



A Comparative Analysis of Financing Models for Rural Road Development in Myanmar: Identifying Model-Specific Key Factors

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ABSTRACT

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Accountability Dynamics, financing configuration, governance capacity, infrastructure financing, multi-source financing, Myanmar, public infrastructure, rural road project development

This study presents a comparative analysis of six rural road projects in Myanmar implemented under distinct financing models, examining the factors that most critically shape infrastructure performance. While infrastructure debates traditionally emphasize capital mobilization, growing evidence suggests governance quality and financing structure also matter for outcomes. Using a qualitative comparative case study design with structured evaluative scoring, interviews, documents, and field observations were inductively coded and quantitized to enable cross-case comparison across 36 variables and 10 analytical dimensions. Seven dimensions were particularly decisive: financial resilience, budget allocation, community engagement, stakeholder coordination, policy and governance, sustainability and safety, and project outcomes. Three structural mechanisms emerge: how financing structures distribute risk and authority, how shared financial stakes shape monitoring and coordination, and how governance arrangements sustain outcomes after completion. Single-source financing concentrates authority and risk, generating disbursement bottlenecks and weak maintenance commitment. Community co-financing generates ownership-based accountability that motivates monitoring and self-organised maintenance, while hybrid and multi-actor arrangements create mutual oversight that strengthens coordination and resilience. These findings suggest that financing structure is an important factor shaping infrastructure outcomes alongside funding volume, though this design cannot isolate their independent effects across cases that also vary in type, scale, and institutional context.

1. INTRODUCTION

Public infrastructure development remains central to economic growth, regional connectivity, and poverty reduction. Yet in many low- and middle-income countries, rural road development deficits persist despite sustained efforts to mobilize financial resources. International institutions such as the World Bank and the Asian Development Bank continue to emphasize financing gaps as the principal barrier to infrastructure expansion. Infrastructure policy has traditionally treated capital mobilization as the central barrier to adequate service delivery [1]. However, a growing body of empirical evidence challenges this capital-centered perspective, indicating that governance quality, regulatory frameworks, and administrative capacity often exert greater influence on infrastructure performance than investment volume alone [2]. This shift reframes infrastructure financing not simply as a problem of capital mobilization, but as a question of how institutional arrangements shape implementation processes and outcomes.

2. LITERATURE REVIEW

In low-capacity environments, weak public investment governance can waste roughly one-third of infrastructure spending on average, with losses exceeding 50% in low-income countries [3]. Bureaucratic inefficiencies—including protracted land clearance procedures, incomplete legal and audit processes, and fiscal budgetary constraints—create bottlenecks that delay fund releases for months [4]. Disbursement efficiency varies systematically across financing structures: single-source government financing follows unified hierarchies; donor financing may introduce parallel processes; multi-source financing provides redundancy [5] but increases transaction costs [6]. Beyond disbursement, budget allocation faces persistent maintenance underinvestment. Maintenance spending typically averages only 20-30% of economically optimal levels in developing countries [7], reflecting that institutions favor new construction projects. Governance quality proves equally significant, yet the relationship between capability and performance remains complex. Early conceptualizations emphasized technical capabilities: budgeting systems, procurement processes, and regulatory frameworks [8].

However, subsequent research distinguished that many developing countries possess formally sophisticated systems that function poorly in practice [9, 10].

Recent research has begun to explore alternative financing structures beyond single-source models. Multiple funding increases redundancy, helping projects absorb shocks and avoid disruption when one source fails [5]. Construction projects with multiple client representatives can benefit from more extensive combined oversight, though this benefit depends on principals coordinating their monitoring rather than free-riding on each other's efforts [11]. However, multiple principals may also generate conflicting directives and coordination costs [12]. Similarly, collaborative governance frameworks suggest multi-stakeholder arrangements generate superior outcomes when responsibilities align with comparative advantages [13], though hybrid governance increases transaction costs and decision-making complexity [14]. Community participation represents another potential accountability mechanism. Research identifies financial contribution and implementation responsibility as particularly significant forms generating stronger ownership than consultation alone [15]. However, community participation faces scale limitations—projects with technical complexity like bridges requiring specialized expertise exceed typical community capacity [16]—and elite capture risks where power inequalities emerge [17]. Community monitoring can match formal oversight when members have a personal stake in the outcome, but is weaker for public-good expenditures with no individual stake [18].

Myanmar provides a particularly relevant context for examining these dynamics. The country combines relatively strong local social capital—reflected in traditions of collective action, community financing, and informal governance—with formal institutional structures characterized by administrative fragmentation and constrained implementation capacity [19, 20]. Long-standing tensions between central authority and regional governance contribute to multi-level approval bottlenecks and limited coordination across agencies [21]. Following political liberalization in 2011, Myanmar received substantial international development assistance from multilateral and bilateral donors [22, 23]. However, the 2021 political shift abruptly reversed this trajectory, leading to international sanctions, reduced external assistance, and broader macroeconomic instability, including currency depreciation and inflation [24]. As a result, infrastructure development now operates within a highly constrained environment, where limited fiscal space and institutional capacity interact with localized forms of social organization [25]. This combination makes Myanmar a particularly informative case for examining how financing structures can either compensate for or activate governance capacity.

Despite extensive literature on infrastructure financing, governance in developing countries, and community participation, several important gaps remain. First, the causal pathways linking financing structures to governance intensity, monitoring practices, and accountability mechanisms are still insufficiently explained. Second, existing studies on community participation pay limited attention to how financial contributions translate into a sense of ownership and strengthen social accountability. Third, research on infrastructure in capacity constrained contexts tends to focus on institutional weaknesses [26], with less attention to the conditions under which projects succeed despite these constraints. Finally, infrastructure financing in Myanmar has

received limited comparative analysis, with most existing studies relying on single-case approaches.

This study addresses the following research question: What factors most critically influence rural road project performance, and how do these factors vary across distinct financing configurations in Myanmar's capacity-constrained governance environment?

The study conducts a structured comparative analysis of six rural road projects implemented under distinct financing arrangements. The findings suggest that infrastructure performance is associated not only with resource availability but also with how financing arrangements are distributed. Financing structures that embed shared financial stakes tend to coincide with stronger monitoring, coordination, and adaptive governance processes, while single-source and externally funded models more often coincide with weakened accountability and implementation bottlenecks. These results provide new empirical insight into how financing design can be leveraged to improve rural road projects outcomes in capacity-constrained environments, while also identifying key policy and governance levers for reform.

3. METHODOLOGY

3.1 Research design

The study combines exploratory inductive analysis with explanatory cross-case comparison to identify patterns in stakeholder perceptions and examine the mechanisms shaping financing outcomes across governance and funding arrangements. Qualitative findings are subsequently converted to structured evaluative ratings while retaining contextual depth. Six cases were purposively selected to represent the diversity of financing models used in Myanmar's rural infrastructure development. The selection reflects variations in funding dominance (local government, donor-driven, community-financed, hybrid shared-governance, and central–local shared management), geographical regions, implementation periods, and levels of stakeholder participation. Practical considerations such as availability of project documents, access to respondents, and feasibility of field visits also guided the selection. Direct financial comparison across the six cases is constrained by differences in currency (MMK vs EUR), project implementation year, road type (paved vs unpaved), and project scale. Budgets have not been normalized by exchange rate, inflation, or road length, as reliable conversion data was not consistently available across all cases and years. Cross-case comparisons therefore focus on financing configuration patterns and governance outcomes rather than absolute financial performance, and Case 4's relative performance is presented as an exploratory observation rather than a formally validated comparative result.

3.2 Data collection

A total of 24 semi-structured face-to-face interviews were completed across the six cases, with four respondents per case representing key stakeholder groups: (1) senior officials from central government, (2) senior officials from Local government, (3) donor representatives/community representatives, and (4) village administrators. Each interview was guided by a protocol of 86 open-ended questions

organized into thematic modules and applied flexibly depending on respondent role and relevance. Senior government officials addressed the full protocol of 86 questions; donor and community representatives addressed approximately 70 questions; and village administrators addressed approximately 40 questions, reflecting the thematic relevance of modules to each stakeholder role. Questions were shared with respondents in advance to facilitate efficient and reflective responses. Interview duration varied according to the number of questions addressed per respondent role — ranging from approximately 45 minutes for village administrators to approximately 90 minutes for senior government officials. Interviews were conducted in Burmese at respondents' own locations, with detailed notes taken during and immediately after each interview and subsequently translated into English by the researcher. Data collection took place between January and May 2025, conducted sequentially across the six cases following project completion. Approximately twenty official documents per case were examined, including budget allocations, cost estimates, design drawings, progress reports, completion certificates, and audit reports. Document review was conducted before interviews to inform the protocol and after interviews to verify respondent accounts. Four field site visits were conducted per case following the interviews to assess physical project conditions, observe local administrative processes, and capture contextual information relevant to financing arrangements.

