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MANAGING ENGINEERING SERVICES IN THE PUBLIC SECTOR: BEST PRACTICES AND LESSONS LEARNED FROM THE DPWH REGIONAL HEADQUARTERS, REGION 6, PHILIPPINES

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Abstract

This study examined the management of engineering services in the public sector by identifying prevailing best practices and critical lessons learned within the Regional Headquarters (RHQ) of the Department of Public Works and Highways (DPWH), Region 6, Western Visayas, Philippines. Using a descriptive-evaluative design, data were collected from 100 respondents — 50 DPWH personnel (service providers) and 50 community representatives (stakeholders and oversight) — and analyzed using the Average Weighted Mean (AWM). The overall effectiveness of engineering services management was rated at a High Effectiveness Extent (HEE, AWM = 3.4), a performance level that, while positive, sits at the threshold of the High category and is therefore vulnerable, particularly regarding long-term project quality and durability and adherence to transparency protocols. The most significant impediments were classified as external/systemic issues (AWM = 3.1, Moderate Difficulty), with Right-of-Way (ROW) acquisition delays and contractor-related problems the chief recurring bottlenecks; internal constraints were comparatively less severe (AWM = 2.5, Low Difficulty). Successful stakeholder coordination emerged as the most effective current best practice (AWM = 3.5, HEE), underscoring the value of early consultation and responsive grievance mechanisms. These findings informed the development of a Framework for Sustainable Engineering Management, which proposes a structural shift from the current vulnerable HEE baseline toward a sustained Very High Effectiveness Extent (VHEE) through a Zero-ROW-Delay policy, institutionalized stakeholder coordination and technological monitoring, and the integration of climate resilience and life-cycle costing. The Framework offers DPWH Region 6 an evidence-based implementation scheme for more resilient, accountable, and sustainable public infrastructure delivery.

Keywords: *engineering management framework; best practices; lessons learned; public sector engineering services; stakeholder coordination; right-of-way acquisition; climate resilience; Region 6, Western Visayas, Philippines*

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Introduction

The public sector in the Philippines plays a pivotal role in national development, particularly through infrastructure projects managed by the Department of Public Works and Highways (DPWH). Engineering services within this sector span planning, design, construction, maintenance, and oversight of roads, bridges, flood-control systems, and public buildings. Persistent challenges — delays, corruption, and inefficiencies — underscore the need for targeted, region-specific research. DPWH was flagged for delayed projects worth PHP 215.9 billion as of late 2024, and allegations of kickbacks in flood-control projects, including a PHP 360-million scandal exposed in 2025, have further eroded public trust. While these problems are documented at the national level, region-specific analyses of best practices and lessons learned remain scarce, particularly for the Regional Headquarters of Region 6 (RHQ R6), Western Visayas.

Region 6 comprises the provinces of Aklan, Antique, Capiz, Guimaras, Iloilo, and Negros Occidental and relies heavily on infrastructure to support agriculture, trade, tourism, and disaster resilience. Frameworks such as the Government Best Practices Recognition (GBPR) program and ISO 9001:2015-aligned Quality Management Systems provide general guidance on standardization, but their application to regional engineering departments within Region 6's unique environmental and socio-economic conditions has not been empirically evaluated. This study addresses that gap by documenting best practices — continuous professional development, enhanced planning, stakeholder engagement — and lessons learned from RHQ R6 projects, and by developing a localized, evidence-based management framework.

Theoretical and Legal Foundations

The study is anchored in three complementary theories. Systems Theory (von Bertalanffy, 1968; Boulding, 1956) frames engineering services as an open system in which planning, resource allocation, and disaster resilience must be integrated to avoid siloed inefficiencies. Knowledge Management Theory, through Nonaka and Takeuchi's (1995) SECI model, anchors the capture of lessons learned from past projects through repositories, post-project debriefs, and training, transforming experiential knowledge into institutional assets. Public Service-Dominant Logic (Osborne, 2013; Vargo & Lusch, 2004) reframes public engineering management around co-created value with stakeholders rather than a purely goods-dominant paradigm, supporting the study's emphasis on community consultation and collaborative procurement.

