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Ghana's Experience with Output and Performance-Based Road Contracts: Key Takeaways

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ABSTRACT

This study provides an overview of Ghana's use of Output and Performance Based Road Contracts under the Transport Sector Improvement Project. Although these contracts are widely used globally, there is limited evidence on how they perform in Sub Saharan Africa, especially in first time implementation contexts. This creates a gap in understanding whether such contracts can work effectively in countries with limited institutional capacity and unstable economic conditions. The study adopts a qualitative documentary case study approach using five official reports from the World Bank and Government of Ghana covering the period from 2017 to 2026. Data were analysed across key areas such as contract design, engineering performance, economic outcomes, and implementation challenges to provide a complete picture of Ghana's experience. The findings show that the contracts achieved strong results in terms of road quality improvement, reduced travel time, increased traffic, and positive economic returns. However, several major challenges were identified, including long procurement delays, contractor capacity gaps, funding difficulties due to economic instability, and safety concerns during project implementation. The study recommends that future projects should ensure stable and protected funding arrangements before implementing performance based contracts, since consistent payment is critical for their success.

Keywords: Procurement; Output and Performance-Based Road Contracts; OPBRC; Ghana; Road Infrastructure; Performance-Based Contracting; Transport Sector Improvement Project; Principal-Agent Theory

INTRODUCTION:

Road infrastructure is widely recognised as a foundational driver of socioeconomic development, providing both economic benefits - employment, income, market integration, and export growth - and social benefits including accessibility, mobility, and equitable service delivery (Tini et al., 2018; Akinradewo et al., 2019). In Ghana, road transport carries over 95% of passenger and freight traffic nationally (World Bank, 2026), yet chronic underinvestment in maintenance, structural contracting failures, and persistent fiscal constraints have left the network deteriorating and unable to sustain the service levels required for inclusive development (Akinradewo et al., 2019; Owoo & Lambon-Quayefio, 2018). In response, the World Bank and Government of Ghana piloted Output and Performance-Based Road Contracts (OPBRCs) under the Transport Sector Improvement Project (TSIP) - the first application of this contracting modality in Ghana - deploying six design-build-maintain contracts across 1,029.43 km of trunk and feeder roads in the Northern, Bono East, and Upper West Regions between 2017 and 2025 (World Bank, 2026; Agyekum, 2025). This article presents a documentary case study of that deployment, examining Ghana's OPBRC experience and extracting key lessons for future performance-based contracting in emerging economies.

BACKGROUND

Ghana's road network is the backbone of national logistics, carrying over 95% of all passenger and freight traffic across a 78,402 km network comprising 14,583 km of trunk roads, 48,383 km of feeder roads, and 15,462 km of urban roads (Dokyi et al., 2024; World Bank, 2026). Despite its strategic importance, the sector is characterised by chronic underinvestment in maintenance: Ghana's Road Fund covered only approximately 45% of maintenance needs between 2018 and 2021, against an expected 65%, perpetuating accelerating network deterioration (World Bank, 2026). Compounding this, the sector faces persistent structural challenges: delayed government payments that erode contractor viability and promote contract abandonment; land tenure complexity arising from customary land vesting in chieftaincies, resulting in prolonged site handover disputes; skilled labour deficits; a preference for imported over locally available materials; low technology adoption; and the sector's heavy dependence on donor financing with limited private-sector credit access (Akinradewo et al., 2019; Owoo & Lambon-Quayefio, 2018). The

consequences are most acute in Northern Ghana, where average travel time from rural communities to the nearest all-weather road exceeded 3.3 hours, agricultural productivity is constrained by logistics costs and post-harvest losses, and the Upper West Region - the poorest in Ghana - recorded a poverty incidence of 70.7%, with Wa West District at 92.4% (World Bank, 2026; World Bank, 2020). Road improvement in these areas is therefore not merely a transport concern but a direct poverty reduction instrument, with agriculture contributing 22% of regional GDP and employing up to 50% of the labour force (World Bank, 2026).

The conventional Design-Bid-Build (DBB) contracting model - Ghana's longstanding road procurement modality - is characterised by unit-rate payments for completed input quantities, creating structural incentive misalignments that compound the sector's maintenance deficit. Tseng & Yang (2024) catalogue its systemic pathologies as: cost and time escalation; poor work quality; inadequate contractor motivation; improper risk-sharing between client and contractor; susceptibility to political influence and corruption; and shorter road service life. Offei-Nyako et al. (2016) document the cost consequences in Ghana specifically: cost deviations for transport infrastructure projects average 28% of estimated cost, Ghana loses approximately US$1.1 billion annually to infrastructure inefficiencies including underpricing, and the larger the project, the greater the divergence between initial and final cost, particularly in Ghana's unpredictable and inflationary economy. Dosumu et al. (2019) further document that Bill of Quantities errors generate disputes whose consequences include cost overruns, poor project performance, loss of contractor and professional reputation, rework, and project abandonment. Critically, Minster et al. (2025) highlight the fact that under conventional contracts, maintenance responsibility ends at handover, is handled through separate short-term contracts, and is routinely underfunded - leaving recently rehabilitated roads without sustained upkeep and creating a cycle of premature deterioration and costly reconstruction that compounds the original maintenance deficit.

Output and Performance-Based Road Contracts (OPBRCs) emerged globally as a direct response to these contracting deficiencies, first introduced in British Columbia, Canada in 1988 and subsequently adopted by Argentina, Uruguay, Brazil, Australia, and New Zealand during the 1990s (ADB, 2023; Sultana et al., 2012). Under the OPBRC model, the contractor assumes responsibility for managing road asset conditions to a pre-set performance level, with the road owner specifying what needs to be achieved rather than how - incentivising measures that improve road quality for the full contract duration rather than ad hoc repairs (Dura, 2021; Iimi & Gericke, 2017). Payments are lump-sum and conditional on achieving specified service levels - such as International Roughness Index (IRI), travel time, and road condition ratings - rather than on the volume of inputs used, thereby aligning contractor incentives with road user interests (Mutai & Aila, 2018; Ogita et al., 2023). Since the 2010s, Sub-Saharan Africa has joined this global diffusion, with deployments documented in Chad, Djibouti, Niger, Madagascar, Mozambique, Nigeria, and Ghana (Minster et al., 2025; Giwa, 2019), yet most documented experience derives from developed markets with competitive contractors, well-established maintenance institutions, and reliable financing - conditions fundamentally different from the Ghanaian context (Gericke et al., 2014; World Bank, 2021).