3.3 Data analysis

This study employs a qualitative comparative case study design with structured evaluative scoring. Analysis proceeded through three main phases: (1) qualitative coding of interview responses, (2) development of an analytical framework through constant comparative analysis, and (3) transformation

of coded qualitative findings into structured evaluative categories to enable systematic cross-case comparison.

All interview responses were analyzed as qualitative textual data. Initial analysis employed inductive coding to identify recurring ideas, patterns, and descriptive themes across respondents. Similar statements and concepts were grouped into preliminary analytical categories such as financing sources, budget allocation practices, project results, institutional constraints, and stakeholder dynamics. This initial coding provided broad cross-case patterns that informed the development of the analytical framework. Codes and themes from the interview data were systematically compared and refined using constant comparative analysis. The 86 interview questions were reduced to 76 preliminary codes through inductive coding, which were then merged, split, and eliminated through this comparative process to yield 36 distinct analytical variables, each representing a specific evaluative construct related to project financing, governance, or outcomes. These 36 variables were then grouped according to their shared conceptual focus, yielding 10 overarching thematic dimensions: 1) Financial Resilience, 2) Budget Allocation, 3) Donor-mediated Financing, 4) Policy and Governance, 5) Community Engagement, 6) Stakeholder Coordination, 7) Technical Capacity, 8) Planning, 9) Project Outcomes, and 10) Sustainability and Safety Outcomes.

Donor-mediated Financing theme was operationalized through four indicators specifically designed to capture donor-coordinated financing arrangements: Donor Coordination, Donor Grant Access, Donor Participation, and Funding Timeliness. These indicators reflect the financing structures present in Cases 2 and 3, these are structurally inapplicable to Cases 1, 4, 5, and 6 and recorded as N/A. Broader indicators capturing non-donor multi-actor financing (e.g., government-community co-financing) represent a direction for future research.

Table 1. Scoring criteria for converting qualitative data to evaluative ratings

Level of Adoption	Author's Assessment	Criteria	Weight of Evidence Required
Very Positive	+3	Strong positive evidence from multiple stakeholder groups; documented achievements; minimal contradictory evidence	> 75% of coded segments positive; triangulated across ≥ 3 data sources
Positive	+2	Consistent positive evidence from majority of sources; some limitations acknowledged	> 60% of coded segments positive; triangulated across ≥ 2 data sources
Slightly Positive	+1	More positive than negative evidence, but with notable constraints or mixed opinions	> 50% but < 60% of coded segments positive
Neutral	0	Balanced evidence; equal positive and negative assessments; or insufficient evidence to determine direction	Approximately equal positive/negative evidence; or very limited data
Slightly Negative	-1	More negative than positive evidence, but not consistently problematic	> 50% but < 60% of coded segments negative
Negative	-2	Consistent negative evidence from majority of sources; clear problems identified	> 60% of coded segments negative; triangulated across ≥ 2 data sources
Very Negative	-3	Strong negative evidence from multiple stakeholder groups; documented failures; minimal contradictory evidence	> 75% of coded segments negative; triangulated across ≥ 3 data sources

Note: Numeric scores were used to calculate composite ratings where two or more raters assessed the same variable. Individual scores were averaged and mapped to final evaluative categories using predefined range thresholds: Very Positive (+2.5 to +3.0), Moderately Positive (+1.5 to +2.4), Slightly Positive (+0.5 to +1.4), Neutral (−0.4 to +0.4), Slightly Negative (−1.4 to −0.5), Moderately Negative (−2.4 to −1.5), and Very Negative (−3.0). For example, a variable where the majority of coded segments were negative, triangulated across interview, documentary, and field data sources, would receive a numeric score of −2, reflecting consistent but not overwhelming negative evidence, which maps to a rating of Negative.

Codes were further refined and merged through constant comparative analysis. Each variable was then evaluated using a seven-point scale ranging from Very Negative (−3) to Very Positive (+3), with predefined criteria for each score (Table 1). The coding unit was a thematic segment, defined as a continuous passage from an interview transcript, project document, or field observation that addressed a specific

variable. For each variable in each case, the collected evidence was reviewed and classified as positive, neutral, or negative according to the amount and strength of supporting evidence across the three data sources. Interviews, project documents, and field observations were given equal weight to ensure methodological triangulation. When evidence from all sources was consistent, the score was assigned with greater

confidence. When findings conflicted, the score was adjusted toward Neutral, and the disagreement was discussed in the case analysis.

Evaluation followed explicit criteria based on three factors: (1) the proportion of positive versus negative evidence, (2) the degree of triangulation across multiple data sources, and (3) the severity or significance of findings. The seven-category continuum ranged from Very Negative (predominantly negative evidence triangulated across multiple sources, with documented failures) through Neutral (balanced or limited evidence) to Very Positive (predominantly positive evidence triangulated across multiple sources, with documented achievements), with intermediate categories reflecting proportionate evidence strength and corroboration (Table A1).

The scores of variables within the same theme were averaged to produce a theme-level score. These scores were then converted into evaluative categories using predefined thresholds: Very Positive (+2.5 to +3.0), Moderately Positive (+1.5 to +2.4), Slightly Positive (+0.5 to +1.4), Neutral (−0.4 to +0.4), Slightly Negative (−1.4 to −0.5), Moderately Negative (−2.4 to −1.5), and Very Negative (−3.0 to −2.5). The 10 thematic dimensions were further reduced to 7 decisive dimensions and grouped into 3 structural mechanisms reflecting the underlying pathways through which financing configuration shapes outcomes. Applying the N/A rule above, Debt Servicing Burden (Variable 3) was excluded from all cases, as no case involved debt financing; the four donor-

related variables (Variables 18–21) were excluded from Cases 1, 4, 5, and 6, which had no donor involvement — avoiding penalizing cases for conditions absent by design rather than by poor performance.

The researcher's prior familiarity with Myanmar's infrastructure governance context informed analytical sensitivity, mitigated through structured criteria, cross-source review, and independent expert validation. Two senior infrastructure governance experts (15+ years' professional experience in Myanmar) validated scoring in two stages. First, they reviewed the researcher's assessments across all 216 variable-level scores, reaching 88% agreement (190 of 216 assessments); the 26 discrepant assessments were resolved through structured discussion and evidence review, producing minor single-category adjustments in 18 of the 26 assessments, with no revision exceeding one level on the evaluative continuum. Second, to provide a formal reliability statistic appropriate for the seven-point ordinal scale, the same two experts independently re-scored all applicable assessments blind to the researcher's original scores. Excluding 22 N/A assessments (Debt Servicing Burden across all six cases, $n = 6$; the four donor variables across the four non-donor cases, $n = 16$) left 194 scoreable pairs. Weighted Cohen's kappa with quadratic weights was $\kappa_w = 0.90$ (95% CI: 0.86–0.93, $n = 194$), with exact agreement at 149 of 194 (76.8%) and no disagreement exceeding two adjacent scale categories.

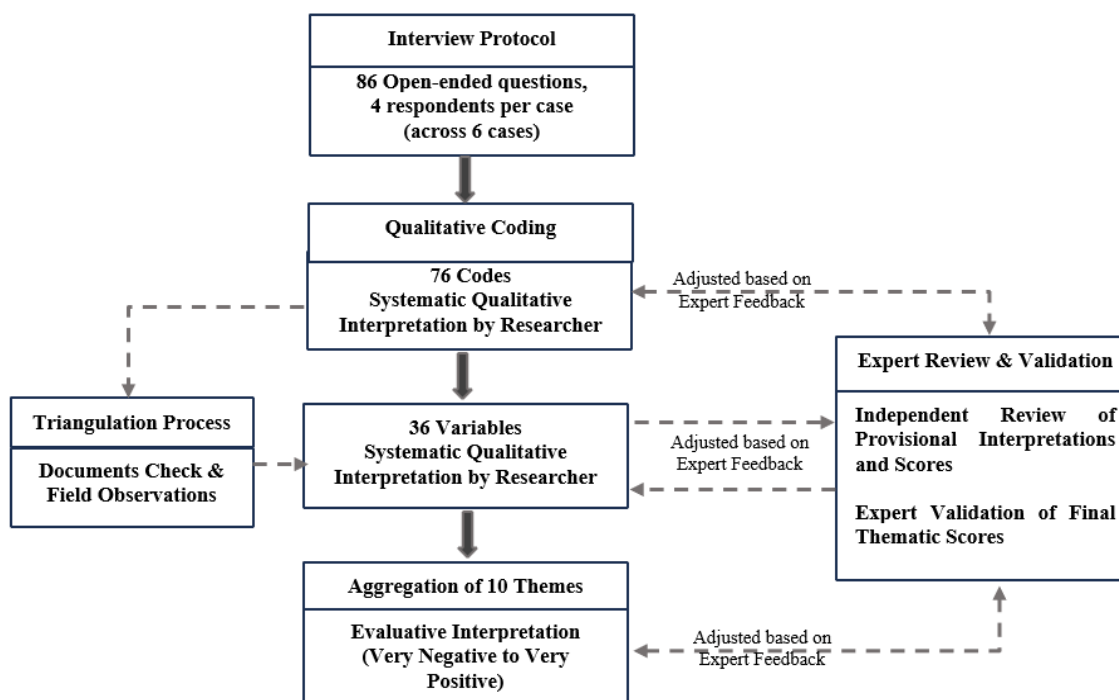


Figure 1. Research process flowchart

Several limitations should be acknowledged. First, performance assessments reflect stakeholder perceptions gathered through interviews, documents, and field observations, consistent with qualitative case study methodology. Objective performance indicators such as cost overrun rates, pavement condition indices, maintenance expenditure records, or safety incident data were not systematically available across all six cases and their absence represents a limitation of the study. Claims about project quality, financial resilience, sustainability, and longevity

