

Foreign Dominance and Local Resilience in Infrastructure Development: Evidence from Sarawak, East Malaysia

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Abstract: As the Sarawak state government accelerates infrastructure development to stimulate economic growth, it has attracted numerous foreign construction enterprises—particularly Chinese firms—entering the market through low-cost bidding. However, this foreign-dominated model, while improving efficiency, has triggered local enterprise marginalization, industrial chain fragmentation, payment delays, and project setbacks, undermining the intended economic spillover effects of public investment. Grounded in policy analysis and field evidence within a dependency theory framework, this study evaluates the structural impacts of foreign participation on Sarawak’s local economy, uncovers governance gaps, and proposes strategies to enhance local economic resilience under open-market conditions. The findings reveal that foreign contractors (especially Chinese enterprises), despite their capital and technological advantages in dominating mega-projects, exhibit pervasive shortcomings: inadequate local participation (falling far below the 40% policy target), deficient knowledge transfer (local firms hold only 6% of green technology patents), significant value leakage (foreign profit repatriation dominated project value flows), and widespread execution delays/cost overruns due to underestimation of tropical climate-geological risks, institutional maladaptation, and resource misallocation. Drawing on experiences from the Philippines, Indonesia, and Vietnam, the study proposes systemic reforms: introducing a Low-Bid Risk Evaluation System (LRES), enforcing a mandatory Local Participation Index (LPI), establishing a Smart-Contract-Based Digital Payment Chain System (DPCS) to protect subcontractors, and requiring pre-bid local adaptation training for foreign contractors. These recommendations aim to construct “embedded institutional resilience,” transforming policy intent into executable governance mechanisms to ensure infrastructure investment genuinely serves Sarawak’s inclusive and sustainable growth.

Keywords: Foreign construction firms; Local enterprise participation; Low-cost bidding; Industrial chain fragmentation; Dependency theory; Institutional capacity; Economic resilience

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1. Introduction

Sarawak, a focal point of regional development in East Malaysia, has pursued rapid economic growth through major infrastructure initiatives such as the Pan Borneo Expressway and the KUTS urban transit system. However, the influx of foreign investors—particularly Chinese construction companies—has presented significant challenges to the local economic structure. This paper investigates the effects of foreign participation in Sarawak’s infrastructure sector, particularly on local industrial linkages, enterprise engagement, and the effectiveness of policy implementation. It further proposes constructive countermeasures grounded in both theoretical analysis and empirical evidence ^[1].

This study is guided by three core research questions:

- (1) How does foreign-led infrastructure development constrain local industry participation?
- (2) What factors hinder effective policy enforcement?
- (3) How can Sarawak cultivate adaptive mechanisms to foster local economic resilience?

The findings of this study also provide broader implications for public investment strategies in other resource-rich regions across Southeast Asia.

2. Sarawak’s infrastructure development policy context and implementation structure

Since 2016, Sarawak has implemented large-scale infrastructure projects, including the RM16 billion Pan Borneo Highway ^[2], RM4.5 billion Kuching Urban Transportation System (KUTS), and the Rural Transformation Programme (RTP) with annual funding exceeding RM1.5 billion. Under the *Post-COVID-19 Development Strategy 2030 (PCDS 2030)*, infrastructure investment is projected to grow over 8% annually, comprising more than 33.5% of the state’s total budget. This strategy harnesses infrastructure development as a catalyst for industrial upgrading, leveraging embedded technological capabilities and institutional innovation to generate sustainable multiplier effects.

However, Sarawak’s complex geography (e.g., dense rainforests, mountainous terrain) and extreme tropical climate (annual rainfall >4,000 mm) impose high technical and capital demands on infrastructure projects. Local firms face structural constraints including:

- (1) Limited access to advanced technologies (e.g., AI-driven construction systems)
- (2) Financing bottlenecks (higher loan rates vs. international players)
- (3) Shortages of skilled labor (only 22% engineering graduates meet industry needs)

In contrast, foreign contractors—particularly Chinese firms—leverage superior resources, as shown in **Table 1**.

Table 1. Competitive edge: Chinese contractors vs. local firms

Competitive edge	Chinese contractors	Local firms
Capital capacity	Syndicated loans at <3% interest	Average bank rate 6.5%
Equipment	Autonomous machinery fleets	78% rely on leased equipment
Engineering expertise	150+ projects in tropical regions	Average 2 large-scale project experiences

These disparities position international players as dominant in public tenders, as evidenced by the KUTS Blue Line tender requirements, as shown in **Table 2**.