The study's legal basis draws on Philippine statutes governing engineering practice and infrastructure standards — the Civil Engineering Law (R.A. 544, 1950), the National Building Code (P.D. 1096, 1977), the Build-Operate-Transfer Law (R.A. 6957, 1990), the Local Government Code (R.A. 7160, 1991), and the Magna Carta for Scientists, Engineers, Researchers, and Other S&T Personnel (R.A. 8439, 1997) — as well as international frameworks for infrastructure governance and sustainability, including the OECD Recommendation on the Governance of Infrastructure (2020), the UN Environment Programme's Good Practice Principles for Sustainable Infrastructure (2021), the World Bank's Guidance on PPP Legal Frameworks (2022), the IMF's Public Investment Management Assessment (2015), and the UNECE Legal Framework for Public-Private Partnerships (2023).

Related Literature and Studies

National literature consistently attributes DPWH project delays and cost overruns to inaccurate budgeting, frequent variation orders, and inadequate planning, compounded by external factors such as weather, the COVID-19 pandemic, and Right-of-Way (ROW) acquisition issues, which frequently surpass internal management issues as causes of suspension and delay. Studies on delay factors in DPWH district engineering offices similarly identify

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weather-related events, pandemic disruptions, and pending completion of prior project phases as leading causes of suspension (cf. Pantalunan et al., 2021, on the DPWH Aurora District Engineering Office).

A parallel body of work identifies enabling conditions for strong performance: supportive leadership, sufficient resource allocation, continuous professional development, and well-defined quality-assurance protocols are repeatedly associated with higher performance among government engineers. A third theme concerns stakeholder engagement: the DPWH's Social and Environmental Management System (SEMS) and mechanisms such as Multipartite Monitoring Teams (MMTs) are designed to secure social acceptability of projects and provide a check-and-balance function; literature on development-project participation (e.g., Bamberger, 1988; Arnstein, 1969) supports a positive association between active beneficiary involvement and long-term project sustainability and social acceptability. Higher-level literature also points to unresolved coordination challenges among infrastructure agencies, the shifting fiscal landscape following the Mandanas ruling on local government unit (LGU) funding, and the centrality of infrastructure resilience to the Philippines' disaster-risk profile.

Taken together, this literature substantiates the value of examining RHQ R6 as a bounded case that can validate, refine, or challenge national-level findings, while adding a distinctive feature largely absent from prior studies: the direct incorporation of community-representative perspectives alongside those of DPWH personnel.

Research Objectives

This study sought to answer the following questions concerning the RHQ R6 Engineering Department:

1. What is the demographic profile of the two respondent groups (DPWH personnel and community representatives) in terms of age, gender, civil status, highest educational attainment, and relevant trainings/seminars attended?
2. How effective is the current management of engineering services at RHQ R6, in terms of efficiency, quality, and compliance?
3. What are the primary recurring constraints, bottlenecks, and systemic issues (internal and external) that impede the sustainable delivery of quality engineering services?
4. What successful management strategies and operational procedures — constituting current “best practices” — are employed at RHQ R6 in terms of stakeholder coordination, contract management, and risk mitigation?
5. What recommended steps and resource requirements would support the adoption and implementation of a Framework for Sustainable Engineering Management at RHQ R6?