Ghana's TSIP was approved by the World Bank Board on 6 June 2017, with an IDA credit of SDR 110.6 million (US$150 million equivalent), and subsequently supplemented by a European Union grant of US$37.48 million approved on 11 June 2020, bringing total financing to US$187.48 million (World Bank, 2020). Six OPBRCs - structured as design-build-maintain contracts - were deployed across two road network types: a 168 km trunk road corridor (Tatale–Yendi–Tamale) in the Northern Region financed by IDA, and 861 km of feeder and farm roads across Bono East and the Upper West Region, financed by both IDA and the EU Trust Fund (World Bank, 2026; Agyekum, 2025). Implementing agencies were the Ghana Highway Authority (GHA) for trunk roads and the Department of Feeder Roads (DFR) under the Ministry of Roads and Highways (MRH) for feeder roads, supported by two independently appointed Monitoring Consultants responsible for verifying service level compliance and certifying lump-sum payments (World Bank, 2022). This represented the first-ever application of the OPBRC modality in Ghana - a landmark pilot of considerable significance given the country's documented road infrastructure challenges, macroeconomic volatility, and institutional readiness gaps (World Bank, 2022). The project was independently evaluated at completion through both a World Bank Implementation Completion Report (World Bank, 2026) and a Government of Ghana Project Completion Report (Agyekum, 2025), producing the richest empirical dataset on OPBRC implementation in Sub-Saharan Africa to date.

Despite over three decades of global OPBRC application, Iimi & Gericke (2017) identify a critical evidentiary gap: "despite the fact that OPRC are being used widely, there is little evidence showing their effectiveness." This gap is particularly acute in Sub-Saharan African emerging economy contexts, where contractor capacity, institutional readiness, and fiscal stability differ materially from the developed-country and Latin American settings that dominate the existing OPBRC literature (Minster et al., 2025; Sultana et al., 2012). African evidence - from Zambia (Iimi & Gericke, 2017; Iimi, 2020), Kenya (Mutai & Aila, 2018), and Nigeria (Giwa, 2019) - is valuable but limited in scale, evaluative depth, and lifecycle completeness. Ghana's TSIP, with its six contracts, 1,029.43 km of road, an eight-year implementation trajectory (2017–2025), and dual independent evaluations, provides an unprecedented empirical dataset for a region-specific assessment. No peer-reviewed study has yet synthesised the full empirical record of this deployment to extract systematically validated lessons applicable to Ghana and comparable emerging economy contexts.

This study addresses the identified research gap through a documentary case study of Ghana's TSIP, guided by two research objectives: (i) to examine Ghana's experience

with Output and Performance-Based Road Contracts across contract structure, engineering outcomes, economic performance, and socioeconomic impacts; and (ii) to extract key lessons from this inaugural OPBRC deployment applicable to future performance-based contracting initiatives in Ghana and comparable emerging economy road sectors. The study makes three specific contributions to the existing body of knowledge. First, it provides the first peer-reviewed empirical synthesis of Ghana's complete OPBRC experience, drawing on four official evaluation documents covering the full project lifecycle. Second, it extends the international OPBRC literature into a Sub-Saharan African first-deployment context characterised by fiscal instability, first-time contractor exposure, and complex institutional arrangements - contextual factors underrepresented in existing comparative studies (Carmona & Alarcón, 2019; Minster et al., 2025). Third, the lessons extracted are structured around five evidence-based dimensions - fiscal stability, feeder-trunk contract fit, institutional readiness, procurement calibration, and ESHS integration - that offer direct policy guidance for the design of future OPBRC programmes in Ghana and comparable emerging economies.

LITERATURE REVIEW

Road Infrastructure and Economic Development

The socioeconomic case for road infrastructure investment is well-established across multiple academic disciplines. Adugbila et al. (2023) document the fact that the expansion of the Accra -Kasoa road in Ghana attracted diverse social groups, improved access to public transport, health facilities, and primary schools, and stimulated improvements in water and electricity infrastructure - with 87 to 95% of residents reporting perceived improvements. Ben (2019) conceptualises these outcomes as both direct - higher vehicle speeds, improved safety and route flexibility - and indirect - optimised industrial structures and the formation of economic traffic belts. Ng et al. (2019) provide the macroeconomic quantification, demonstrating through cross-national analysis that growth in road length per thousand population contributes positively to GDP growth and export expansion. These interconnected pathways from road investment to development outcomes are particularly salient in Northern Ghana's agricultural hinterlands, where poor road access directly impedes market participation and post-harvest logistics (World Bank, 2026).

Output and Performance-Based Road Contract (OPBRC): Definition and Principles

OPBRC represent a fundamental reorientation of road contracting from input measurement to outcome delivery. Mutai & Aila (2018) define OPBRCs as involving a shift away from traditional approaches - where the client designs and supervises - to a focus on the outcomes the client wishes to achieve, with payments based on measured outputs reflecting target road conditions rather than quantities of input work. Dura (2021) articulates the contractual core: the contractor assumes responsibility for managing road assets to a pre-set performance level, with the road owner specifying what needs to be achieved, thereby incentivising measures that improve asset condition for the contract's full duration rather than ad hoc repairs. OPBRCs may be pure or hybrid, ranging from simple single-service contracts to comprehensive instruments covering all road assets within the right-of-way (Mutai & Aila, 2018; Dura, 2021). A key design feature across all forms is contractor flexibility in achieving performance targets - including choice of engineering design or innovative technology - since payment depends on performance outcomes rather than on input values (Dura, 2021; Calahorra-Jimenez & Poythress, 2024).

Traditional Contracting vs. OPBRC: The Incentive Misalignment Problem

The fundamental weakness of conventional Bill of Quantities (BoQ) contracting in road maintenance is the misalignment of contractor incentives. Walumoli (2015) identifies the core distortion: in traditional contracts, the contractor is paid on unit prices for different work items and therefore "has the wrong incentive, which is to carry out the maximum amount of works, in order to maximize its turnover and profits." Ogita et al. (2023) confirm that traditional contracts create incentives for work volume inflation, fail to account for long-term maintenance, and generate misalignment between government and contractor objectives. Offei-Nyako et al. (2016) document the financial consequences in Ghana: cost deviations average 28% of estimated cost for transport infrastructure projects, with Ghana losing approximately US$1.1 billion annually to infrastructure inefficiencies. Dosumu et al. (2019) catalogue the downstream effects of BoQ errors as including cost overruns, dispute escalation, poor project performance, and project abandonment. These documented pathologies establish the institutional context for Ghana's adoption of the OPBRC alternative.