therefore reflect evidence-based evaluative judgements derived from the analytical scoring framework rather than independently verified objective measurements. Second, the study employed a single-round interview design, however, extensive documentary review (120 official documents) and field validation (24 site visits) strengthened triangulation and reduced reliance on self-reported data. Third, qualitative coding was conducted by a single researcher, which may introduce interpretive bias. This risk was mitigated through independent expert validation and structured scoring criteria,

achieving high expert validation agreement (88%). Fourth, contextual political sensitivities at the time of data collection may have influenced respondent openness, particularly among government officials. The use of anonymous semi-structured interviews and documentary triangulation helped reduce this risk. Fifth, retrospective data collection for earlier cases may involve elements of recall bias, partially addressed through documentary verification. Finally, while the findings support analytical generalization regarding financing model characteristics, they are not intended for statistical generalization beyond the purposively selected cases. The overall research design, encompassing case selection, data collection, coding, and cross-case synthesis, is illustrated in Figure 1.

3.4 Ethical consideration

This study was conducted as part of doctoral research at the Asian Institute of Technology (AIT) under the supervision of the second author. Data collection was conducted with formal authorization from the Department of Rural Road Development (DRRD), which facilitated access to respondents and project documentation. All participants voluntarily provided informed consent before interviews and were informed of the research purpose. To ensure confidentiality and respondent safety, cases are identified by number and respondents by stakeholder role only, with no personally identifying information disclosed. Interview data were captured through detailed notes taken with respondent permission and securely stored. Fieldwork was conducted between January and May 2025.

4. CASE DESCRIPTIONS

All six cases were implemented under the mandate of Myanmar's Department of Rural Road Development (DRRD), which classifies roads, bridges, and associated connectivity structures as integral components of rural road development. This institutional classification provides the basis for including Case 5 — a Bailey steel bridge — alongside road construction projects, as the bridge serves as a critical rural road connectivity link between two townships and was prioritized, funded, and managed within the same rural road development framework as the other cases. Table 2 summarizes the key characteristics of all six cases, including financing structure, budget, and implementation timeline.

Case 1- Local Government Financial Source Dominant Model - involves the construction of a 2.5-km concrete paved road known as the Pa Sa Nga Road, implemented by DRRD and financed predominantly by the local government with a budget of 550 million MMK. The project was carried out during 2022–2023 in the Ayeyarwady Region. The central government provided minimal assistance, primarily supplying equipment, while the community contributed through land donations. With the local government serving as the main financier and decision-maker, this project is categorized as a Local Government Dominant Financing model.

Case 2- Grant Financial Source Dominant Model With Central Support -consists of two paved asphalt road segments (29 km and 2.1 km) and a reinforced cement concrete (RCC) bridge, implemented under the Rural Development Program

III, Phase IV. The project was primarily financed through a €10.90 million KfW grant- German Development Bank, supported by the central government through equipment provision, and by the local government through construction materials. Communities also contributed via land donations, conducted from 2018–2021 in Shan State. This case represents a Donor-Driven Financing model with the central government support where external funding strongly shaped planning, accountability, and implementation standards.

Case 3- Grant Financial Source Dominant Model With Local Government Support - involves the construction of three paved asphalt roads (10.45 km, 4.53 km, and 15.04 km) under the Rural Development Program Phase I, implemented between 2014–2016 in Shan State. The project was also financed mainly through a €7.00 million KfW grant, complemented by local government material support and community land donations. With donor funding playing a significant role, this case is also categorized as a Donor-Driven Financing model with Local government support.

Case 4- Community Led Financial Source Dominant Model with Central & Local Government Support - focuses on the construction of a 3.2-km unpaved Kankar road in the Bago Region, implemented during 2021–2022. The project relied heavily on community funding through 80 million MMK, while the central government supported the project by providing machinery and operators. The local government played only a minimal role, contributing limited assistance. Given the heavy reliance on community resources and leadership, this case is categorized as a Community-Dominant Financing model.

Case 5- Hybrid Shared-Governance Financing Model- involves the construction of a 320-ft Bailey steel bridge implemented during 2023–2024 in the Ayeyarwady Region. The funding structure combined community contributions (200 million MMK), local government financing through General Reserved Fund (70 million MMK) and Emergency Fund (370 million MMK), with additional central government support for the Bailey bridge components. As the project involved substantial contributions from community, local, and central government actors, it represents a Hybrid Shared-Governance Financing model, where responsibilities and financial roles are distributed across stakeholder groups. The project was completed within six months as a rapid rehabilitation response following severe damage caused by a cyclone. Its prioritization stemmed from the strategic importance of the bridge, which serves as a key connection between two major townships supporting significant agricultural production and a large population.

Case 6- Dual Government Financial Source Dominant Model- comprises a 4.43-km paved road with multiple structures, including 5 concrete bridges, 10 wooden bridges, and 6 culverts, implemented during 2022–2023 across Yangon and Ayeyarwady Regions. The central government played the leading role and provided the majority of funding (980.00 million MMK), while the local government also contributed to the project. This case is categorized as a Dual Government Financial Source Dominant model, reflecting strong collaboration between both levels of government in financing and implementation. The project also received exceptional priority because it served as a key inter-district road connecting Yangon and Ayeyarwady, an area with significant population density and housing expansion.

Table 2. Project profiles

Case	Location	Project Type / Scope	Budget	Financing Model	Funding Composition	Procurement Method	Period
I	Ayeyarwady	Concrete road (2.5 km)	550 million MMK	Local Government Dominant	Local Government (dominant); minimal central government support; Community land donation	Tender	2022–2023
II	Shan State	Asphalt roads (29 km & 2.1 km) + RCC bridge	€10.90 million	Donor-Driven	KfW Grant (dominant); Central Gov. equipment; Local Gov. materials; Community land donation	Tender	2018–2021
III	Shan State	Asphalt roads (10.45 km, 4.53 km, 15.04 km)	€7.00 million	Donor-Driven Financing (Local Government Support)	KfW Grant (dominant); Local Gov. materials; Community land donation	Tender	2014–2016
IV	Bago	Kankar road (3.2 km, unpaved)	80 million MMK	Community Dominant	Community funds (dominant); Central Gov. machines & operators; Local Gov. minimal support	DRRD	2021–2022
V	Ayeyarwady	320-ft Bailey steel bridge	640 million MMK	Hybrid Shared-Governance	Community (200M); Local Gov. (70M + 370M funds); Central Gov. Bailey support	DRRD	2023–2024
VI	Yangon & Ayeyarwady	Paved road + 5 concrete bridges, 10 wooden bridges, 6 culverts (4.43 km)	980.00 million MMK	Dual Government Financial Source Dominant	Central Gov. (dominant); Local Gov. support	Tender	2022–2023

5. RESULTS AND DISCUSSION

This section presents findings from six infrastructure projects in Myanmar, each representing distinct financing configurations. The analysis proceeds in two stages: individual case examination and cross-case synthesis to examine key factors influencing Myanmar public infrastructure projects across the cases. The findings highlight distinct performance patterns across financing structures in institutionally constrained environments. Among the ten analytical themes, financial resilience, budget allocation, community engagement, stakeholder coordination, policy and governance, sustainability and safety outcomes, and project outcomes emerge as particularly decisive across the cases. Most significantly, the study reveals that hybrid financing models combining community oversight with governmental authority generate mutually reinforcing accountability unavailable to single-source models.

5.1 Case 1: Local government financial source dominant model

Case 1 illustrates how single-source local government financing produces procedural order but structural fragility. While implementation appears stable and rule-bound, financial resilience and long-term sustainability remain constrained by rigid approval hierarchies and weak maintenance incentives. Financial resilience was assessed as slightly negative, driven primarily by bureaucratic disbursement delays and limited fiscal autonomy within DRRD. Sequential approvals across township, district, and ministerial levels frequently delayed fund releases for extended periods, restricting adaptive financial management. Contractors continued work despite delayed payments to preserve future contracting relationships, effectively absorbing short-term liquidity pressures. As one contractor noted, “We use our own funds sometimes because stopping work means DRRD will question our commitment.” Neutral

scores for inflation impact and cost overruns therefore reflect risk displacement rather than institutional robustness. Similar dynamics have been documented in low-capacity public works environments, where delayed payments shift fiscal strain to contractors and mask systemic financial weakness [27]. In this context, the apparent financial resilience was therefore sustained through private-sector loss absorption rather than embedded institutional resilience.