The study's significance lies in its direct contribution to public-service delivery and governmental efficiency: for RHQ R6 itself, it provides an evidence base for streamlining bureaucratic procedures and reducing delays and cost overruns; for regional policymakers, it supplies performance metrics to guide budget allocation and reform; for the public, it translates into more durable, better-delivered infrastructure; and for future researchers, it

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Methods

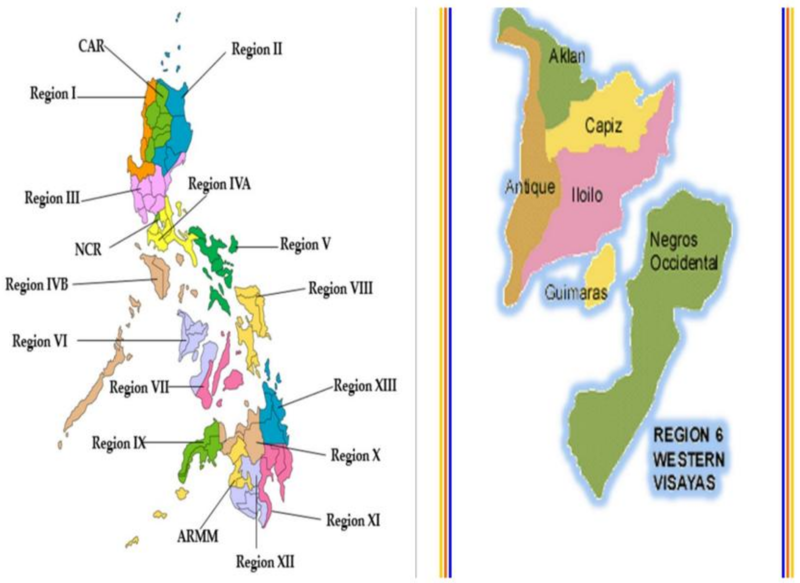
Research Design

The study employed a Sequential Explanatory Mixed-Methods Design (Quantitative → Qualitative). In Phase A (Quantitative), a descriptive-correlational survey established the organizational performance baseline. In Phase B (Qualitative), an explanatory case-study component — semi-structured interviews and focus group discussions — elaborated on the quantitative results. Statistical findings from Phase A (e.g., a specific performance dimension scoring low) directly shaped the interview questions used in Phase B, and the resulting numeric, textual, and archival data were triangulated to strengthen the credibility of the identified best practices and lessons learned.

Research Environment

The study was conducted within the Engineering Department of the DPWH Regional Headquarters (RHQ R6), situated in Western Visayas (Region 6), Philippines — a region comprising the provinces of Aklan, Antique, Capiz, Guimaras, Iloilo, and Negros Occidental, with a population exceeding 7.9 million. The region is frequently affected by typhoons and coastal hazards, making resilience and climate-smart design central concerns for its engineering services. Its economy depends heavily on agriculture, fisheries, and tourism, all of which rely on functioning infrastructure. The Engineering Department is organized into Planning and Design, Construction, Maintenance, and Quality Assurance and Hydrology (QAH) divisions, and its personnel range from long-tenured senior staff with institutional memory to technical staff (project engineers, inspectors) and administrative/support personnel.

Figure 1. Location map of the research environment: Region 6 (Western Visayas), Philippines.



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Respondents and Sampling

The study involved two respondent groups totaling 100 participants: 50 DPWH personnel, drawn via stratified random sampling across the Planning and Design, Construction, Quality Assurance, and Maintenance divisions, and 50 community representatives (e.g., barangay officials, NGO/CSO leaders, and project beneficiaries) selected through critical-case and maximum-variation sampling from project sites identified in Phase A as having either highly successful or highly problematic outcomes.

Table 1. Distribution of Respondents

Research Environment	DPWH Personnel	Community Representatives	Total	%
RHQ R6	50	50	100	100

Instruments

Three instruments were used: a structured survey questionnaire (for DPWH personnel), semi-structured interview guides (for DPWH key informants and community representatives), and a document-analysis checklist. The questionnaire used a 5-point Likert scale to measure perceived effectiveness across the following areas: project planning and design, procurement and contract management, construction supervision and quality assurance, maintenance and asset preservation, and process standardization/knowledge sharing. It underwent face and content validation by a panel of DPWH senior officials and academic experts, with reliability assessed via Cronbach's Alpha on pilot data. The semi-structured interview guides for DPWH key informants elicited detailed accounts of successful practices (e.g., projects completed ahead of schedule and under budget) and locally adapted technical solutions, while community interviews and focus group discussions validated the external, real-world relevance of internally reported best practices.