International Evidence of OPBRC Effectiveness

The most extensive evidence base for OPBRC effectiveness comes from Latin America. Prasad et al. (2022) report that Brazil's CREMA (Contrato de Recuperación y Mantenimiento) programme achieved unit costs of works per kilometre 25–35% lower than traditional contracts, maintenance unit costs 34% lower, and road conditions rated 'Very Good' compared to 'Regular' for traditional contracts. In Argentina, the CREMA system reduced roads in poor condition (IRI > 4) from 35 to 10% and roads in bad condition (IRI > 5) from 11 to 2%, with an estimated annual road-user cost saving of at least US$275 million (Prasad et al., 2022). Walumoli (2015) confirms that Argentina's adoption of PBCs reduced the share of roads in poor condition from 25% to less than 5% by 1999, while Uruguay's national network was 42% under performance-based contracts by January 2000. In Asia, Tseng & Yang (2024) report a benefit-cost ratio of 5.35 from a PBC pilot in Taiwan, and Susanti et al. (2016) demonstrate through IRI measurement in Indonesia that PBC implementation ensured quality and road service performance over the long term.

African evidence, while more limited, supports the international pattern. In Zambia, Iimi & Gericke (2017) show that roads under OPRC arrangements had an 18 percentage point higher probability of receiving required maintenance works compared to non-OPRC roads - demonstrating the maintenance commitment advantage of OPBRCs. Iimi (2020) further shows that OPRC arrangements in Zambia increased agricultural production, with small-scale farmers benefiting from improved market connectivity. In Kenya, Mutai & Aila (2018) demonstrate that PBC elements explain 83.2% of road agency performance variance ($R^2 = 0.832$), constituting strong empirical support for the OPBRC model in a Sub-Saharan African institutional context. Nigeria's Kaduna State pilot - the only OPRC implemented in Nigeria - covered 460 km of rural roads over a 5-year contract at N6.75 billion, opening communities, enabling market access, and improving healthcare and education access, though the modality has not been continued (Giwa, 2019). For Ghana specifically, Jangali (2021) confirms the OPRC approach for the UWR feeder roads under TSIP, noting that contractors are paid based on performance rather than inputs, and are responsible for maintaining roads for three years after the construction phase.

Theoretical Framework: Principal-Agent Theory

Principal-Agent Theory (PAT) provides the theoretical foundation for understanding OPBRC incentive design and contractor behaviour. Braun & Guston (2003) define the principal-agent relationship as a specific social relationship of delegation in which one actor extends their capacity through another who accepts appropriate resources and acts in the principal's interests. Gauld (2023) applies this to public contracting: agency theory encapsulates the idea that public sector performance improves when incentive-based contracts align the goals of principals and agents. PAT centres on two problems: adverse selection - arising when the principal cannot fully verify the agent's capability at selection - and moral hazard - arising when the agent acts in self-interest in ways the principal cannot directly observe (Shrestha et al., 2019). Rees (1984) formalises the moral hazard problem: when neither agent effort (a) nor state of the world (θ) is observable, the agent will choose actions to maximise their own utility rather than the principal's desired outcome. In the road contracting context, these problems manifest as abnormally low bids (adverse selection) and ad hoc minimal repairs (moral hazard). OPBRCs address both problems through performance-based payment schedules, long-duration contracts that internalise lifecycle incentives, and independent monitoring consultants that reduce information asymmetry (Rees, 1984; Dura, 2021).

RESEARCH METHODOLOGY

This study adopts a qualitative, documentary case study research design, grounded in an interpretivist epistemological stance (Yin, 2018). The case is Ghana's TSIP - defined as a bounded system comprising the first application of OPBRCs in Ghana's road sector across six contracts, three regions, and the period 2017–2026. Case study analysis is appropriate given the contextually embedded, longitudinal, and multi-faceted nature of OPBRC implementation, which cannot be reduced to controlled experimental conditions. The design supports detailed examination of mechanisms, outcomes, and contextual conditions consistent with the study's objective of extracting transferable lessons. A purely documentary approach was adopted because the primary evaluation documents - generated by the World Bank and Government of Ghana as part of the official TSIP project cycle - provide comprehensive, systematically collected, and institutionally authoritative data on all dimensions of the study's two research objectives.

The analytical corpus comprises five primary sources, selected on criteria of official authority, systematic data collection, lifecycle coverage, and inter-source corroboration: (i) the World Bank Project Appraisal Document (World Bank, 2017), providing baseline conditions, original targets, and appraisal-stage economic analysis; (ii) the Additional Financing Project Paper PAD3483 (World Bank, 2020), documenting the EU-funded scale-up to 670 km of UWR feeder roads and revised results framework; (iii) the Restructuring Paper RES50974 (World Bank, 2022), providing mid-implementation ratings and macroeconomic risk data; (iv) the Implementation Completion and Results Report ICR00379 (World Bank, 2026), the World Bank's definitive outcome assessment with ex-post HDM-4 and RED economic models and formal lessons; and (v) the Project Completion Report (PCR) (Agyekum, 2025), the Government of Ghana's independent evaluation corroborating engineering and economic data.

A systematic data extraction protocol was applied across all five sources, organised around five thematic categories: contract structure and deployment; engineering performance; economic performance; socioeconomic impacts; and implementation challenges. Triangulation was achieved by comparing ICR and PCR figures - noting and explaining discrepancies (e.g., the ICR EIRR of 30.4% versus PCR EIRR of 42.7% on the trunk road, attributable to different traffic growth assumptions per ICR Annex 4) (World Bank, 2026); cross-referencing appraisal targets from PAD and PAD3483 against completion actuals; and checking administrative data from the Ministry of Finance Programme-Based Budget Estimates (MoF, 2025) and the World Bank Implementation Status Report (World Bank, 2022a) against project-cycle documentation. The analytical framework integrates Principal-Agent Theory - providing theoretical language for interpreting OPBRC incentive design and contractor behaviour - with the international OPBRC literature on critical success factors (Minster et al., 2025; Dura, 2021; Iimi & Gericke, 2017), which provides the comparative benchmarks against which Ghana's experience is evaluated.

FINDINGS

OPBRC Deployment Structure

The TSIP was approved by the World Bank Board on 6 June 2017, with an IDA credit of SDR 110.6 million (US$150 million equivalent), supplemented by a European Union grant of US$37.48 million approved as Additional Financing on 11 June 2020, bringing total financing to US$187.48 million (World Bank, 2020). Six OPBRCs structured as design-build-maintain contracts were deployed across two road types: a 168 km trunk road corridor in the Northern Region, and approximately 861 km of feeder and farm roads in Bono East and Upper West Regions (Agyekum, 2025; World Bank, 2026)

Table 1: Summary of OPBRC packages under Ghana TSIP

Package	Road Type	Corridor / Region	km	Finance	Duration	Completion
GHA Lot 1	Trunk	Tatale–Yendi, Northern Region	61.98	IDA	7 yrs	99%
GHA Lot 2	Trunk	Yendi–Tamale, Northern Region	106.02	IDA	7 yrs	99%
Bono East Pkg 3	Feeder & Farm	Atebubu-Amanten, Bono East	191.25	IDA	5 yrs	98%
UWR Lot 1 (AF)	Feeder & Farm	Wa Municipal, Wa West, Nadowli-Kaleo	235.40	EU TF	3.5 yrs	100%
UWR Lot 2 (AF)	Feeder & Farm	Jirapa, Lawra, Dafiama-Bussie	208.98	EU TF	3.5 yrs	100%
UWR Lot 3 (AF)	Feeder & Farm	Nandom, Lambussie-Karni	225.80	EU TF	3.5 yrs	100%
TOTAL	-	3 regions, Northern Ghana	1,029.43	IDA + EU	3.5–7 yrs	~99%

Note: Planned total = 1,052.18 km. Sources: Agyekum (2025); World Bank (2026).