Budget Allocation scored slightly positive, however, variable-level analysis revealed persistent weaknesses in maintenance budgeting and only neutral performance in multi-year financial planning. Although a multi-year budgeting framework exists, its implementation remains insufficiently robust to shape long-term project outcomes. Maintenance budgeting is particularly weak, reflecting institutional incentives that prioritize new construction over asset preservation. This pattern aligns with broader evidence from developing countries, where maintenance spending typically averages only 20–30% of economically optimal levels [7]. This suggests that Myanmar’s maintenance shortfalls are not anomalous, but rather reflect a systemic governance bias common in infrastructure management in developing contexts.

Sustainability and Safety performance was rated as slightly negative, reflecting a broader prioritisation of budget compliance and timely completion over long-term durability and safety practices. At the variable-level analysis, respondents indicated that safety management remains rudimentary, with contractors reporting minimal oversight beyond basic inspections, while documentary evidence and respondents suggested long-term maintenance planning is largely absent. Organizational performance is assessed primarily against completion metrics, not longevity or service quality, creating misaligned incentives across the project cycle. Similar patterns have been observed in other developing contexts, where formal safety regulations exist but weak enforcement results in minimal practical compliance [28].

Technical Capacity scored neutral, with DRRD demonstrating adequate implementation and feasibility

capability at the variables level. However, this adequacy exists within several constrained parameters. Design or specification changes required multi-level authorization and lengthy approval timelines. Additional costs were rarely accepted once budgets were finalized. This administrative rigidity limited adaptive problem-solving and forced implementation teams to navigate around procedural bottlenecks rather than resolve them institutionally.

Project Outcomes were evaluated as slightly negative, driven by limited monitoring capacity, and minor material quality compromises. While these issues did not critically affect functionality, they highlight gaps in accountability and quality assurance. The main focus was on completing the project within the designated timeframe and avoiding major cost overruns. This completion-oriented culture reflects the broader trade-offs identified in infrastructure literature, where schedule and budget pressures frequently produce incremental quality compromises [29]. This challenges the assumption that completion-focused metrics ensure project success – they may instead ensure project completion at the expense of project quality.

Overall, Case 1 demonstrates that local government–dominant financing can deliver organized implementation within established procedural frameworks. However, financial risk concentration, bureaucratic rigidity, weak maintenance commitment, and limited community accountability constrain systemic resilience. The case highlights how single-source financing embeds fragility not through resource scarcity, but through the configuration of authority and incentives within hierarchical approval systems.

5.2 Case 2: Grant financial source dominant model with central support

Case 2 demonstrates how donor-dominant financing can strengthen procedural governance while simultaneously limiting financial adaptability and local ownership. Although donor oversight improved planning discipline and administrative transparency, the fixed financial structure constrained the system's ability to respond to macroeconomic shocks and weakened incentive structures for long-term community engagement.

Despite donor oversight, financial resilience was evaluated as slightly negative despite strong procedural oversight. The project was financed through a fixed euro-denominated grant, while contractor payments were made in Myanmar kyat using the mandatory government exchange rate. This arrangement appeared reasonable during 2017–2018, when exchange rate volatility was limited. However, Myanmar's 2021 change in governance triggered severe currency depreciation and accelerated inflation, significantly increasing costs of materials, labour, and equipment, while payments with the official exchange rate failed to reflect actual market conditions. Following the suspension of KfW operations after the sudden political changes in 2021, no mechanism existed for budget revision or inflation adjustment. This observation is consistent with the study, where fixed-rate payment clauses in infrastructure development projects often shift exchange-rate risk from donors to contractors and local implementing agencies [30]. In this case, the donor's procedural safeguards functioned in practice to insulate the donor from financial exposure while transferring exchange rate and inflation volatility to contractors least able to absorb such risks.

Community Engagement was rated as neutral overall, while

slightly negative community contributions and neutral feedback and ownership, indicating a missed opportunity for deeper participation. As KfW fully financed the project, local communities had no financial stake in the infrastructure. Participation therefore became passive consultation rather than active partnership; communities provided land donations and attended information meetings, but lacked incentives for sustained engagement or monitoring. This dynamic contrasts sharply with partially-funded models. Full external financing eliminates this incentive structure, reducing communities to beneficiaries rather than stakeholders. Evidence from participatory development literature similarly shows that consultation is insufficient to generate genuine community ownership, and that mechanisms such as financial co-investment and cost-sharing significantly strengthen psychological commitment for long-term infrastructure maintenance [15].

Policy and Governance was rated as moderately positive overall. At the variable level, formal dispute resolution mechanisms and policy prioritisation indicators consistently scored positively. These mechanisms were clearly institutionalised, providing contractors with predictable and transparent recourse when disagreements emerged. One government representative noted: "With KfW, we follow international standards. Everything is documented. If there's a problem, there's a procedure. This is very different from our normal process." Case 2 therefore reflects a more coherent and responsive governance environment, in which KfW's procedural standards reinforced alignment between national policy frameworks and on-ground project implementation. This finding aligns with evidence that learning-by-doing in donor–recipient relationships can strengthen procedural compliance over time as governments internalise donor requirements through repeated engagement [31].

Technical capacity improved slightly compared with locally financed projects, with feasibility assessments scoring moderately positive and implementation capacity slightly positive, though adaptive capacity remained neutral. Donor procedures strengthened compliance with technical standards but did not fundamentally alter the system's ability to respond flexibly to unforeseen challenges. This distinction reflects the difference between compliance capacity, which enables organizations to meet procedural requirements, and adaptive capacity, which enables them to solve problems dynamically. The pattern observed in Case 2 therefore reflects institutional strengthening in form rather than function, consistent with the phenomenon described by Andrews et al. [9] as "capability for form rather than function" in development institutions.

Despite acceptable overall project delivery, Sustainability and Safety Outcomes scored slightly negative due to limited post-project maintenance systems and weak local enforcement capacity. Donor oversight primarily focused on procedural compliance and timely implementation rather than long-term asset management. As a result, while the project met donor standards during construction, insufficient resources and institutional incentives existed to ensure sustained maintenance after completion. Similar challenges have been widely documented in donor-funded infrastructure projects, where strong implementation procedures do not necessarily translate into durable post-project governance systems [32, 33].

In summary, Case 2 illustrates the dual nature of donor-dominant financing. External funding and procedural oversight strengthened planning discipline, administrative

transparency, and compliance with formal governance standards. However, the rigid financing structure limited adaptability to macroeconomic shocks and weakened the incentive structures that sustain long-term community engagement and maintenance. The case therefore demonstrates that procedural governance improvements alone cannot fully compensate for structural limitations in financial flexibility and locally embedded accountability mechanisms.

5.3 Case 3: Grant financial source dominant model with local government support

Case 3 represents an earlier phase of donor–government collaboration under a grant-dominant financing structure. While the project operated under a similar institutional framework as Case 2, differences in timing and institutional experience produced distinct performance patterns. The case demonstrates how early-stage donor engagement can strengthen stakeholder coordination while still facing procedural inefficiencies and limited institutional adaptation.

Financial resilience was assessed as slightly negative in Case 3, but for reasons distinct from Case 2. Unlike Case 2, where external macroeconomic shocks drove financial strain, Case 3's weaknesses arose primarily from administrative delays, despite occurring during relative macroeconomic stability. Negative results were observed across all variables, including cost overruns, highlighting the impact of procedural inefficiencies. These findings suggest that KfW's fixed-budget, fixed-rate model can create recurring constraints, though the severity of financial strain depends on timing, economic conditions, and institutional capacity. Such context dependency challenges the notion of universally applicable donor "best practices," underscoring the need for financing mechanisms to align with local governance realities [34]. Moreover, administrative bottlenecks can independently escalate costs, even in technically straightforward projects, emphasizing the importance of procedural efficiency [35].

Planning outcomes scored neutral, particularly in the consideration of community needs in the planning stage at the variable-level analysis. One might assume later projects would suffer from donor fatigue or routine complacency. Instead, Case 2 outperformed Case 3 in planning quality, suggesting an upward learning trajectory. A government official involved in both projects explained: "In the first phase [Case 3], we were still learning KfW's systems. Many procedures were new to us. By the third phase [Case 2], we understood the required documentation, proper consultations, and technical standards to apply. The process became smoother and more thorough." Evidence from project management literature similarly shows that accumulated experiences through collaborative implementation strengthen planning capability in subsequent initiatives [36].