Data Gathering Procedure

Following approval from the DPWH Regional Director and clearance from an institutional ethics review board, the questionnaire was finalized through pilot testing (with reliability analysis) on a representative DPWH sample outside the study population. Surveys were then administered to the stratified DPWH sample, preferably electronically to maximize confidentiality and response rate. Following quantitative analysis, purposive sampling identified DPWH key informants who scored notably high or low on critical variables, and critical-case/maximum-variation sampling identified community representatives from project sites with markedly successful or problematic outcomes. Semi-structured interviews and focus group discussions were then conducted, audio-recorded with consent, and transcribed. Quantitative results (the what and how much) directly informed the qualitative investigation (the how and why); the resulting qualitative data were used to corroborate DPWH-reported practices against community experience and official records.

Statistical Treatment and Scoring

Descriptive statistics (frequency, percentage, weighted mean) summarized respondent demographics and performance ratings. One-way ANOVA tested for significant differences in perceived management effectiveness across DPWH divisions (Planning, Construction, Quality Assurance, Maintenance). Item scores on the 5-point

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Likert scale were averaged per management dimension to obtain the Weighted Mean (AWM); negatively worded items were reverse-scored so that higher values consistently indicate more favorable outcomes. Qualitative data from interviews and focus group discussions were thematically coded, with codes grouped into categories directly aligned with the study's objectives (e.g., “Administrative and Compliance Hurdles”), and systematically compared against the quantitative findings and documentary evidence.

Table 2. Verbal Interpretation Scale for Weighted Mean Scores

Weighted Mean Range	Effectiveness Interpretation	Difficulty Interpretation	Framework Interpretation
4.20 – 5.00	Very High Effectiveness Extent (VHEE)	Very High Difficulty (VHD)	Area of Best Practice
3.40 – 4.19	High Effectiveness Extent (HEE)	High Difficulty (HD)	Area of Strength
2.60 – 3.39	Moderate Effectiveness Extent (MEE)	Moderate Difficulty (MD)	Area of Good Practice
1.80 – 2.59	Low Effectiveness Extent (LEE)	Low Difficulty (LD)	Area for Improvement
1.00 – 1.79	Very Low Effectiveness Extent (VLEE)	Very Low Difficulty (VLD)	Area Requiring Immediate Attention

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Results

This section presents findings from the 100 respondents (50 DPWH personnel and 50 community representatives) in Region 6, Western Visayas, beginning with the respondent profile and proceeding through the study's three core diagnostic measures: effectiveness, constraints, and current strategies.

Respondent Profile

Respondents were concentrated in the middle-age brackets: the 35–39 and 30–34 age groups each accounted for 27% of the sample (54% combined), while only 4% were 51 years old and above, and 13% were 20–29 years old. The sample skewed male overall (70% male, 30% female), a pattern consistent across both groups and all age categories, reflecting the traditionally male-dominated composition of engineering and public works fields. Married respondents predominated (83% overall; 76% of DPWH personnel and 90% of community representatives), and educational attainment was high, with 82% of respondents college graduates and a further 9% holding postgraduate degrees (concentrated among DPWH personnel, consistent with the professional requirements of government engineering roles). Reported training exposure was extensive: all DPWH personnel had attended technical, governance, and sustainability-related training, while community representatives showed correspondingly high exposure to governance, transparency, and social/environmental training — evidence that both respondent groups possessed the foundational competence to render informed judgments on engineering-services management, even if depth in specialized areas (e.g., value-for-money analysis, advanced risk-based project management) remains an area for further capacity-building.