Table 2. Minimum scale requirements and supporting documentation for project types

Project type	Minimum scale requirement	Notes
ART or rail projects	Contract value $\geq$ RM100 million	Provide copies of contracts and project verification documents
Urban infrastructure	Total length $\geq$ 5 km, or single structure (e.g., bridge) $\geq$ 100 meters	Include as-built drawings, handover certificates, etc.
Smart traffic systems	Experience covering $\geq$ 5 stations (e.g., dispatching, ticketing, surveillance)	Include system integration or software configuration details

Bidding companies must demonstrate sound financial stability, with the following indicators, as shown in **Table 3**.

Table 3. Financial and creditworthiness requirements

Requirement	Specific criteria
Audited financial reports	Audited statements for the last 3 consecutive years (including balance sheet, income statement, and cash flow statement)
Net assets	Net assets $\geq$ RM50 million
Annual turnover	Annual revenue $\geq$ RM100 million
Cash flow capacity	Provide proof of working capital or a bank credit line of at least RM 20 million
No debt risk	No significant outstanding debts, unresolved legal disputes, or breach of contract records in the reports

Resource: Tender document for Kuching Autonomous Rapid Transit (ART) Blue Line – Package 2

To mitigate foreign dominance and advance industrial upgrading, Sarawak mandated three bidding conditions:

- (1) Foreign firms must establish joint ventures with local partners;
- (2) Local participation must cover at least 40% of project value (including equity, subcontracting, and employment);
- (3) Bid evaluation adopts multidimensional scoring (60% technical/ESG, 40% price).

However, inadequate enforcement capacity (e.g., only 12 auditors for 142 projects in 2023) and local contractors' technical limitations (only 15% are proficient in BIM [Building Information Modeling]) have undermined implementation. Consequently, the policy's intent to empower local industries remains unrealized, with foreign firms still winning 92% of mega-projects ($>$ RM500 mil) in 2022–2024 ^[3].

3. Contradictions between foreign domination and local enterprise development

The growing dominance of foreign construction firms in Sarawak's infrastructure sector has created multiple tensions that hinder the development of local enterprises. Although intended to promote inclusive growth, current practices have often marginalized local actors and weakened the industrial spillover effect of public investment. This section outlines four key contradictions emerging from foreign-led infrastructure implementation ^[4].

3.1. Winning bids at low prices and marginalization of local enterprises

Chinese contractors consistently submit bids 15–22% below local cost benchmarks (CIDB 2023 Q3 Report), triggering unsustainable price competition. Although price constitutes only 40% of the evaluation criteria, foreign firms dominate the lowest-quartile bids in 83% of tenders ($>$ RM500 mil).

Joint ventures (JVs) often operate as “shell partnerships”: Local entities are excluded from critical domains (e.g., BIM coordination, supply chain management), reducing their role to subcontractor-level participation (average profit share <15%). This violates Sarawak’s Genuine Partnership Guidelines 2022, requiring joint decision-making on ≥30% project value.

3.2. Weakening of the local industrial chain

Foreign contractors import 72% of materials and 65% equipment (e.g., tunnel boring machines from China), bypassing local suppliers. State audit data shows local participation averaged 21.3% in 2022–2023—half the 40% policy target—with only 12% of procurement value flowing to Sarawak-registered firms ^[5].

This import dependency stifles local industrial linkages: For every RM1 billion project, RM380 million potential local value-add is lost (World Bank 2023). This undercuts the intended industrial linkage effects and limits the growth potential of domestic supply chains ^[6].

3.3. Payment risks for downstream businesses

Systemic payment delays plague local subcontractors in foreign-led projects, driven by prime contractors’ low-bid strategies that necessitate downstream cost compression. At the Pan Borneo Highway Section 11 project, 87% of suppliers suffered delays exceeding 180 days, with 41% waiting over 12 months—triple the state average (World Bank Enterprise Survey 2023, Sarawak Module, N = 200) ^[7].

3.3.1. Structural roots lie in risk-shifting clauses:

“Pay-when-paid” (PWP) clauses allow primes to withhold payments until receiving owner funds, transferring liquidity risk to SMEs; “Pay-if-paid” (PIP) variants in 23% of contracts enable outright non-payment if the owner defaults ^[8].

3.3.2. Local firms lack bargaining power to reject these terms:

92% of subcontractors accepted PWP/PIP clauses under duress, fearing blacklisting from future bids (Sarawak Fair Contracting Report 2024).

3.4. Local social impacts

Labor inclusion failure: At the Kuching-Samarahan Expressway project, only 28% of skilled positions were held by locals vs. contracted 45%—a breach penalized by merely RM250,000 (<0.1% project value).