Stakeholder Coordination was relatively stronger in Case 3 because early-phase donor projects typically involve more intensive field engagement, frequent joint site visits, and hands-on collaboration. At the variable level, transparency in planning scored slightly negative in Case 3, but to a lesser degree than in Case 2, indicating that early-phase projects tend to maintain higher transparency. One representative noted: "In the first phase, KfW staff visited often and we solved problems together on-site. Communication was constant. By the later phase, everything went through formal channels." This pattern suggests a trade-off between relational coordination and procedural formalization as donor partnerships mature. Early

project phases tend to involve intensive interaction among actors, while later phases rely more heavily on structured administrative procedures. Similar coordination dynamics have been identified in large capital projects, where early collaborative engagement plays a critical role in aligning stakeholders and establishing project objectives before formal execution processes dominate [37].

Despite these variations, most other dimensions—including Technical Capacity, Community Engagement, Sustainability and Safety Outcomes, and Project Outcomes—remained broadly similar to Case 2. This consistency indicates that while stakeholder coordination and planning practices improved over time through institutional learning, deeper structural constraints within governance and financing systems remained largely unchanged. Overall, Case 3 produced neutral outcomes, balancing adequate technical compliance with the absence of strong long-term institutional systems. The case demonstrates that donor support can ensure procedural quality, and initial coordination, particularly during early phases of engagement. However, persistent institutional constraints limit deeper improvements in resilience and sustainability, particularly where institutional capacity and governance mechanisms are weak or misaligned with local realities [38].

5.4 Case 4: Community led financial source dominant model with central & local government support

Case 4 demonstrated neutral Financial Resilience, moderately positive Sustainability and Safety Outcomes, and strong Project Outcomes, representing the most notable areas of performance. Other thematic dimensions—including community engagement, policy and governance, stakeholder coordination, and technical capacity—showed slightly positive and stable performance, indicating a relatively well-coordinated implementation environment. The distinctive feature of this case was not project scale, technical complexity, or funding volume, but rather the financing configuration: the community provided the primary financial resources, implementation was undertaken directly by DRRD, the central government contributed equipment support, and local government involvement remained minimal.

Financial Resilience scored neutral in Case 4, while budget disbursement efficiency was rated as neutral, cost overruns and financial transparency were assessed as slightly positive, and inflation impact and formal financial management were evaluated as negative at the variable level. Unlike Cases 1–3, financial decision-making authority rested largely with the community committee that mobilised and monitored funds, while DRRD focused on technical implementation. This arrangement avoided multi-layered approval processes and lengthy tender procedures. Reduced transaction costs allowed a greater share of project funds to be directed toward construction rather than administrative overhead. One participant explained, "In government-led projects, we don't know where money goes. In our project, we see every receipt because the committee posts them publicly." This is consistent with evidence that mobilized, visible community accountability can rival formal audits, though it works best as a complement rather than a substitute [39]. Case 4 shows that visible, community-verified accounting can substitute for the assurance formal audits are meant to provide.

Community Engagement was rated as slightly positive in Case 4, clearly distinguishing it from Cases 1–3. This outcome was driven by positive variable-level performance in

community financial contribution, ownership, and feedback. Unlike Cases 1–3, where infrastructure was typically perceived as “government property,” participants in Case 4 explicitly described the road as “our road,” reflecting strong ownership and protective attitudes. One villager explained: “We paid for this road with money we earned. Every family contributed. So, we watch carefully to make sure the work is done properly and the money is not wasted.” This pattern is consistent with Ostrom’s [40] theory of collective action, which shows that resource users who contribute financially develop stronger ownership and monitoring incentives than those engaged through consultation alone. In infrastructure contexts, such user contributions have also been associated with improved maintenance outcomes compared to fully subsidized projects [41].

This ownership mentality generated several reinforcing effects. Community members voluntarily monitored construction quality, identified defects that might have escaped formal inspections, and self-organised minor maintenance activities rather than waiting for government intervention. Sustainability and Safety Outcomes were also stronger in Case 4 than in all other cases, supported by community-led risk awareness, explicit attention to long-term maintenance, and continuous informal oversight. These dynamics reflect self-reinforcing cycles of engagement and maintenance observed in community-contributed rural infrastructure projects [42], as well as positive feedback between ownership, maintenance practices, and sustainability outcomes documented in community-managed infrastructure systems [16].

Project Outcomes similarly benefited from active community participation, which enabled responsive monitoring, higher implementation quality, and timely corrective action. At the variable level, monitoring and evaluation scored moderately positive, reflecting continuous informal oversight by community members, while project quality was evaluated as slightly positive, supported by early detection of defects and immediate corrective action during implementation. These outcomes are consistent with Ostrom’s [43] concept of coproduction, which shows that combining citizen contributions with government technical provision produces superior performance.

Case 4’s strong assessed performance across multiple domains reflects the distinctive dynamics of community-led execution, characterized by continuous tracking, flexible coordination, and rapid decision-making. Most critically, the community-financed model generated a positive feedback loop: financial contribution fostered ownership, ownership motivated monitoring, and monitoring improved quality and sustained engagement. Local knowledge supported context-sensitive risk management, while transparent information flow reduced mismanagement and strengthened financial resilience. Importantly, social accountability mechanisms—rooted in reputation and collective sanctions—often proved more effective than formal audit procedures, suggesting that in contexts with strong social capital, simpler community-based mechanisms can deliver superior governance and sustainability outcomes [39, 40].

5.5 Case 5: Hybrid shared-governance financing model

Case 5 demonstrated moderately high performance in Budget Allocation and Project Outcomes, slightly positive Sustainability and Safety Outcomes, and a very high level of

Planning. Following severe cyclone damage, the central government classified the bridge reconstruction as emergency priority infrastructure due to its strategic importance in connecting two major townships with high agricultural production and population density. This designation triggered accelerated approval processes, expedited funding mechanisms, and heightened governmental attention, fundamentally altering implementation dynamics.

Financial Resilience emerged as neutral in Case 5. At the variable level, budget disbursement efficiency, cost overruns, and financial transparency scored slightly positive, while formal financial management remained weak. Financial approvals that typically take months were processed within weeks, and equipment allocations that usually require competitive requests across multiple projects were directed immediately to Case 5. As one township official explained: “Usually when we request budget releases, we wait in line behind many other projects. For this bridge, Finance officers processed our requests first. Equipment was reallocated from other projects to ours.” This accelerated process demonstrates that when political will and institutional attention concentrate on a specific project, existing systems can function with significantly greater speed and flexibility. It also shows that administrative capacity exists within the system but is rarely exercised in standard project implementation [44].

Budget Allocation was assessed as moderately positive in Case 5, with all related variables scoring positively. Notably, maintenance budget policy reached a moderately positive level, and multi-year budget planning had slightly positive outcomes. They resulted from the interaction of priority designation, the high-risk nature of bridge infrastructure, and multi-source financing. The project’s priority status streamlined approval and disbursement processes, resulting in smoother and more predictable budget flows. Case 5 thus demonstrates that maintenance planning capacity exists within Myanmar’s public infrastructure system but is activated selectively when institutional attention, risk visibility, and political salience converge [45].

The bridge’s technical complexity contributed to the very positive planning score by the integration of community knowledge with governmental planning processes, which strengthened early-stage scoping, feasibility assessments, local coordination, and resource allocation. The government official noted: “Bailey bridges require planning discipline. You cannot improvise or adjust on the fly. Everything must be calculated and coordinated before construction begins.” Importantly, this planning strength emerged from technical necessity rather than superior institutional capacity. This finding highlights how project characteristics themselves can draw out planning capability that existing organizations do not otherwise exercise, as technologically complex projects impose greater planning discipline and coordination requirements regardless of baseline institutional strength [46, 47].

Project outcomes in Case 5 were assessed as moderately positive. At the variable level, project quality scored moderately positive, while monitoring and evaluation emerged as slightly positive. Despite the technical nature of the bridge project, the community played a meaningful role in tracking progress, coordinating logistics, and maintaining transparency. These results illustrate that different project types require distinct managerial emphases rather than uniformly high engagement across all dimensions [48]. Evidence from emergency infrastructure projects shows that

agencies can complete approvals and implementation in weeks for prioritized projects—demonstrating that constraints often reflect organizational priorities rather than technical limitations [49, 50].

Overall, Case 5 demonstrates how the combination of community ownership and structured government involvement, reinforced by the technical characteristics of a Bailey bridge project, can enhance planning effectiveness, financial performance, and project outcomes beyond those observed in community-led road projects. Notably, the government’s focused attention on the project significantly shaped outcomes across most thematic areas.

5.6 Case 6: Dual government financial source dominant model

Case 6 demonstrated the strongest overall performance profile among government-financed projects. Most significantly, Case 6 was the only case resulting in slightly positive Financial Resilience, breaking the pattern of negative resilience across other government-only and donor-only models. Like Case 5, Case 6 benefited from priority designation. However, its priority status stemmed from strategic rather than emergency rationale.

