% (China) to 45% (Korea). Private IRR is highest in Japan (6.5%), where subsidies de-risk projects, and lowest in China (4.3%), where full risk transfer compresses returns. The payback period is longest in China (18 years), approaching the concession limit, and shortest in Japan (14 years). VFM value is highest in Korea (USD 12.5 million) owing to scale, but VFM per invested dollar is more comparable across models.

5. Financial Sustainability Assessment Framework

To systematically evaluate sustainability across the three models, we propose a four-stage horizontal assessment framework (Figure 3).

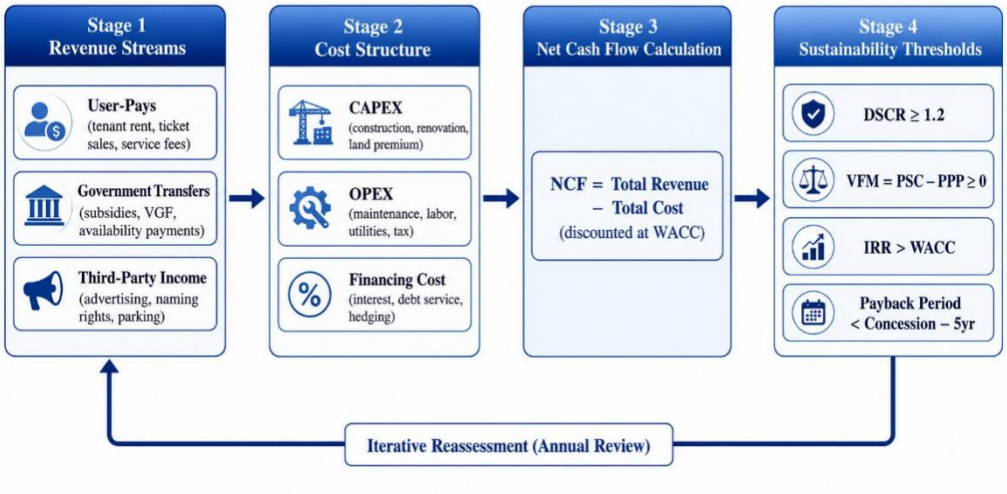

Figure 3. Financial Sustainability Assessment Framework for PPP Idle Land Projects.

The framework proceeds through four stages:

Revenue Streams (user-pays, government transfers, third-party income) → **Cost Structure** (CAPEX, OPEX, financing costs) → **Net Cash Flow Calculation** (NCF = Total Revenue − Total Cost, discounted at WACC) → **Sustainability Thresholds** (DSCR ≥ 1.2; VFM ≥ 0; IRR > WACC; Payback Period < Concession − 5 years). A feedback loop from Stage 4 to Stage 1 enables iterative

annual reassessment.

Application to the three models.

(1) Type I (China) comfortably meets DSCR (2.74) and VFM thresholds, but the private IRR of 4.3% falls below typical infrastructure equity return expectations (8–12%), and the 18-year payback period leaves only a two-year buffer. Sustainability is viable but fragile.

(2) Type II (Japan) achieves the most balanced profile—IRRs (5.5–7.0%) offer comfortable margins above Japanese risk-free rates (< 1%), and 12–16-year payback periods provide ample buffer. DSCR levels are subsidy-supported. However, reliance on national subsidy programs introduces policy risk.

(3) Type III (Korea) generates the highest absolute VFM but moderate private IRRs (5.0–6.5%); sustainability is structurally robust but institutionally demanding, requiring sustained public corporation capacity across electoral cycles.

6. Discussion

The cross-national variation documented above cannot be explained by project-level financial parameters alone. Three institutional factors appear decisive.

(1) F**iscal capacity and land ownership structure** drive model selection. China's local governments, facing acute fiscal pressure from declining land transfer revenues, have rationally externalized all financial risk to private partners. Japan's dedicated national disaster mitigation budgets enable the hybrid subsidy model. Korea's strong public corporations with independent balance sheets allow state co-investment.

(2) **PPP ecosystem maturity** constrains model complexity. China's fragmented regulatory environment [3] renders more intricate risk-sharing arrangements administratively infeasible, reinforcing BOT dominance. Japan and Korea, with longer PPP histories and standardized contractual frameworks, can operationalize more nuanced arrangements.

(3) S**ocio-political expectations regarding public goods** shape procedural requirements. Japan's post-disaster ethos embeds community consensus as non-negotiable, enhancing legitimacy at the cost of speed. Korea mandates mixed-use with public facility components. China prioritizes fiscal efficiency and speed, with community participation limited to consultation.

Three policy implications emerge.

(1) Match the operational model to institutional maturity. Governments with limited PPP experience should start with simpler models before progressing to more complex arrangements.

(2) Calibrate sustainability thresholds to model type. For Type I, the payback-to-concession ratio is more discriminating than DSCR; for Type II, subsidy stream stability is as critical as project-level ratios.

(3) Institutionalize cross-subsidization for projects with public goods dimensions. Government co-investment—through subsidies or public equity—can unlock private investment in commercially marginal projects while maintaining financial discipline.

7. Conclusion

This study conducted a comparative analysis of three PPP operational models for idle land revitalization in East Asia, finding that model selection is primarily institutionally driven—by fiscal capacity, PPP ecosystem maturity, and socio-political expectations—rather than by project-level financial optimization. Each model exhibits a distinct sustainability profile: the Chinese model is viable but fragile, the Japanese model is the most balanced, and the Korean model is the most robust but institutionally demanding. A four-stage financial sustainability assessment framework integrating revenue streams, cost structures, net cash flow calculation, and threshold evaluation was

proposed and applied. The study's limitations—reliance on a small number of case studies, backward-looking financial indicators, and a necessarily simplified typology—suggest directions for future large-N quantitative comparison, stochastic simulation modeling, and investigation of hybrid models as the East Asian PPP landscape continues to evolve.

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