Accountability deficit: Of 17 safety incidents (2023), 14 were linked to design flaws by foreign engineers, yet liability was transferred to local subcontractors via “back-to-back” indemnity clauses (Sarawak OSHA Report Case #2023-047).

4. Challenges in project implementation: Climate, institutions, and execution

The rollout of foreign-led infrastructure projects in Sarawak has encountered a range of interlocking challenges that undermine their timely and cost-effective delivery ^[9,10]. These challenges span across three core domains:

- (1) Environmental and geological constraints: Sarawak’s extreme rainfall patterns, peat-rich soils, and landslide-prone terrains require highly localized engineering solutions. Many foreign contractors lack adequate adaptation strategies for tropical climates and complex subsoil conditions, leading to frequent delays and structural issues.
- (2) Institutional mismatches and regulatory complexity: The coexistence of Malaysian Standards (MS) and

legacy British Standards (BS), compounded by multi-level approval processes involving federal, state, and indigenous authorities, creates procedural ambiguity. Foreign firms often struggle with regulatory interpretation, licensing, and environmental approvals—resulting in legal disputes and prolonged bottlenecks.

- (3) Executional limitations and resource gaps: Low-bid procurement strategies adopted by many foreign contractors often result in insufficient contingency planning and poor on-site resourcing. Inadequate technical protocols, workforce delays, and logistical inefficiencies further weaken execution capacity, particularly during monsoon seasons or on geotechnically unstable sites.

Collectively, these climate-driven, institutional, and operational barriers have contributed to widespread delays, cost overruns, and underperformance across major projects in Sarawak. Addressing them requires not only technical recalibration and better standard harmonization but also deeper alignment between foreign contractors and local institutional ecosystems.

4.1. Climate and geology adaptation

Sarawak's unique climatic and geological conditions pose serious challenges to infrastructure development, particularly for foreign contractors unfamiliar with the local terrain. The region experiences intense monsoonal rainfall and unpredictable subsoil conditions, which significantly increase engineering complexity, risk, and cost ^[11].

4.1.1. Climatic extremes and construction delays

Sarawak's monsoon season, typically spanning October to April, brings monthly rainfall exceeding 600 mm, among the highest in Southeast Asia. These torrential rains can quickly turn construction zones into inaccessible or unstable sites, especially in rainforest-covered areas where soil erosion and slope instability are common ^[12].

According to the World Bank (2024), in Sarawak's equatorial rainforest terrain, every single day of rain results in an average of 3.5 days of project delay, due to compounded effects such as:

- (1) Limited access for heavy machinery,
- (2) Prolonged drying and curing times for concrete works,
- (3) Frequent site shutdowns for safety compliance.

This rainfall impact multiplier severely undermines project scheduling and demands sophisticated adaptive planning—something many foreign contractors fail to integrate into their bid-phase risk assessments.

4.1.2. Geological complexity and technical misjudgment

Sarawak's terrain is also characterized by its geotechnical heterogeneity, with approximately 35% of major infrastructure projects built on peatlands or landslide-prone zones. These conditions require hyper-localized geotechnical investigation, soil treatment strategies, and adaptive engineering design.

Yet many foreign firms, especially those unfamiliar with tropical geologies, underestimate subsurface risks. For example:

- (1) On the Bintulu–Miri Highway, insufficient soil consolidation planning led to piling structures sinking 2.1 meters, primarily due to peat soil compression, a failure attributed to poor hydrogeological assessment.
- (2) The Sarawak State Auditor-General Report (2024) highlighted similar issues in KUTS Phase 1, where slope failures and groundwater management errors caused delays totaling 9.3% beyond the planned schedule.

Across large-scale public projects in the state, average construction delays reached 14.7% in 2023, a figure significantly above the national benchmark. A substantial portion of these delays can be traced back to geological

misjudgments and inadequate rain-adaptation protocols.

4.1.3. Root causes of underperformance

Key recurring deficiencies observed among foreign contractors include:

- (1) Over-reliance on BS or GB soil classification methods without tropical soil calibration;
- (2) Absence of real-time rain risk models in scheduling software;
- (3) Generic slope stabilization designs that fail under local saturation and run-off conditions;
- (4) Lack of contingency in budgeting for monsoon-induced rework or delayed mobilization.

4.2. Inadequate system and approval processes

Malaysia’s construction sector is governed by a hybrid regulatory framework that integrates British Standards (BS), Malaysian Standards (MS), and Chinese Standards (GB). While this system is intended to align international best practices with national requirements, in practice, it has created systemic challenges, especially for foreign contractors unfamiliar with local regulatory nuances. These challenges include technical incompatibilities, bureaucratic ambiguity, and lengthy approval procedures, all of which contribute to delays, cost escalations, and credibility risks for non-local firms.