Financial resilience in this case was assessed as slightly positive, with all associated variables, including financial management, showing positive outcomes. This performance was primarily due to dual funding and parallel approval mechanisms, which reduced reliance on a single approval chain and minimized bottlenecks. The project’s designation as a priority inter-district road further accelerated approvals. Consistent with organizational resilience theory, these multiple pathways and diversified funding sources introduced functional redundancy, reducing vulnerability to disruptions affecting any single channel [5]. This project avoided the negative outcomes observed in other cases, demonstrating that

strategic structuring of funding and approval arrangements can meaningfully improve financial stability even without comprehensive institutional reform.

Budget Allocation was assessed as moderately high in Case 6 while the results at the variable level were largely consistent with Case 5, except that multi-year budget planning scored neutral. Under the dual-government financing and management arrangement, budget allocation and disbursement were relatively smooth, and maintenance budgeting was formally incorporated. This appears to reflect the nature of the project rather than weaknesses in fiscal capacity. Maintenance responsibilities were addressed through annual allocations rather than through a dedicated multi-year planning framework. This suggests that the absence of multi-year budgeting in Case 6 reflects differentiated risk perceptions and infrastructure typology, consistent with public budgeting practices that reserve long-term commitments for higher-risk and higher-salience assets [45].

Sustainability and Safety Outcomes scored moderately positive in Case 6, while the moderately positive sustainability and risk management and even slightly positive infrastructure longevity was resulted at the variable level. The involvement of two regional governments created redundant oversight—each region monitored work within its territory and also paid attention to the other’s progress. Scale demanded formalized safety protocols because numerous construction teams working simultaneously created coordination hazards requiring systematic management. This accountability differential explains why sustainability varies across nominally similar projects, consistent with evidence that horizontal accountability among public agencies and the presence of multiple client representatives can strengthen monitoring and compliance in complex construction projects when principals coordinate their oversight rather than duplicate or free-ride on it [11, 51].

Table 3. Level of adoption across thematic dimensions

Theme	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Financial Resilience	Neutral	Slightly Negative	Slightly Negative	Neutral	Neutral	Slightly Positive
Budget Allocation	Slightly Positive	Neutral	Neutral	Slightly Positive	Moderately Positive	Moderately Positive
Community Engagement	Slightly Negative	Neutral	Neutral	Slightly Positive	Slightly Positive	Slightly Positive
Policy & Governance	Neutral	Slightly Positive	Neutral	Slightly Positive	Slightly Positive	Moderately Positive
Donor-mediated Financing	N/A	Slightly Positive	Slightly Positive	N/A	N/A	N/A
Stakeholder Coordination	Slightly Negative	Slightly Negative	Neutral	Slightly Positive	Slightly Positive	Slightly Positive
Technical Capacity	Neutral	Slightly Positive	Slightly Positive	Slightly Positive	Slightly Positive	Slightly Positive
Sustainability & Safety Outcomes	Slightly Negative	Slightly Negative	Slightly Negative	Moderately Positive	Slightly Positive	Moderately Positive
Planning	Very Positive	Moderately Positive	Slightly Positive	Moderately Positive	Very Positive	Very Positive
Project Outcomes	Slightly Negative	Neutral	Neutral	Moderately Positive	Moderately Positive	Moderately Positive

Note: Numeric scores were used to calculate composite ratings where two or more raters assessed the same variable. Individual scores were averaged and mapped to final evaluative categories using predefined range thresholds: Very Positive (+2.5 to +3.0), Moderately Positive (+1.5 to +2.4), Slightly Positive (+0.5 to +1.4), Neutral (−0.4 to +0.4), Slightly Negative (−1.4 to −0.5), Moderately Negative (−2.4 to −1.5), and Very Negative (−3.0). For example, a variable where the majority of coded segments were negative, triangulated across interview, documentary, and field data sources, would receive a numeric score of −2, reflecting consistent but not overwhelming negative evidence, which maps to a rating of Negative.

Although the project relied solely on government funding, non-state actor participation was evaluated as moderately high due to the tendering process. As an inter-district link, the project required higher contractor capacity and coordination, which further expanded private sector involvement compared with smaller township-level projects. This finding suggests that elevated project status and visibility—rather than financing source alone—can incentivize strong non-state actor engagement by increasing reputational returns and performance expectations. Such reputational and peer-monitoring dynamics have been shown to intensify actor effort and compliance in multi-stakeholder projects, particularly where visibility and scrutiny are high [11, 52].

One innovative feature of Case 6 was parallel implementation that reduced single-point dependencies and accelerated overall delivery. If one region faced temporary obstacles, the other continued progress. However, parallel implementation also increased coordination complexity. Interface management required careful communication and joint inspection, reflecting well-documented coordination risks in complex, multi-actor infrastructure projects [53]. This pattern supports the view that institutional capacity exists within Myanmar's public sector but is activated selectively in response to project salience and risk rather than applied uniformly across all projects [54]. The complete variable-level scores across all six cases and ten analytical dimensions are presented in Table 3 and Table A2.

5.7 Cross-case analysis: Model-specific performance patterns

This section synthesizes findings across six infrastructure projects implemented under distinct financing configurations to identify systematic performance patterns. Among the ten analytical dimensions, seven emerge as particularly decisive in differentiating performance across cases: financial resilience, budget allocation, community engagement, stakeholder coordination, policy and governance, sustainability and safety outcomes, and project outcomes. The remaining three dimensions—donor-mediated financing, technical capacity, and planning—while analytically relevant, function primarily as enabling conditions or explanatory mechanisms. Donor-mediated financing operates through financial resilience and accountability patterns rather than as a standalone outcome dimension; and is applicable specifically to Cases 2 and 3 where donor involvement was present. Technical capacity and planning show less cross-case variation and therefore contribute less to explaining performance divergence. The seven decisive dimensions are further grouped into three structural areas that reflect the underlying mechanisms through which financing configuration shapes infrastructure performance: (1) Financial Architecture, encompassing financial resilience and budget allocation; (2) Accountability Dynamics, encompassing community engagement, stakeholder coordination, and project outcomes; and (3) Governance Activation and Sustainability, encompassing policy and governance, and sustainability and safety outcomes (Table A3). The findings demonstrate how financing structure shapes performance through three underlying mechanisms.

5.7.1 Financial Architecture: Financial resilience and budget allocation

Single-source dominant financing creates structural

fragility by concentrating financial authority and risk within a single approval chain. Across Cases 1–3, financial stability was maintained not through resilient institutional systems but through informal contractor loss absorption—a hidden subsidy that masked systemic weakness. In single-source dominant financing, contractors absorbed cash flow disruptions caused by sequential approval delays. Under donor-funded fixed-rate structures, inflation and exchange rate risks were similarly transferred downward. While the mechanisms differ, the outcome is consistent: financing structures concentrate risk in actors least able to absorb it. This indicates that fragility is embedded in how financing authority is organised, rather than in the amount of capital available. Multi-actor configurations disrupt this pattern by redistributing both authority and risk. In Case 6, dual-government financing introduced parallel approval pathways that operated under the same macroeconomic constraints that destabilised Cases 2 and 3, yet avoided comparable delays. This contrast suggests that financing structure can amplify or mitigate governance constraints depending on how decision-making authority is distributed. Although Case 6's strategic priority designation and the resulting institutional attention may also have contributed to its comparative advantage, the configuration of control appears to be an important factor alongside funding volume and institutional priority.

Budget allocation reflects the same structural logic over a longer time horizon. Although budget availability appears broadly sufficient across cases, maintenance commitment remains weak in Cases 1–3 and significantly stronger in Cases 4–6. This divergence is not explained by fiscal capacity but by incentive design. Where a single principal dominates financing, maintenance is deprioritised in favour of new construction. In contrast, multi-source arrangements create shared stakes in asset preservation, generating cross-actor accountability for long-term performance. Financing architecture thus determines not only short-term financial flows but also whether incentives for sustainability are structurally embedded.

5.7.2 Accountability Dynamics: Community engagement, stakeholder coordination, and project outcomes

The most significant finding of this study is that hybrid and multi-source financing generates reinforcing accountability loops. The underlying mechanism is financial stake: actors who contribute their own resources gain both the incentive and the legitimacy to monitor the contributions of others. In contrast, full external funding in Cases 2 and 3 eliminated this dynamic, reducing communities to passive beneficiaries with little material incentive to engage beyond initial land donation. In addition, heavy reliance on donor funding may weaken local ownership, as communities in Myanmar often hesitate to question project quality due to cultural norms of respect toward external actors. Community financial contribution in Case 4 reversed this logic. Participants self-organised monitoring, enforced quality standards, and undertook maintenance—not due to formal obligations, but because the asset was both psychologically and financially theirs [40]. This mechanism extends beyond community participation to institutional relationships.

In Cases 5 and 6, multi-actor financing created mutual oversight among contributing government levels, strengthening coordination and compressing approval timelines in ways that hierarchical, single-source systems failed to achieve [55]. This variation in accountability

structures provides a more compelling explanation for differences in monitoring quality and project outcomes than technical capacity or planning design. It suggests that performance is determined less by what institutions can do, and more by whether actors have a direct stake in ensuring that it is done [2, 56].