Contractors received lump-sum payments conditional on achieving specified service levels and KPIs; payments based solely on input quantities were eliminated from the contractual structure (Agyekum, 2025; World Bank, 2022). Performance deductions for ESHS and maintenance non-compliance totalled GH₵4,498,105.64 across all six contracts (Agyekum, 2025), confirming that the performance incentive mechanism was operationally activated. Two independent Monitoring Consultants verified service level compliance and certified payments.

A significant structural concern was the delay between project approval and contract mobilisation. The two trunk road OPBRCs were not signed until July 2021 - nearly five years after Board approval - owing to protracted design reviews, a 29-month RAP finalisation delay, and procurement bottlenecks (World Bank, 2026). UWR design phases extended to 20–27 months against a planned nine months, driven by concept design inadequacy (Agyekum, 2025). These delays compressed the maintenance phase and reduced the sustainability value of the long-term OPBRC structure.

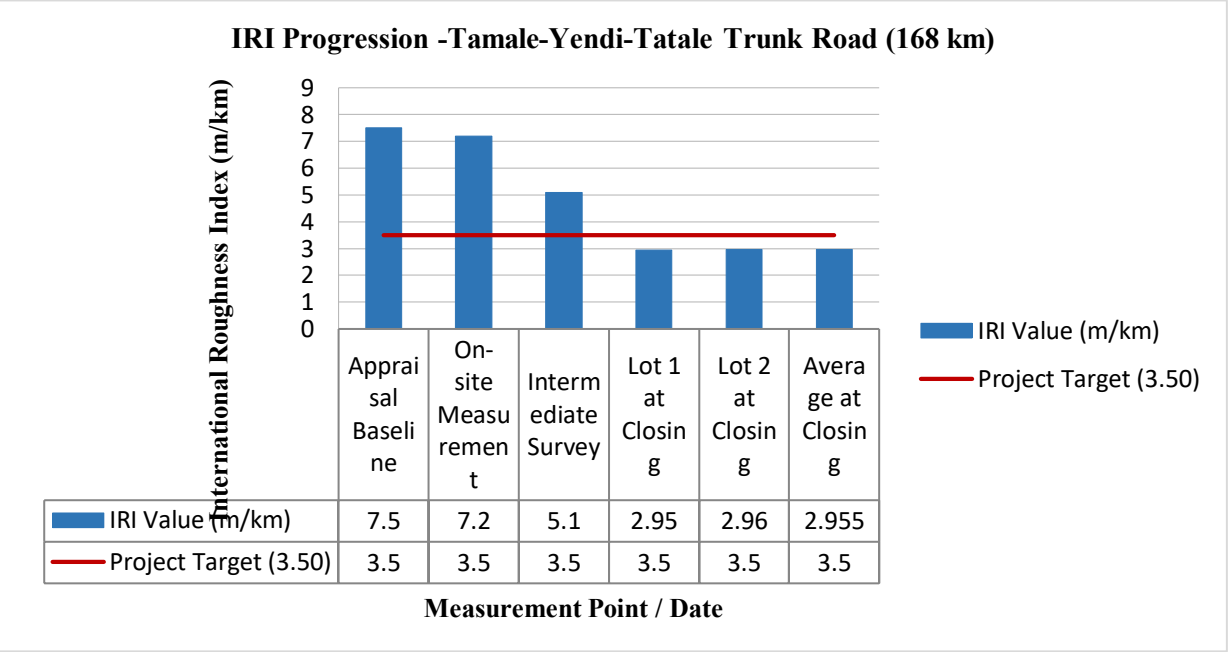
Engineering and Physical Performance Outcomes

International Roughness Index

The IRI baseline on the trunk road prior to construction was 7.50 m/km - classified as Poor (World Bank, 2017, Results Framework). The end target was 3.50 m/km (World Bank, 2020). The PCR documents a progressive improvement: IRI declined from 7.20 m/km in June 2022 (on-site measurement after construction commencement) to 5.1 m/km in May 2025, reaching 2.955 m/km at project closing in June 2025 (Agyekum, 2025). GHA Lot 1 recorded 2.95 m/km and Lot 2 recorded 2.96 m/km - both surpassing the 3.50 target by over 15% and achieving a Good classification (World Bank, 2026). This represents a 60.6% improvement from the 7.50 m/km baseline, confirming that OPBRC-embedded maintenance

obligations contributed to sustained road quality improvement.

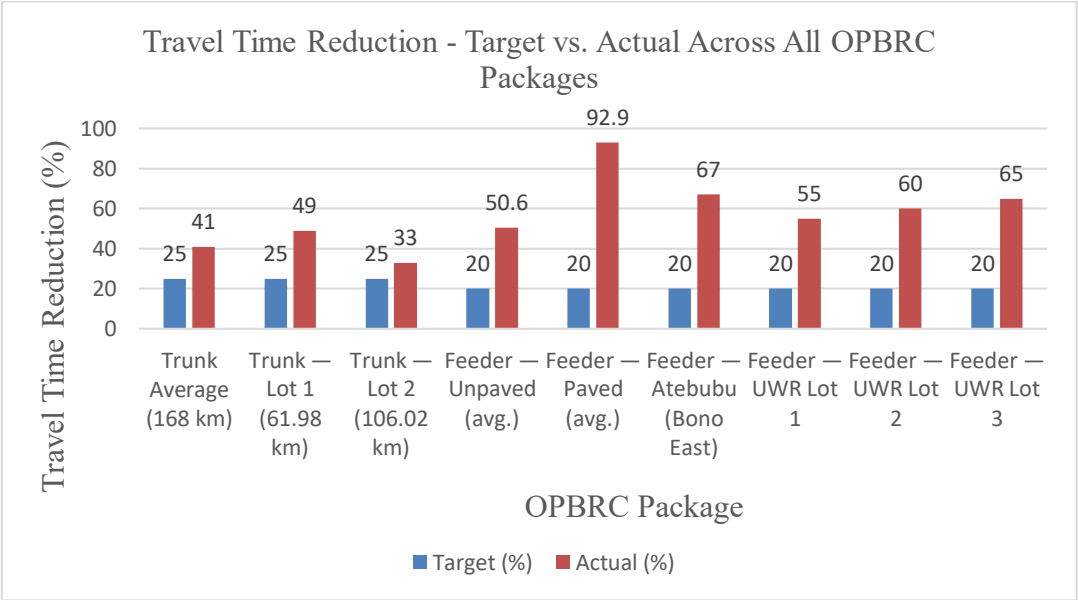
Figure 1: IRI Progression -Tamale-Yendi-Tatale Trunk Road (168 km)