4.2.1. Technical standard conflicts

One of the most critical barriers to seamless project delivery lies in the conflicting technical requirements between BS, MS, and other national standards, such as China’s GB system (Table 4). In particular, inconsistencies in geotechnical and soil testing protocols often force foreign contractors to redesign or revalidate key components mid-project, leading to schedule overruns and budgetary strain.

Table 4. Cross-jurisdictional technical conflicts

Conflict area	BS Standard	MS Standard	Chinese Standard (GB)	Impact
Slope safety	BS 8004:2015 – Foundations	MS EN 1997-1:2010 – Eurocode 7	GB 50007-2011 – Building Foundation Code	MS permits a 1.8× lower factor of safety compared to BS and GB, raising landslide risk and triggering redesigns or local authority rejections.
Peat soil testing	BS 1377-2:2022 – Soil Methods	MS 2801:2019 – Peat Soil Testing	GB/T 50123-2019 – Soil Test Methods	Saturation thresholds and shear strength metrics differ, resulting in incompatible test data and 3–6 month redesign delays.

These discrepancies not only undermine engineering consistency but can also erode contractor credibility, especially in public infrastructure and high-stakes tender environments.

4.2.2. Procedural bottlenecks

In addition to technical conflicts, foreign contractors must navigate Malaysia’s multilayered and decentralized approval systems, which include federal ministries, state-level authorities, and indigenous land councils. This fragmented structure contributes to significant delays in environmental, land, and operational clearances.

- (1) Environmental Impact Assessment (EIA) approval delays: According to data from CIDB’s Project Dashboard 2023, foreign contractors face an average EIA approval period of 14 months, compared to 8 months for local contractors.
- (2) Key contributing factors: NCR (Native Customary Rights) Land Certification: Projects located on or near NCR-designated lands must undergo mandatory tribal consultations, involving negotiations with multiple indigenous communities. This adds, on average, 4.7 months to the approval timeline (Figure 1).

- (3) Language and legal misinterpretations: A CIDB arbitration case (2024-077) revealed that 38% of Chinese contractors misinterpreted the term “substantial completion” as referring to mechanical completion, resulting in premature handovers and a 22% project rework rate. This illustrates a critical need for multilingual contract templates and localized legal training.

4.2.3. Operational gridlock

Even after securing design and environmental approvals, foreign contractors frequently encounter downstream execution barriers, especially in areas such as equipment mobilization and skilled labor deployment. These issues are often caused by document mismatches, inconsistent certification protocols, and slow institutional processing.

- (1) Equipment mobilization delays: Machinery sourced from abroad—often compliant with BS or GB standards—faces average customs delays of 17 days, due to non-alignment with Malaysia’s MS-based certification. These delays disrupt project timelines and inflate idle equipment costs on-site.
- (2) Professional licensing delays: Foreign engineers, particularly from China and the Republic of Korea, encounter average wait times of 68 days to receive MS-accredited licenses, in stark contrast to 14 days in neighboring Singapore. These licensing delays discourage expatriate professionals from long-term assignments, affecting project supervision and quality control.

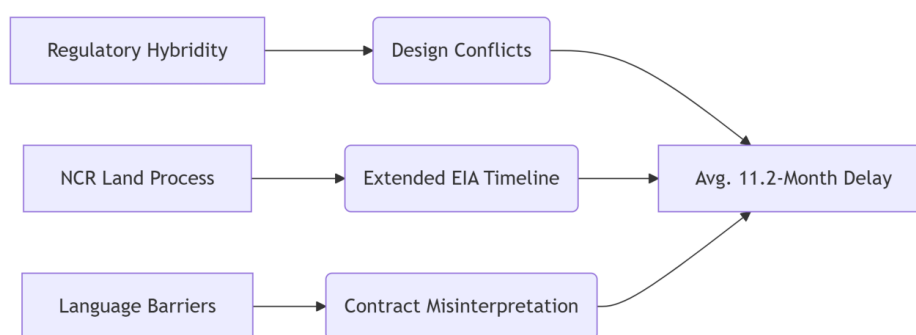


Figure 1. Systemic impact diagram

4.3. Insufficient resources for project execution

One of the most persistent challenges undermining timely and effective project delivery in Malaysia’s construction sector is the issue of insufficient on-ground resources, particularly in large-scale infrastructure projects. This problem is notably acute among foreign contractors, whose bidding strategies and operational models often fail to account for local conditions and risk variables.