5.7.3 Governance Activation and Sustainability: Policy and governance, and sustainability and safety outcomes

Policy and governance operate as the core mechanism shaping how financing structures function in practice. Across all cases, bureaucratic and administrative delays are not incidental constraints but direct outcomes of governance design. Financial management performance—including cash flow stability and responsiveness to cost fluctuations—is determined less by resource availability than by the flexibility of governance arrangements. Single-source systems (Cases 1–3) illustrate how governance rigidity amplifies financial fragility, as delays cannot be absorbed or bypassed within linear approval structures. By contrast, cases with hybrid or multi-actor financing demonstrate that governance constraints can be mitigated through incentive-aligned configurations rather than formal institutional reform. Community co-financing in Case 4 enabled rapid, informal problem-solving and continuous monitoring, while dual-government financing in Case 6 introduced redundancy that reduced approval bottlenecks. Active community engagement increases government responsiveness and accountability, creating social pressure that makes it difficult for authorities to overlook the issue. These improvements did not result from stronger formal procedures—as seen in donor-supported Cases 2 and 3—but from embedded accountability incentives that enabled actors to act more responsively.

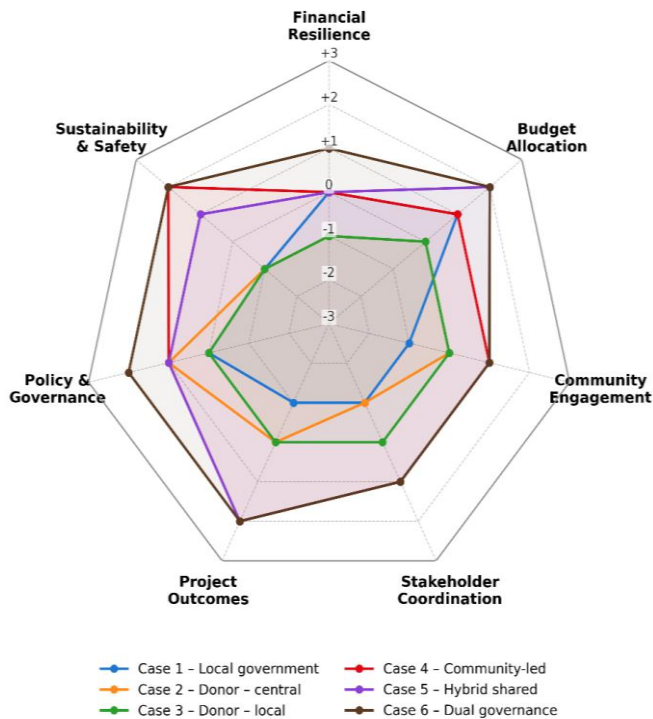


Figure 2. Cross-case performance matrix: Seven decisive dimensions

Notes: Scores range from -3 (Very Negative) to +3 (Very Positive)

Sustainability and safety outcomes represent the point at which governance and financing interactions become most

visible. Weak post-completion performance in Cases 1–3 is not primarily a resource constraint but a structural outcome of incentive design. Respondents across cases consistently reported that maintenance is underfunded and safety risks accumulate over time, despite adequate initial investment. This pattern indicates that long-term performance is not embedded within the financing structure itself. In contrast, Cases 4–6 demonstrate that sustainability emerges when accountability is structurally integrated into financing arrangements. Community financial contribution in Case 4 extended naturally into protective stewardship and self-organised maintenance. Multi-actor government financing in Cases 5 and 6 created overlapping accountability relationships that sustained institutional attention beyond project completion. These findings show that durability may not be driven by financing model or construction quality alone, but by whether financing arrangements embed continuous accountability.

These findings should be interpreted with caution because the cases differ in several contextual factors, including project scale, technical complexity, and institutional priority. Cases 5 and 6, in particular, received exceptional institutional attention that may have influenced outcomes. Accordingly, this comparative design cannot isolate financing configuration as an independent causal factor. Cross-case variation across the seven decisive dimensions is visualized in Figure 2.

6. CONCLUSIONS

This study examined six rural road projects in Myanmar to assess how different financing configurations influence infrastructure performance. The findings suggest that project outcomes are not shaped by the volume of financial resources than by how financing arrangements distribute authority, incentives, and accountability among actors. The analysis reveals three structural mechanisms through which financing arrangements shape outcomes. First, financing structure appears to be an important factor associated with project outcomes alongside financing volume. Single-source financing arrangements consistently generated disbursement bottlenecks, transferred financial risk to contractors, and produced weak maintenance commitment. In contrast, multi-actor financing arrangements whether donor-coordinated as in Cases 2 and 3, or government-community configuration as in Cases 4–6, improved financial resilience by reducing dependence on a single approval chain. Notably, the lowest funded case (Case 4) outperformed higher-funded donor models across accountability and sustainability dimensions, suggesting that financing structure may play an important role alongside funding volume. However, as multiple factors vary across cases, this comparative design cannot isolate the independent effects of financing structure and funding volume.

Second, financial co-participation among multiple actors generated accountability that formal oversight alone did not replicate. In Case 4, community financial contributions generate ownership-based incentives that strengthen monitoring, enforcement, and transparency. However, such arrangements are more effective in smaller-scale projects, as increasing technical complexity and project size may limit community capacity. In Cases 5 and 6, multi-actor government financing created mutual oversight relationships that strengthened coordination and sustained institutional attention

beyond project completion. These accountability relationships arose from financial stake, rather than formal institutional reform. Third, Myanmar's administrative systems possess dormant institutional capacity that financing design can selectively activate. Cases 5 and 6 demonstrate that approval processes which typically require months were compressed to weeks when political salience and multi-actor accountability were present. Though it should be noted that the strong outcomes in these cases reflect exceptional government institutional priority rather than financing structure per se. Community co-financing in Case 4 similarly shows that informal accountability mechanisms, rooted in financial stake and social capital, can outperform formal oversight systems without requiring institutional reform.

Taken together, these findings suggest that financing models function partly as governance mechanisms and not solely as financial instruments, contributing preliminary empirical insight into how institutional design may shape infrastructure outcomes in constrained contexts. As the six cases vary simultaneously in scale, technical complexity, procurement method, political priority, and emergency status, these patterns should be read as associations observed within a purposive six-case comparison rather than as isolated causal effects of financing structure. From a policy perspective, the results indicate that improving infrastructure performance does not necessarily require comprehensive institutional reform. Instead, targeted adjustments to financing structures — such as introducing multi-actor arrangements, encouraging community co-financing in appropriate contexts, and reducing reliance on sequential approval systems — may provide practical near-term improvements that complement rather than substitute for increases in funding volume and broader governance reforms.

7. RECOMMENDATIONS

Improving rural road project performance in capacity-constrained environments requires greater attention to the governance functions embedded within financing arrangements. Policymakers should prioritize financing structures that incorporate shared financial participation across stakeholders, including community co-financing, third-party funding, and multi-level governmental contributions, applied selectively to avoid administrative complexity in larger or technically demanding projects. Simultaneously, institutional reforms should reduce delays in approval and disbursement processes by introducing parallel approval pathways, delegating authority to subnational levels, and clarifying disbursement frameworks to improve reliability while maintaining oversight. In addition, rural road strategies should also leverage locally embedded governance capacity, particularly through community-based monitoring, complemented where appropriate by third-party or independent oversight, where formal institutions are limited. These structural adjustments align incentives and enhance accountability, offering a practical and immediately actionable pathway to sustainable rural infrastructure outcomes. Evidence from Myanmar suggests that such financing-focused reforms may offer practical near-term improvements that complement increases in funding volume and broader governance reforms.

DISCLOSURE OF AI USE

The authors used Generative AI (GenAI) tools strictly to polish language and improve readability of the manuscript. The authors take full responsibility for the originality, accuracy and integrity of the manuscript. All analyses, interpretations, results, discussion, and conclusions were developed and reviewed by the authors.