Effectiveness of Engineering Services Management

Table 3. Effectiveness of Engineering Services Management

Dimension	AWM	Descriptive Equivalent
Efficiency (timeliness of planning/design, procurement efficiency, budget utilization, minimization of internal delays)	3.5	HEE
Quality (adherence to specifications, QA/inspection effectiveness, durability after turnover, field supervision)	3.4	HEE
Compliance (COA/DBM rules, contractual enforcement, environmental/social safeguards, transparency)	3.4	HEE
Overall	3.4	HEE

The overall AWM of 3.4 falls precisely at the lower boundary of the High Effectiveness Extent range (3.40–4.19). Efficiency was the strongest dimension (AWM = 3.5), suggesting internal bureaucratic processes and budget utilization function comparatively well and merit formalization as a best practice. Quality and Compliance, both at 3.4, sit at the minimum threshold of the “High” category: procedures and standards are in place, but their translation into long-term durability and consistent field supervision, as well as sustained adherence to transparency and social-safeguard requirements, is uneven. This positions the current performance baseline as positive but vulnerable to slipping into the Moderate range absent targeted intervention.

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Recurring Constraints and Bottlenecks

Table 4. Recurring Constraints and Bottlenecks

Constraint Category	AWM	Descriptive Equivalent
Internal constraints (technical-personnel shortages, inter-division communication, COA-audit-driven caution, maintenance budget shortfalls)	2.5	LD
External/systemic issues (ROW acquisition delays, adverse weather, variation orders, contractor-related problems)	3.1	MD
Overall	2.8	MD

Overall difficulty was rated Moderate (AWM = 2.8), but a clear divergence separated the two categories. External/systemic issues (AWM = 3.1) were rated more difficult than internal constraints (AWM = 2.5), with Right-of-Way (ROW) acquisition delays and contractor-related problems (financial capacity, substandard workmanship) the most salient recurring bottlenecks, alongside adverse weather conditions. Internal issues — inter-division communication, audit-driven caution, and specialized-skills gaps — were rated as comparatively controllable, indicating that RHQ R6's internal management capacity is broadly adequate relative to current demands, while its principal vulnerabilities lie in the external operating environment.

Current Management Strategies and Best Practices

Table 5. Successful Management Strategies

Strategy Cluster	AWM	Descriptive Equivalent
Successful stakeholder coordination (early LGU/community consultation, Multipartite Monitoring Teams, responsive grievance handling)	3.5	HEE
Efficient contract management (pre-construction meetings, timely penalties/liquidated damages, technology-based monitoring)	3.4	HEE
Effective risk mitigation (climate-resilient design, proactive ROW/permit acquisition, formal risk registers)	3.4	HEE
Overall	3.4	HEE

All three strategy clusters were rated High Effectiveness Extent, with an overall AWM of 3.4 that mirrors the effectiveness rating in Table 3, confirming that current management strategies are generally successful but have room to move toward Very High Effectiveness. Successful stakeholder coordination was the highest-rated cluster

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(AWM = 3.5), confirming that genuine, timely community involvement and prompt response to grievances are central to project success. Within risk mitigation, proactive ROW and permit acquisition scored comparatively lower, indicating that while the practice is employed, it needs to shift from merely "effective" to rigorously enforced — directly addressing the ROW bottleneck identified in Table 4.

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Discussion

Interpretation of Findings

Three conclusions follow from the results. First, engineering services management at RHQ R6 performs at an acceptable but vulnerable level (overall AWM = 3.4, HEE): efficiency is a genuine strength, but quality and compliance sit at the threshold of the High category, indicating a persistent gap between policy intent and field execution — particularly around long-term project durability and consistent transparency practice. This finding is consistent with national literature attributing DPWH performance gaps to a mismatch between planning-stage compliance and construction-stage follow-through.