4.3.1. Bid-induced resource gaps

A key driver of resource insufficiency is the low-bid strategy commonly adopted by foreign firms in competitive tenders. While effective in securing contracts, this approach often results in compressed contingency budgets, leaving limited financial flexibility to respond to delays, design changes, or unforeseen site conditions (**Figure 2**).

According to CIDB Guideline 7A, a minimum contingency allocation of 8% is recommended for large-scale infrastructure projects in Malaysia. However, data from the CIDB Project Dashboard 2023 reveals that foreign bids often allocate less than 2.5%—a discrepancy that significantly increases project vulnerability to disruption. These tight margins frequently result in manpower shortages, delays in equipment deployment, and difficulties in engaging qualified subcontractors during peak demand periods.

4.3.2. Knowledge and protocol deficits

In addition to under-budgeting, foreign contractors often lack the technical protocols adapted to Malaysia's tropical monsoon climate. Approximately 79% of foreign firms operating in Malaysia do not possess monsoon-adapted construction protocols, such as:

- (1) Specialized techniques for foundation stabilization in saturated clay soils;
- (2) Real-time erosion and sediment control during prolonged rainfall;
- (3) Adjusted scheduling models that account for seasonal weather volatility.

The absence of such context-sensitive know-how not only hinders operational continuity but also amplifies environmental and structural risks during project execution.

4.3.3. Delay divergence by contractor origin

These deficiencies are reflected in the project performance metrics reported by CIDB (Table 5). An analysis of 84 infrastructure projects exceeding RM500 million in value demonstrates.

Table 5. Clear divergences in outcomes based on contractor origin

Contractor type	Average delay (months)	Cost overrun (%)	Critical failure rate (%)
Chinese	7.3	22	71
Japanese	3.1	9	29
Local (Malaysian)	2.4	6	18

Source: Construction Industry Development Board (CIDB) Malaysia, Project Dashboard 2023, Kuala Lumpur.

Chinese firms, while securing a substantial portion of high-value contracts, exhibit the highest average delay (7.3 months) and critical failure rate (71%), often attributed to poor site adaptation, underestimation of local complexities, and limited engagement with local subcontractors. In contrast, Malaysian contractors outperform foreign counterparts across all indicators, with lower delays, tighter cost control, and fewer critical project failures—underscoring the value of contextual familiarity, stable local supply chains, and institutional learning.

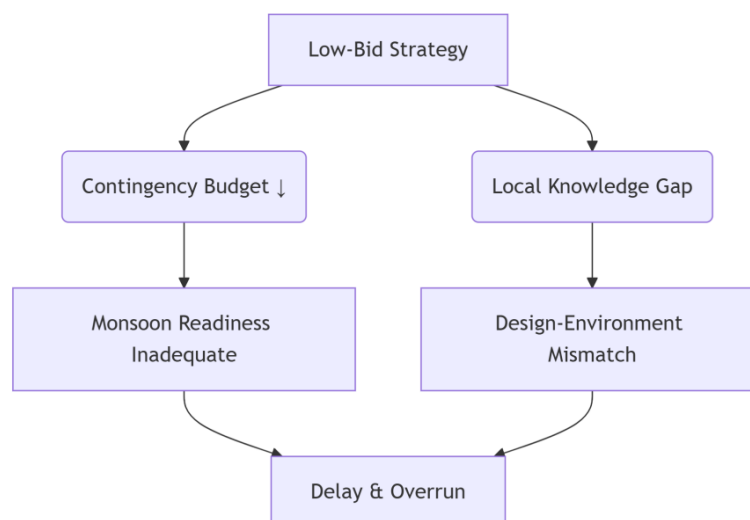


Figure 2. Causes and effects of low-bid strategy on project delay and cost overrun

5. Reframing structural dependency in infrastructure development

This chapter applies a revised dependency framework to examine Sarawak's overreliance on foreign firms

in infrastructure projects. Traditional dependency theory highlights the risk of peripheral regions becoming structurally subservient to external capital. However, this study builds upon Evans’ concept of disarticulated accumulation, where development is not merely dependent but increasingly decoupled from local productive systems.

In Sarawak’s infrastructure sector, foreign firms dominate high-value projects but contribute minimally to knowledge transfer, local employment, and industrial upgrading. The result is a fragmented development pattern: while physical assets grow, local capacities remain underdeveloped.

5.1. Structural indicators of disarticulated accumulation

The dominance of foreign patent ownership illustrates a severe knowledge drain (Table 6). Despite growing investment in “green infrastructure,” local firms are excluded from core technology development, which perpetuates dependence on external expertise.