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APPENDIX

Table A1. Indicative phrases for scoring intensities

Intensity Level	Illustrative Key Phrases (Project Outcomes)	Illustrative Key Phrases (Financial Resilience)
Very Negative	Absent or failed monitoring and evaluation; no corrective action; severe quality defects; project outcomes critically compromised	Severe disbursement delays; extreme cost overruns; unsustainable debt servicing; opaque financial reporting; inflation critically undermines budgets; financial management failure
Negative	Weak or inconsistent monitoring and evaluation; limited feedback use; major quality deficiencies; outcomes well below standards	Frequent disbursement bottlenecks; significant cost overruns; high debt burden; limited financial transparency; inflation pressures strain costs; weak financial controls
Slightly Negative	Irregular monitoring and evaluation; delayed or partial feedback; minor quality shortcomings; outcomes slightly below expectations	Occasional disbursement delays; minor cost overruns; manageable but rising debt; partial transparency; moderate inflation effects; constrained financial management capacity
Neutral	Basic monitoring and evaluation in place; compliance-focused monitoring; acceptable quality; outcomes meet	Timely basic disbursement; costs largely on budget; debt obligations met; standard transparency; inflation effects

Slightly Positive	minimum requirements Functional monitoring and evaluation; feedback occasionally informs adjustments; generally good quality; satisfactory outcomes	manageable; adequate financial management Generally timely disbursement; costs mostly controlled; sustainable debt levels; acceptable transparency; limited inflation impact; sound financial management practices
Positive	Strong monitoring and evaluation; timely feedback and corrective actions; high project quality; outcomes clearly above standards	Efficient disbursement; minimal cost overruns; low debt burden; high financial transparency; inflation well managed; strong financial management systems
Very Positive	Robust and adaptive monitoring and evaluation; continuous learning and adjustment; exceptional quality; outcomes consistently exceed expectations	Highly efficient disbursement; costs consistently controlled; negligible debt stress; exemplary transparency; inflation effectively absorbed; exceptional financial management

Table A2. Levels of adoption across analytical variables

No.	Themes	Variables	Case I	Case II	Case III	Case IV	Case V	Case VI
1	Financial Resilience	Budget Disbursement Efficiency	Slightly Negative	Slightly Negative	Slightly Negative	Neutral	Slightly Positive	Moderately Positive
2		Cost Overruns	Neutral	Neutral	Slightly Negative	Slightly Positive	Slightly Positive	Moderately Positive
3		Debt Servicing Burden	N/A	N/A	N/A	N/A	N/A	N/A
4		Financial Transparency	Neutral	Slightly Negative	Slightly Negative	Slightly Positive	Slightly Positive	Slightly Positive
5		Inflation Impact	Neutral	Slightly Negative	Slightly Negative	Slightly Negative	Neutral	Slightly Positive
6		Financial Management Central	Neutral	Slightly Negative	Slightly Negative	Moderately Negative	Slightly Negative	Slightly Positive
7		Government Budget Allocation Local	Slightly Positive	Slightly Positive	Slightly Positive	Slightly Positive	Moderately Positive	Moderately Positive
8	Budget Allocation	Government Budget Allocation	Moderately Positive	Slightly Positive	Slightly Positive	Moderately Positive	Moderately Positive	Moderately Positive
9		Maintenance Budget Policy	Slightly Negative	Slightly Negative	Slightly Negative	Neutral	Moderately Positive	Moderately Positive
10		Multi-Year Budget Planning	Neutral	Neutral	Neutral	Neutral	Slightly Positive	Neutral
11		Community Contribution	Slightly Negative	Slightly Negative	Slightly Negative	Neutral	Slightly Positive	Slightly Positive
12		Community Feedback	Neutral	Neutral	Neutral	Slightly Positive	Slightly Positive	Slightly Positive
13		Community Ownership	Slightly Negative	Neutral	Neutral	Slightly Positive	Slightly Positive	Slightly Positive
14		Dispute Resolution Mechanism	Neutral	Slightly Positive	Neutral	Slightly Positive	Slightly Positive	Moderately Positive
15	Policy & Governance	Policy Priority for Rural Roads	Slightly Positive	Moderately Positive	Slightly Positive	Slightly Positive	Moderately Positive	Slightly Positive
16		Policy Reform	Neutral	Neutral	Slightly Negative	Slightly Positive	Slightly Positive	Moderately Positive
17		Legal Framework Adaptation	Neutral	Neutral	Slightly Negative	Slightly Negative	Slightly Negative	Slightly Positive
18	Donor-mediated Financing	Donor Coordination	N/A	Neutral	Slightly Positive	N/A	N/A	N/A
19		Donor Grant Access	N/A	Moderately Positive	Moderately Positive	N/A	N/A	N/A
20		Donor Participation	N/A	Slightly Positive	Slightly Positive	N/A	N/A	N/A
21		Funding Timeliness	N/A	Slightly Negative	Moderately Negative	N/A	N/A	N/A
22	Stakeholder Coordination	Government Coordination	Neutral	Slightly Positive	Slightly Positive	Moderately Positive	Moderately Positive	Moderately Positive
23		Stakeholder Conflict	Slightly Negative	Slightly Negative	Slightly Negative	Slightly Positive	Neutral	Slightly Positive
24		Stakeholder Inclusion	Neutral	Slightly Negative	Neutral	Slightly Positive	Slightly Positive	Moderately Positive
25		Transparency in Planning	Slightly Negative	Moderately Negative	Slightly Negative	Neutral	Neutral	Neutral
26		Non-State Actor	Slightly	Neutral	Neutral	Slightly	Moderately	Moderately

27	Technical Capacity	Participation Implementation Capacity	Negative Slightly Positive	Slightly Positive	Neutral	Positive Moderately Positive	Positive Slightly Positive	Positive Moderately Positive
28		Technical Feasibility	Slightly Positive	Moderately Positive	Moderately Positive	Moderately Positive	Moderately Positive	Moderately Positive
29		Technological Adaptation	Slightly Negative	Neutral	Slightly Positive	Slightly Negative	Neutral	Neutral
30	Project Outcomes	Monitoring and Evaluation	Slightly Negative	Neutral	Neutral	Moderately Positive	Slightly Positive	Moderately Positive
31		Project Quality	Neutral	Neutral	Neutral	Slightly Positive	Moderately Positive	Slightly Positive
32	Sustainability & Safety Outcomes	Infrastructure Longevity	Slightly Negative	Slightly Negative	Slightly Negative	Neutral	Slightly Positive	Slightly Positive
33		Sustainability & Risk Management	Slightly Negative	Slightly Negative	Neutral	Moderately Positive	Neutral	Moderately Positive
34	Planning	Project Objective	Very Positive	Moderately Positive	Moderately Positive	Moderately Positive	Very Positive	Very Positive
35		Project scope modifications in planning stage	Very Positive	Moderately Positive	Moderately Positive	Moderately Positive	Very Positive	Very Positive
36		Consideration of Community Needs in the planning stage	Very Positive	Moderately Positive	Neutral	Moderately Positive	Very Positive	Very Positive

Table A3. Key themes and variables identified from cross-case analysis

Key Themes	Key Variables	Role	Cross-case Pattern
Financial Resilience	Budget Disbursement Efficiency	Enabling	Weak in Cases 1–3; improves with multi-source financing
Financial Resilience	Cost Overruns/ Control	Enabling	Apparent stability in Cases 1–3 conceals hidden fragility; stronger in Cases 4–6
Financial Resilience	Financial Transparency	Enabling	Weak in Cases 1–3; community posting of receipts strengthens transparency in Cases 4–6
Financial Resilience	Inflation Impact	Constraining	Significant in Cases 2–3; risk transferred to contractors; mitigated only in Case 6
Budget Allocation	Maintenance budget policy	Enabling	Structurally underfunded in Cases 1–3; stronger in Cases 4–6 with shared accountability
Budget Allocation	Multi-year budget planning	Constraining	Persistently weak across all cases; activated selectively only in Case 5
Community Engagement	Community contribution	Enabling	Weak in Cases 1–3; financial contribution in Case 4 generates ownership and monitoring
Community Engagement	Community ownership	Enabling	Absent in Cases 1–3; community financing in Case 4 strengthens sustainability outcomes
Stakeholder Coordination	Stakeholder Conflict Management	Enabling	Weak in Cases 1–3; improves in Cases 4–6 with multi-actor financing and shared stakes
Stakeholder Coordination	Stakeholder inclusion	Enabling	Limited in Cases 1–3; improves in Cases 4–6 as financing diversifies actor involvement
Stakeholder Coordination	Transparency in planning	Constraining	Persistently weak across all cases; structural constraint not resolved by financing model
Stakeholder Coordination	Non-State Actor Participation	Enabling	Weak in Cases 1–3; improves coordination and oversight in Cases 5–6 through reputational incentives
Policy and Governance	Dispute Resolution Mechanism	Enabling	Weak in Cases 1 and 4–5; formalised under donor procedures in Cases 2–3; stronger in Case 6
Policy and Governance	Policy Reform	Enabling	Stronger in Cases 2–3 under donor oversight; sustained in Cases 5–6 through priority designation
Policy and Governance	Legal Framework Adaptation	Constraining	Weak in Cases 1–5; compliance capacity built without adaptive institutional reform
Sustainability & Safety Outcomes	Infrastructure Longevity	Enabling	Weak in Cases 1–3; community ownership in Cases 4–6 generates protective stewardship behaviour
Sustainability & Safety Outcomes	Sustainability and Risk Management	Enabling	Weak in Cases 1–3; stronger in Cases 4–6 where accountability is embedded in financing structure
Project Outcomes	Monitoring & evaluation	Enabling	Weak in Cases 1–3; continuous informal monitoring in Case 4 outperforms formal audit procedures