Travel Time Reduction

Travel time reduction was the primary PDO-1 outcome and the most tangible evidence of OPBRC effectiveness for road users. On the 168 km Tatale–Tamale trunk corridor, travel time decreased from approximately four hours to two hours and 43 minutes - a 53% reduction against the 25% target (Agyekum, 2025; World Bank, 2026). Average travel speed rose from 42 km/h to 61.8 km/h (World Bank, 2026). Lot 1 recorded a 49% reduction and Lot 2 a 33% reduction (World Bank, 2026). On feeder roads, unpaved sections recorded a 50.6% reduction (22 to 11 minutes) and paved sections a 92.9% reduction (19 to approximately 2 minutes) - all against a 20% target (Agyekum, 2025). Feeder package results ranged from 55% (UWR Lot 1) to 67% (Atebubu, Bono East) (World Bank, 2026)

Figure 2: Travel Time Reduction - Target vs. Actual Across All OPBRC Packages

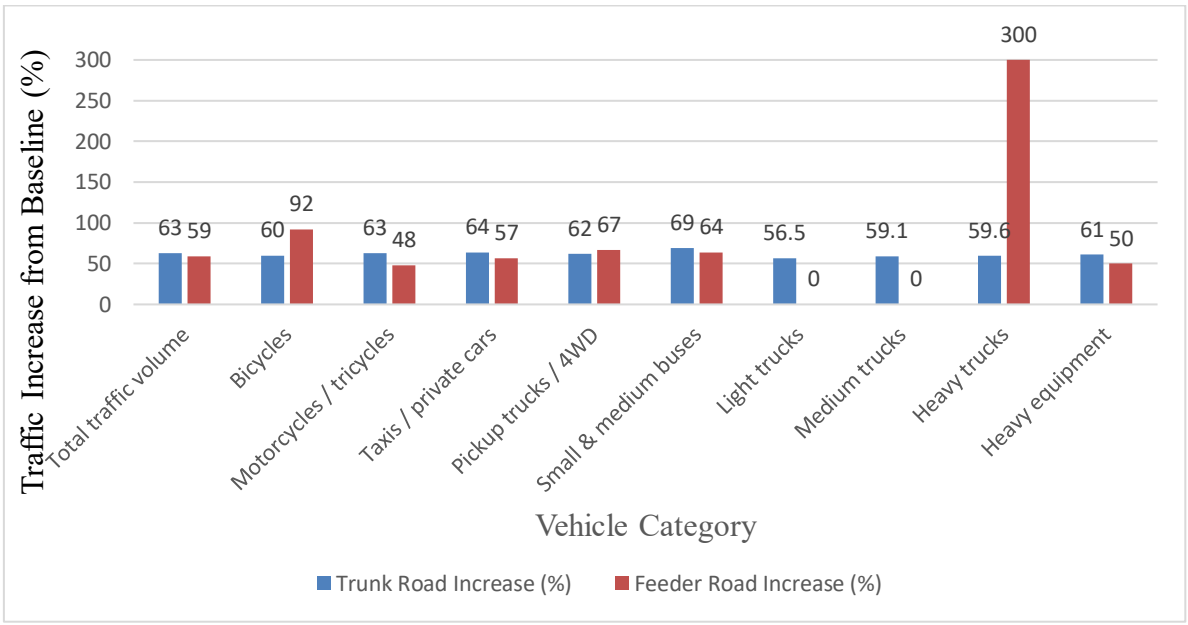


Traffic Volume Changes

Road rehabilitation generated substantial induced traffic across both network types. Trunk road total traffic increased by 63% from baseline to project completion, with vehicle categories ranging from 50% (4-axle semi-trailers) to 69% (small and medium buses) (Agyekum, 2025). Feeder roads recorded a 59% average traffic increase, with the most pronounced shift being a 300% increase in heavy truck traffic - reflecting a transformation in agricultural logistics (Agyekum, 2025; World

Bank, 2026). Total AADT on feeder roads increased from 654 at baseline to 1,090 at completion (World Bank, 2026). Bicycles increased 92% and motorcycles 48% on feeder roads, indicating broader, non-motorised connectivity gains

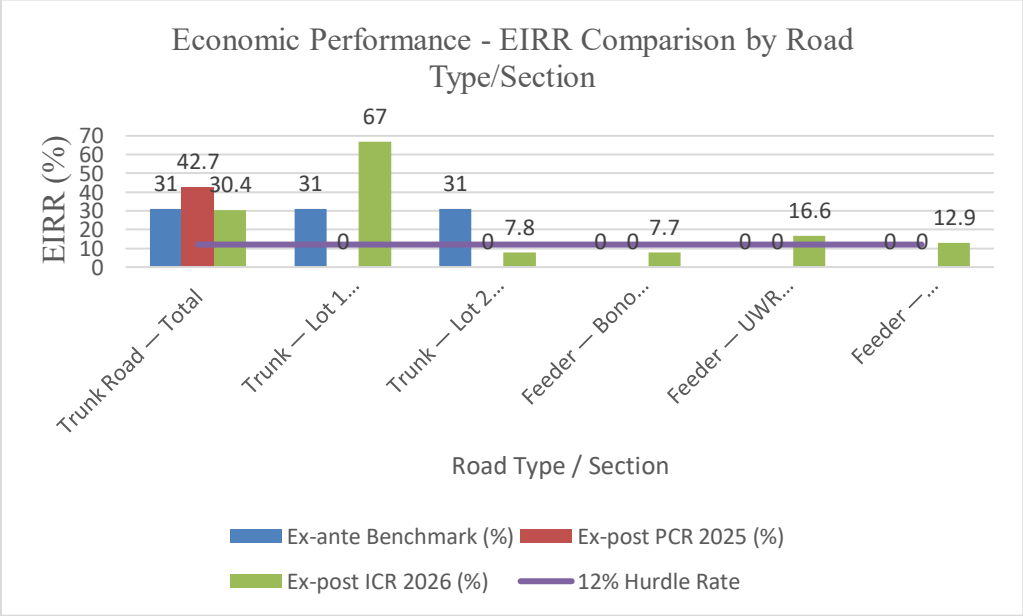
Figure 3: Traffic Volume Changes- Trunk vs. Feeder Roads by Vehicle Category



Ex-post economic analysis using HDM-4 (trunk roads, 12% discount rate, 20-year evaluation period) confirmed robust returns substantially exceeding the appraisal benchmark of 26–36% EIRR (World Bank, 2017). The PCR (Agyekum, 2025) computed an EIRR of 42.7% and NPV of US$282.20 million, with vehicle operating cost savings of US$166.95 million and travel time savings of US$58.70 million. The ICR (World Bank, 2026) independently computed an EIRR of 30.4%, NPV of US$174 million, and B/C ratio of 4.1 - the divergence from the PCR reflecting different traffic growth assumptions (World Bank, 2026). Both analyses substantially exceeded the appraisal benchmark. At section level, Lot 1 (Tatale–Yendi, upgrading an entirely unsealed road) returned an EIRR of 67%, while Lot 2 (Yendi–Tamale) returned 7.8% in isolation but is economically dependent on Lot 1 traffic generation (World Bank, 2026).