Table 6. Ownership of green construction-related patents in Sarawak (2023)

Patent holder category	Share (%)
Foreign contractors	89%
Local contractors	6%
Universities & research bodies	5%

Source: WIPO Construction Tech Registry, 2023

This imbalance signals a classic feature of disarticulated accumulation: value extraction without reinvestment. Foreign firms capture the majority of economic surplus, while local supply chains remain shallow and undercapitalized (Table 7).

Table 7. Value flow in infrastructure projects (2023)

Financial flow	Amount (RM billion)
Foreign profit repatriation	6.8
Local contractor net earnings	2.7
Local material supplier net earnings	0.4

Source: Sarawak Treasury Report on Infrastructure Investment Returns, 2023

5.2. Institutional capacity deficits

Beyond structural dependency, Sarawak also suffers from institutional enforcement gaps, where policy intentions are routinely undermined by weak implementation mechanisms.

- This study draws from Peters’ theory of institutional capacity, which emphasizes two essential components:
- (1) Adaptive governance: the state’s ability to dynamically respond to implementation failures;
 - (2) Administrative capacity: the technical and organizational capability to enforce rules and monitor compliance.

To make these concepts operational within infrastructure governance, this study proposes the following conversion framework, as shown in Table 8.

Table 8. Translating institutional theory into infrastructure governance tools

Peters' concept	Operational mechanism	Southeast Asian example
Adaptive governance	Tiered penalty for localization shortfall (e.g., 0.2% contract deduction per 1% gap)	Vietnam's Expressway Project (Decree 10/2022)
Administrative capacity	AI-driven blockchain system to track compliance, fund flows, and technology transfer	Indonesia's Patimban Port Project (JICA, 2023)
Rule enforcement	Mandatory Local Participation Index (LPI) auditing & digital payment chain	Proposed in Sarawak context

These mechanisms transform Peters' theoretical dimensions into a three-part regulatory toolkit for Sarawak: Legislative anchors, Digital enforcement instruments, and Execution accountability.

5.3. Synthesis: Beyond dependency, toward embedded institutional resilience

Sarawak's infrastructure landscape does not reflect a lack of development activity, but rather a misalignment between growth and local empowerment. Projects are often executed by foreign-led consortia with minimal integration into the local ecosystem.

This section argues that breaking the dependency cycle requires more than revised procurement laws; it demands an institutional shift—from passive rule-setting to active performance governance. Embedding smart contracts, performance-based penalties, and localization verification systems into Sarawak's infrastructure delivery will be essential.

The next section explores how peer economies in Southeast Asia have implemented such institutional innovations, and what Sarawak can learn from their successes and failures.

6. International experience and comparative analysis

To address structural imbalances arising from foreign dominance in infrastructure, several Southeast Asian countries have pioneered policy mechanisms that balance external participation with domestic development goals. A common pattern across these efforts is the emergence of a “constraint–incentive–assessment” triadic framework, which seeks not only to localize project inputs but to institutionalize enforcement and accountability.

6.1. The Philippines: Local sourcing preference with incentives

In 2019, the Philippine government implemented a “60% local sourcing preference” policy for infrastructure projects exceeding USD 50 million. Under this approach, foreign contractors were encouraged—though not mandated—to procure at least 60% of inputs locally. Compliance with this benchmark triggered fiscal incentives, including VAT exemptions and accelerated customs clearance.

As a result, domestic building material suppliers' market share rose from 35% to 52%. However, weak oversight enabled several foreign firms to misreport procurement data, avoiding compliance without repercussion.

Lesson for Sarawak: Legal mandates are more enforceable than soft preferences. A price-based prioritization clause (e.g., “local offer $\leq 115\%$ of foreign bid”) could be codified in procurement law to ensure enforceability, paired with randomized audits to verify reporting.

6.2. Indonesia: Mandated technology transfer and blockchain monitoring

The Tanjung Priok Port Redevelopment Project, led by Chinese firms, introduced a mandatory technology transfer clause requiring that at least 20% of the local workforce receive formal technical training. A third-party auditing

team, co-appointed by the government and a bilateral agency, tracked contractor compliance.

Outcomes: Local skilled labor participation rose from 12% to 30%. However, cost overruns and delayed deliverables persisted.

Separately, in the Patimban Port Project, Indonesia piloted AI-driven blockchain systems to track real-time local participation data. Combined with a training fund requirement (0.5% of contract value), this helped raise the share of certified local engineers from 18% to 37%.

Lesson for Sarawak: Institutional capacity is strengthened not only through rules, but through digital compliance mechanisms. AI + blockchain can provide tamper-proof monitoring of labor, fund flows, and localization efforts.