For feeder roads, the RED model found a combined EIRR of 12.9% (World Bank, 2026). Unpaved sections returned 15–32% - above the 12% World Bank hurdle rate (Agyekum, 2025), while paved sections returned 3–11%, below the hurdle rate, reflecting high unit paving costs relative to low traffic volumes (World Bank, 2026). Average cost growth across all six OPBRC contracts was 32.8%, ranging from 3.9% (GHA Lot 1 - constrained by an abnormally low bid, 42.7% below the engineer's estimate) to 95.6% (UWR Lot 2 - driven by additional paved sections funded by EU grant savings) (Agyekum, 2025).

Figure 4: Economic Performance - EIRR Comparison by Road Type/Section



OPBRC Attributes Assessed Against Conventional Contracting

The PCR (Agyekum, 2025) assessed eleven OPBRC-specific attributes for the Ghana context. Six were fully or partly achieved - reduction of contract preparation costs, lump sum mechanism, prioritisation of maintenance, quality assurance, PPP concepts, and job creation. Three were not achieved or could not be certified - risk transfer to contractor, innovation, and cost reduction verification versus DBB. Two were conditionally achieved - value for money and timely delivery. Notably, job creation substantially exceeded targets: over 49,122 job opportunities were generated during the construction phase, with 29.4–33.8% female (Agyekum, 2025). These results are consistent with international literature suggesting that OPBRC effectiveness is context-sensitive, particularly in first-time implementation settings where contractor capacity, institutional readiness, and maintenance funding security are uncertain (Stankevich et al., 2005; Minster et al., 2025).

Socioeconomic Outcomes

By project closing, 219,143 people had gained improved access to sustainable transport infrastructure - 13.7% above the 192,720 target (World Bank, 2026). Of these, 214,143 rural people gained all-season road access, with 130,785 in the Upper West Region, 59,717 on the Northern Region trunk corridor, and 28,641 in Bono East (World Bank, 2026). On feeder roads, 50% of users reported increased market access, 16.7% reported reduced produce loss, 10% reported lower freight charges (Agyekum, 2025), and average monthly household income increased by US$178.77 (males) and US$129.92 (females) (Agyekum, 2025). School attendance among females increased by 13% and 86% of students reported positive impacts on education access (World Bank, 2026). On the trunk road, 48.3% of beneficiaries reported expanded economic activities and 73.3% of cross-border traders recorded reduced travel time to sales points (Agyekum, 2025)

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Figure 5: OPBRC Attributes Assessed Against Conventional Contracting

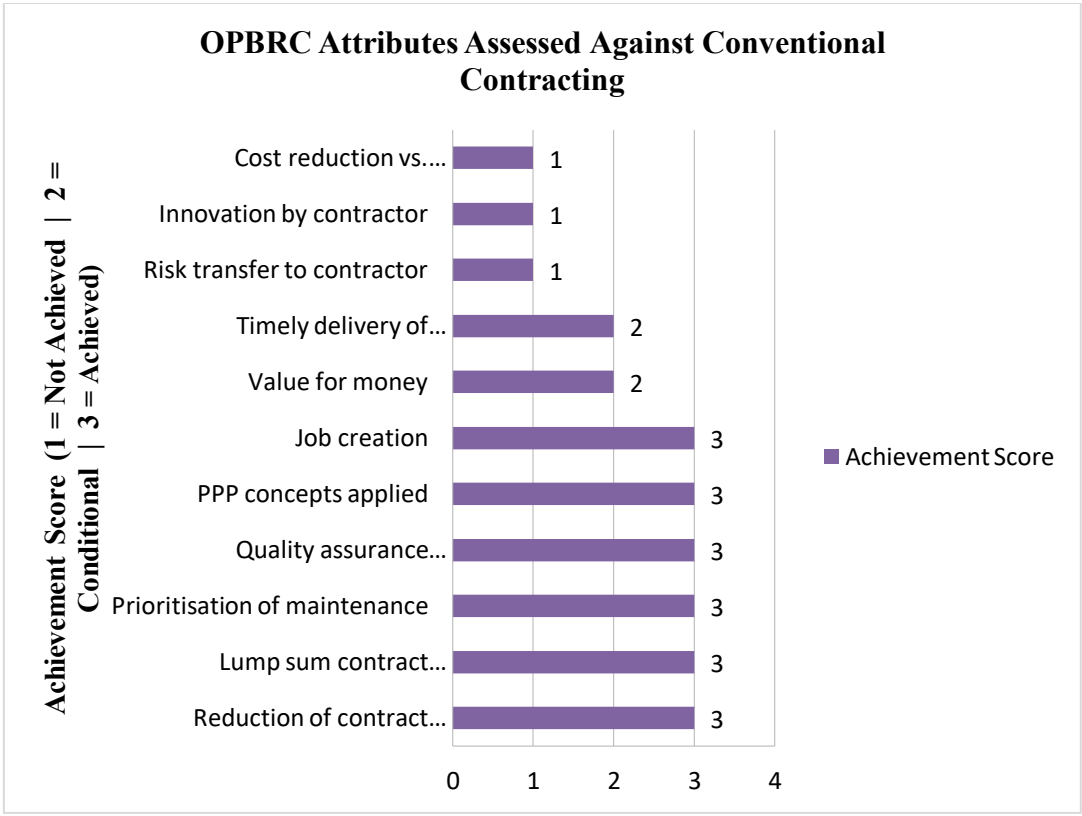
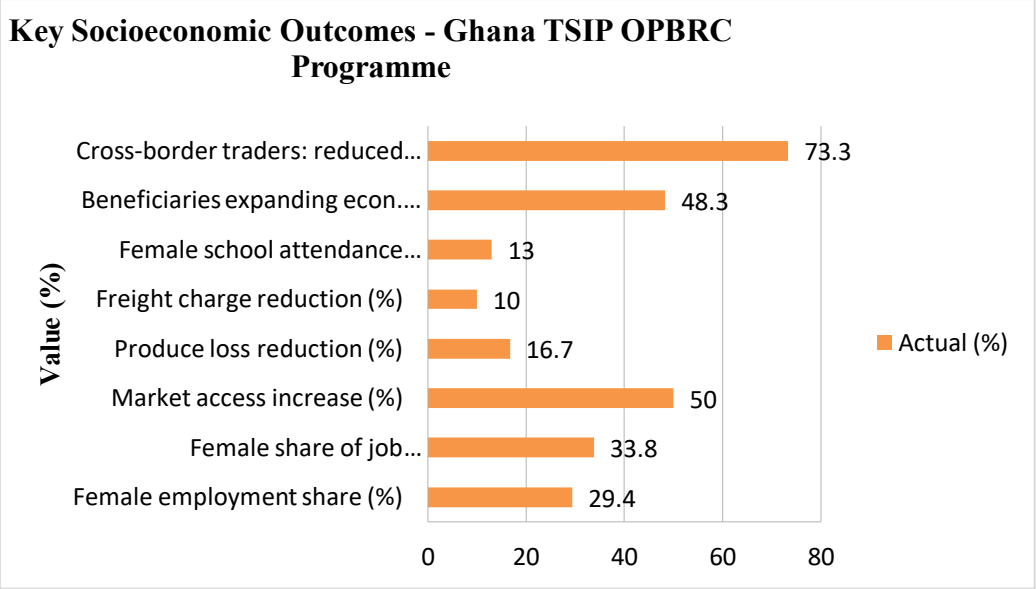


Figure 6: Key Socioeconomic Outcomes - Ghana TSIP OPBRC Programme



Implementation Challenges and Key Lessons

Lesson 1 - Fiscal Stability is a Prerequisite

The most consequential external constraint on TSIP delivery was Ghana's macroeconomic instability. Contractor invoice payments were capped from October 2024 as a result of Ghana meeting IMF Extended Credit Facility (ECF) conditions - its eighth IMF programme since 1987 (World Bank, 2026; IMF, 2023). Interest on delayed invoice payments for the two trunk road contracts accrued to approximately US$659,000 by May 2025, forcing contractors to pre-finance works and causing key staff to leave project sites (World Bank, 2026). Ghana's public debt had reached 78% of GDP in 2020, reflecting both higher deficits and subdued growth (World Bank, 2022). OPBRCs' reliance on steady, predictable long-term cash flows makes them structurally more vulnerable to fiscal crises than shorter conventional contracts, and the ICR recommends dedicated OPBRC escrow accounts as a structural safeguard (World Bank, 2026).

Lesson 2 - Feeder OPBRCs Outperformed Trunk OPBRCs

The three EU-funded UWR feeder packages reached 100% physical completion; the trunk road contracts were 99% complete at closing with outstanding remedial works (Agyekum, 2025, Executive Summary). Feeder OPBRCs consistently outperformed trunk road OPBRCs on completion, maintenance compliance, and client satisfaction (World Bank, 2026), reflecting better alignment between feeder road contract complexity, available contractor capacity, and the shorter 3.5-year duration (Agyekum, 2025). The ICR explicitly recommends that trunk corridors requiring major reconstruction adopt hybrid arrangements - completing heavy works under conventional contracts before transitioning to performance-based maintenance (World Bank, 2026). This finding refines international guidance by specifying that the OPBRC-suitability threshold is conditioned on reconstruction intensity relative to local contractor capacity.

Lesson 3 - Institutional Readiness is Non-Negotiable

The OPBRC modality was genuinely novel to all project parties - agencies, contractors, consultants, and supervisors. Three pre-commencement workshops were held but deemed insufficient (Agyekum, 2025). Design review processes on UWR contracts extended to 20–27 months against a planned nine months, driven by inadequate concept designs and limited contractor capacity for detailed field investigation (World Bank, 2026). The ICR recommends multi-year, progressive capacity building for all OPBRC stakeholders, focused not only on technical and tendering aspects but on long-term contractual risk profiles and quality responsibilities (World Bank, 2026). This lesson resonates with Sultana et al. (2012) and Ogita et al. (2023), who identify lack of experience and inadequate training as primary barriers to PBMC success in developing countries.

Lesson 4 - Procurement Calibration is Critical

Competitive bidding produced contract prices cumulatively 42% below engineer's estimates, with GHA Lot 1 priced 42.7% below - an abnormally low bid that constrained cash flow and quality throughout the contract (Agyekum, 2025; World Bank, 2026). This reflects the adverse selection problem identified in PAT: lowest-price procurement cannot verify contractor capability (Shrestha et al., 2019). The PCR and ICR recommend single-stage, two-envelope procurement with rated technical criteria rather than lowest-price bidding for complex, high-risk OPBRC contracts (World Bank, 2026). This is consistent with Prasad et al. (2022), who identify the need for sufficient information on road condition and bidder capacity before contract award to avoid inflated risk premia and abnormally low bids.

Lesson 5 - ESHS Requirements Must be Embedded

The project recorded nine contractor fatalities and 49 safety incidents, of which only seven were formally reported per World Bank procedures (World Bank, 2026). Total payment deductions for ESHS non-compliance across all contracts reached GH₵4,498,105.64 (Agyekum, 2025), confirming that the contractual penalty mechanism functioned as designed but was insufficient to prevent harm. The ICR recommends integrating OHS requirements into feasibility studies and bidding documents, and enforcing zero-tolerance ESHS compliance linked to payment certification (World Bank, 2026). This lesson has broader relevance to all infrastructure contracting in Ghana's road sector: the performance deduction mechanism can only function preventively when safety criteria are embedded at procurement entry rather than enforced reactively post-award

Table 2: Ghana TSIP OPBRC key lesson framework

#	Dimension	Lesson	Evidence	Source
L1	Fiscal Stability	Steady long-term cash flow is a structural prerequisite; fiscal crises halt OPBRC delivery	US$659K interest accrued; work stoppages Oct 2024	World Bank (2026)
L2	Contract Design	Feeder OPBRCs better suited than trunk in low-capacity settings; hybrid contracts for heavy reconstruction	100% vs 99% completion; ICR Lesson Para. 51	World Bank (2026); Agyekum (2025)
L3	Institutional Readiness	Multi-year capacity building for all stakeholders; not only technical, but risk profile and self-regulation	Design delays 20–27 months; insufficient training	World Bank (2026); Agyekum (2025)
L4	Procurement	Two-envelope rated-criteria procurement; not lowest-price bidding	42.7% below estimate; Lot 1 quality/cash flow issues	World Bank (2026); Agyekum (2025)
L5	ESHS Integration	OHS criteria embedded in bid qualification; zero-tolerance enforcement from day 1	9 fatalities; 49 incidents; GH₵4.5M deductions	World Bank (2026); Agyekum (2025)

Sources: World Bank (2026); Agyekum (2025).