6.3. Vietnam: Enforcement via tiered penalty system

In Vietnam’s Northern Expressway Project, foreign contractors were required to localize 40% of core components (e.g., bridges, tunnel segments). This compelled foreign and local firms to co-develop critical infrastructure elements, resulting in the emergence of three domestic tier-1 contractors.

What set Vietnam apart was its tiered penalty system:

- (1) For every 1% shortfall in localization, 0.2% of contract value was deducted.
- (2) Localization performance was tracked quarterly, verified by an inter-agency team.

Lesson for Sarawak: Adaptive enforcement can be embedded through contractual penalty schedules, aligning Peters’ “adaptive governance” theory with tangible outcomes.

6.4. Synthesis: Toward a closed-loop localization model

Across these three cases, successful elements coalesce into a triadic strategy in **Table 9**.

Table 9. Comparative policy framework: ASEAN localization tools

Country	Constraint mechanism	Incentive tool	Assessment method
Philippines	60% sourcing preference (non-binding)	Tax exemptions	Self-reporting with weak auditing
Indonesia	Mandatory training + tech transfer	Training fund (0.5% contract value)	Blockchain monitoring + third-party audit
Vietnam	40% localization clause + penalties	Procurement scoring bonus	Tiered penalty (0.2%/1% shortfall)

Sources: World Bank (2022); JICA (2023); Vietnam MOC (2022)

6.5. Implications for Sarawak

These comparative insights offer clear implications:

- (1) Replace quotas with enforceable preference systems
 - Codify price-based local sourcing rights in procurement law.
- (2) Mandate tech transfer contributions
 - Require foreign contractors to deposit 0.8% of contract value into a Technology Transfer Fund, verified by public-private monitors.
- (3) Adopt tiered penalties for non-compliance
 - Introduce a localization penalty clause modeled on Vietnam’s Decree 10/2022.
- (4) Deploy digital compliance tools
 - Invest in AI-enhanced blockchain systems for real-time tracking of labor, materials, and payment chains, modeled after Indonesia’s Patimban Port.

These reforms would shift Sarawak’s current infrastructure governance model from symbolic compliance

toward embedded institutional enforcement.

7. Policy recommendations

Building on Sarawak’s empirical findings and regional policy experiences from Southeast Asia, this chapter proposes a comprehensive set of actionable recommendations to enhance institutional resilience and realign foreign infrastructure investment with local development objectives. Each recommendation addresses a specific governance gap identified in previous chapters.

7.1. Reforming the bid evaluation and price review mechanism

To prevent “race-to-the-bottom” bidding and protect project quality, Sarawak should introduce a Low-Bid Risk Evaluation System (LRES) that flags submissions deviating $\pm 20\%$ from market-based cost curves. Bidders must submit a risk reserve justification, verified by third-party cost consultants (aligned with CIDB cost standards).

Recommended enhancements:

- (1) Mandatory risk disclosure: Projects with abnormally low bids must provide cost-risk mitigation plans.
- (2) Enhanced penalties: Firms engaging in unsustainable pricing should face escalating sanctions:
 - (a) First violation: Written warning
 - (b) Second violation: Temporary disqualification (1–3 years)
 - (c) Third violation: Blacklisting (aligned with RA 9184, Philippines)
- (3) Reputation-based disclosure: Publish violators on public procurement portals to increase reputational cost.

7.2. Strengthening the Local Participation Index system

A Local Participation Index (LPI) should be used as a mandatory scoring dimension in all major infrastructure tenders (**Table 10**). The LPI should reflect actual economic embedding, not merely formal partnerships.

Table 10. LPI key components

Indicator	Weight (%)	Verification mechanism
Local equity share	30%	Joint signatory bank rights audit
Technology transfer	40%	Co-registered IP & training evidence
Local employment	30%	EPF & SOCSO-linked workforce database

Bidder score $< 60\%$ on LPI = automatic disqualification from future tenders for 2 years.

Compliance architecture:

- (1) Real-time monitoring: Via a digital dashboard accessible to authorities, contractors, and community observers.
- (2) Cross-verification: Between statutory bodies and independent engineering consultants.

7.3. Establishing a digital fund disbursement and oversight system

To resolve chronic delays in subcontractor and supplier payments, Sarawak should introduce a Digital Payment Chain System (DPCS) based on milestone-based smart contracts and a State Treasury-controlled escrow mechanism.

Core features:

- (1) Centralized treasury account: All public project funds flow through a controlled escrow account.

- (2) Auto-triggered milestone payments: Disbursed directly to subcontractors based on verified completion.
- (3) Overdue compensation clause: Payments delayed beyond 30 days to incur a 1.5% monthly penalty, modeled on Malaysia’s “Contractor Payment Protection Act, Article 5.”