DISCUSSION

The findings of this study both affirm and qualify the international evidence on OPBRC effectiveness. On engineering and economic metrics, Ghana's TSIP substantially exceeded its targets: the IRI improved by 60.6% from baseline, trunk road travel time fell by 53% against a 25% target, and ex-post EIRRs of 30.4–42.7% exceeded the appraisal benchmark of 26–36%. These outcomes are consistent with the Latin American evidence reviewed by Prasad et al. (2022), who found that PBCs better lead to improved road quality and cost savings compared to traditional contracts. They also mirror Mutai & Aila's (2018) Kenyan finding of PBC as a significant predictor of road agency performance, and Susanti et al.'s (2016) Indonesian evidence that PBC implementation ensures long-term road service quality. The 219,143 beneficiaries who gained improved transport access - 13.7% above target - and the 50% increase in feeder road market access parallel Iimi's (2020) Zambian findings on OPRCs and agricultural productivity, establishing a consistent Sub-Saharan African evidence trail.

The finding that feeder road OPBRCs outperformed trunk road OPBRCs is a novel contribution to the international literature, which has not previously distinguished between these sub-types systematically in an African context. This cross-sectional difference is consistent with PAT's adverse selection and moral hazard predictions: trunk road contracts involved longer durations, higher reconstruction intensity, more complex multi-stakeholder design review, and higher contract values - all conditions that amplify principal-agent problems when institutional capacity is limited. Minster et al. (2025) note that OPBRC case studies differ widely across political context, local governance, and stakeholder capacity - precisely the dimensions that differentiated the trunk and feeder experiences in Ghana's TSIP. The practical implication - that heavy reconstruction should be separated from performance-based maintenance in first-deployment settings - extends and contextualises existing guidance from Jangali (2021), who advises that when initial works represent more than 40–50% of contract value, the risk threshold for pure OPBRC delivery may be exceeded.

The five challenges documented in this study collectively expose the structural vulnerabilities of OPBRCs in fiscally constrained, institutionally nascent settings. The macroeconomic dimension - Ghana's IMF ECF-driven disbursement cap and the resulting US$659,000 in interest accruals - has not been documented in previous African OPBRC case studies and constitutes a significant contribution to the field. Sultana et al. (2012) identified dependency on external funding and political influence as barriers in developing countries, but the Ghana case shows that the mechanism is specifically the fiscal cap-induced payment interruption, not merely funding dependency in general. This has direct implications for the design of future OPBRCs: payment security mechanisms - whether escrow accounts, Letters of Credit, or ring-fenced Road Fund sub-accounts - must be contractually pre-specified rather than assumed. The ESHS challenge - nine fatalities and GH₵4.5 million in deductions - similarly advances the literature beyond Ogita et al.'s (2023) observation that PBCs impose complexity challenges, by showing that penalty-based ESHS mechanisms are insufficient without proactive bid-stage integration of safety requirements.

RECOMMENDATIONS AND IMPLICATIONS FOR PRACTICE

This study generates five evidence-based recommendations for policymakers, road agencies, and development partners designing future OPBRC programmes in Ghana and comparable emerging economies. First, the Ministry of Roads and Highways (MRH) and Ministry of Finance (MoF) should institutionalise ring-fenced, pre-funded payment mechanisms - such as OPBRC-specific escrow accounts or Road Fund sub-accounts - that protect contractor cash flow from broader fiscal consolidation measures. The Ghana experience demonstrates that the long-term, lump-sum OPBRC payment structure is incompatible with ad hoc disbursement capping under IMF fiscal frameworks (World Bank, 2026). Second, GHA and DFR should apply the hybrid contracting principle for future trunk road programmes: conventional BoQ contracts for the rehabilitation phase when reconstruction intensity exceeds 40% of contract value, transitioning to performance-based maintenance contracts thereafter (Jangali, 2021; World Bank, 2026).

Third, the World Bank and MRH should design multi-year, phased capacity building programmes that begin at least 18 months before OPBRC contract award, covering not only technical design and tendering but long-term risk management, self-regulation obligations, and ESHS requirements (Agyekum, 2025). Fourth, procurement regulations for OPBRC awards should be updated to mandate two-envelope evaluation with rated technical criteria - eliminating the perverse incentive created by lowest-price bidding that produced abnormally low bids in Ghana's TSIP (World Bank, 2026). Fifth, all future OPBRC bidding documents should embed ESHS compliance standards as minimum eligibility criteria - not post-award penalties - including mandatory OHS training and certification, incident reporting obligations, and linkage of safety performance to payment certification (World Bank, 2026).

CONCLUSION

This study examined Ghana's pilot experience with Output and Performance-Based Road Contracts under the TSIP - the country's first and most comprehensive OPBRC deployment - and extracted five key lessons for future performance-based contracting in emerging economies. The empirical evidence is largely affirmative of OPBRC effectiveness within its technical remit: IRI improved from 7.50 to 2.955 m/km (60.6%), trunk road travel time fell by 53% against a 25% target, feeder road travel time fell by 50–93% against a 20% target, ex-post EIRRs of 30.4–42.7% exceeded the appraisal benchmark, and 219,143 beneficiaries gained improved transport access. These outcomes affirm the value of the OPBRC modality as a contracting instrument for road infrastructure in Sub-Saharan Africa.

At the same time, the study documents significant implementation challenges - procurement delays of up to 49 months, contractor capacity gaps producing abnormally low bids and maintenance non-compliance, macroeconomic instability causing work stoppages and US$659,000 in interest losses, a critical post-closing maintenance funding gap on trunk roads, and ESHS failures resulting in nine fatalities - that reveal the structural preconditions the OPBRC modality requires to fulfil its promise. The consistent superiority of feeder road over trunk road OPBRCs - documented for the first time in a systematic, peer-reviewed analysis of the African context - provides actionable guidance for contract design sequencing in low-capacity settings. Ghana's TSIP thus constitutes a landmark case study: demonstrating that OPBRCs can deliver transformational road outcomes in an emerging economy while simultaneously mapping the fiscal, institutional, and contractual conditions under which those outcomes are achievable.

This study is limited to the six OPBRC packages under the TSIP (2017–2026) and to primary documentary sources; future research should supplement these findings with contractor and community field interviews to triangulate the institutional and behavioural dimensions of OPBRC implementation. Comparative studies across Ghana's subsequent OPBRC deployments - as the modality diffuses from pilot to mainstreamed procurement instrument - will further test and refine the lessons extracted here. The study contributes the first peer-reviewed synthesis of Ghana's complete OPBRC experience and offers a replicable analytical framework for evaluating performance-based contracting in comparable emerging economy road sectors..

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