7.4. Implementing a local adaptation training framework for foreign contractors

Foreign contractors should be required to undergo a certified pre-bid orientation program covering Sarawak’s regulatory, environmental, and cultural operating context.

Mandatory curriculum:

- (1) Tropical Civil Engineering Standards (80 hours)
- (2) Indigenous Land & Rights Protocols (case-based learning)
- (3) Occupational Health & Environmental Compliance (CIDB + EQA alignment)

Enforcement mechanism:

- (1) Bidders failing to pass the course will have their technical evaluation score reduced by 30%.
- (2) Courses managed jointly by CIDB Sarawak, state universities, and indigenous community boards.

7.5. Summary: Toward an embedded enforcement ecosystem

Together, these reforms embed verification, incentives, and consequences into Sarawak’s infrastructure delivery system (**Table 11**). By moving beyond policy declarations toward enforcement-ready mechanisms, Sarawak can unlock the full multiplier potential of infrastructure investment while safeguarding its local economy.

Table 11. Closed-loop infrastructure governance framework for Sarawak

Reform area	Institutional tool	Enforcement mechanism
Bid evaluation	LRES + technical scoring	Market deviation thresholds + blacklisting
Local participation	LPI with hard indicators	Score threshold + contract-linked penalties
Fund flow transparency	Digital payment chain	Treasury escrow + auto penalties
Foreign contractor fit	Pre-bid training certification	Mandatory course + score deduction for failure

8. Conclusion: Toward infrastructure decoupling and institutional resilience

Sarawak’s infrastructure development dilemma illustrates a deeper structural contradiction between the imperatives of global economic integration and the pursuit of inclusive, locally embedded growth. While foreign contractors have introduced capital, technology, and large-scale delivery capacity, their prolonged dominance has crowded out local firms, diluted industrial learning effects, and exposed gaps in Sarawak’s institutional enforcement architecture.

Through the lens of Evans’ disarticulated accumulation theory, this study identifies a critical risk: infrastructure-led growth that bypasses domestic capacity building and perpetuates value leakage and knowledge dependency. Simultaneously, Peters’ framework of institutional capacity helps illuminate why well-intentioned localization policies in Sarawak often fail—not due to poor design, but due to fragile enforcement, limited feedback mechanisms, and reactive governance models.

To reverse this path, the study calls for a fundamental transition from policy symbolism to performance enforcement. Four institutional pathways emerge from the analysis (**Table 12**):

- (1) Embedded verification: Through tools like the Local Participation Index (LPI), enforced with hard indicators (equity, patents, employment), verified by AI-assisted audit systems.

- (2) Responsive penalty systems: Tiered consequence structures such as Vietnam’s 0.2% deduction model, tied directly to localization shortfalls.
- (3) Digital infrastructure governance: Smart-contract-based disbursement platforms, ensuring real-time, conditional fund flows and minimizing rent-seeking and payment delays.
- (4) Knowledge localization: Mandated technology transfer funding, compulsory contractor training, and co-patenting provisions that convert passive procurement into capacity-building platforms.

These are not abstract principles—they are implementable policy levers, already piloted in the Philippines, Indonesia, and Vietnam, and shown to be adaptable under Sarawak’s existing legal and administrative frameworks.

Table 12. “Infrastructure Decoupling” pathway to 2030

Target dimension	2023 baseline	2030 goal (PCDS)
Local value-added in foreign projects	28%	45%
Tier-1 local infrastructure contractors	4 firms	12 firms
Green tech patent localization	11%	35%

Source: PCDS 2030 Mid-Term Review; WIPO; Sarawak Treasury

These goals are attainable—but only through a restructured governance architecture, where policy, technology, and enforcement co-evolve.

8.1. Final reflection

Sarawak stands at a critical inflection point. The question is no longer whether infrastructure can drive growth, but what kind of growth, for whom, and under whose control. By embracing institutional resilience and embedding accountability, adaptability, and digital traceability into its infrastructure ecosystem, Sarawak can shift foreign investment from a vector of dependency into a vehicle of inclusive transformation.

Breaking the “dependent growth trap” requires not rejection of foreign involvement, but a recalibration of the terms—a governance reset where infrastructure becomes both a physical and institutional asset. Only then can Sarawak fulfill its 2030 vision: infrastructure not merely as expenditure, but as a sovereign pathway to industrial and commercial self-determination.

8.2. Others

Delays in municipal road projects, in particular, have led to severe traffic congestion. This creates additional social costs due to the time wasted by road users during traffic jams. These losses can be estimated based on congestion duration and user volume, potentially forming the basis for a separate research agenda.

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