Second, the study's most consequential finding is that external/systemic factors, not internal management deficiencies, constitute the primary bottleneck to quality service delivery. ROW acquisition delays and contractor-related problems (AWM = 3.1, MD) considerably outweigh internal constraints (AWM = 2.5, LD). This mirrors prior findings on DPWH district engineering offices, where weather, pandemic disruption, and dependency on prior project phases were identified as leading causes of suspension (Pantalunan et al., 2021), and is broadly consistent with national reporting that ROW and contractor issues persistently rank among the top causes of project delay and suspension in the Philippines.

Third, successful stakeholder coordination is the strongest current best practice (AWM = 3.5, HEE), reinforcing a substantial body of literature linking active beneficiary participation — through consultation, grievance mechanisms, and monitoring structures such as Multipartite Monitoring Teams — to greater project sustainability and social acceptability (e.g., Bamberger, 1988; Arnstein, 1969). The convergence of internal (DPWH) and external (community) data on this point strengthens confidence that stakeholder engagement is not merely a procedural formality at RHQ R6 but a functioning driver of project outcomes.

The respondent profile — predominantly middle-aged, married, and college-educated — lends the findings practical credibility: the insights come from individuals with substantial professional or civic experience and a direct personal stake in the durability of local infrastructure. At the same time, the pronounced gender imbalance in both respondent groups (70% male overall) is a limitation that should be addressed in the resulting framework, which should ensure that best practices and lessons learned are gender-responsive rather than reflecting only the dominant demographic's perspectives.

The Framework for Sustainable Engineering Management

These findings support the development of a Framework for Sustainable Engineering Management, intended to move RHQ R6's performance baseline from a vulnerable High Effectiveness Extent (AWM 3.4) toward a sustained Very High Effectiveness Extent (AWM ≥ 4.20). The Framework's general objective is to provide an evidence-based, integrated management model that institutionalizes proven best practices while mitigating the systemic constraints identified above. Its specific objectives fall into four areas: (a) elevating overall service quality and durability by closing the gap between technical standards and field execution; (b) institutionalizing best practices and accountability, principally by mandating stakeholder-centric coordination and technology-enabled contractor monitoring; (c) mitigating systemic constraints, chiefly through proactive ROW clearance and mandatory climate-resilience integration; and (d) promoting sustainability and governance through strengthened compliance, transparency, and continuous capacity-building for both DPWH personnel and community representatives.

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Operationally, the Framework is organized as a ten-point implementation scheme, summarized in Table 6, that assigns objectives, strategies, responsible units, indicative budgets, funding sources, timeframes, and expected outcomes to each area of concern.

Table 6. Scheme of Implementation for the Framework for Sustainable Engineering Management

Area of Concern	Core Strategy	Persons/Units Involved	Expected Outcome
I. External constraint mitigation (ROW acquisition)	Zero-ROW-Delay Policy: full ROW/permit clearance verified by the Regional Director before Notice to Proceed	Regional Director, Planning & Design Division, Legal Section, Contractors	100% of awarded projects begin construction on time, eliminating ROW-related variation orders
II. Quality and durability (field supervision)	Mandatory GPS-enabled geotagging and real-time reporting to a centralized dashboard	Field Engineers, Project Managers, Planning & Design Division, QA Section	95% compliance in daily geotagged reporting; 15% reduction in contractor non-conformance reports
III. Stakeholder coordination	Formalized Multipartite Monitoring Teams (MMTs); mandatory bi-monthly consultation forums	Project Managers, Community Representatives, LGU Planning Officers, Regional Director's Office	90% MMT attendance; 50% reduction in formal public complaints
IV. Contractor accountability	Time-bound protocol for issuing Liquidated Damages and termination notices at defined performance thresholds	Regional Director, Legal Section, Project Managers, Contractors	Timely penalty imposition on 95% of errant contractors; stricter performance-based contractor selection
V. Climate resilience	Mandatory "Climate Impact and Resilience Statement" certified for every project design	Planning & Design Division, designated Climate Resilience Officer, Regional Director	100% of new designs incorporate climate-adaptation features; 10% reduction in typhoon-related maintenance cost
VI. Financial/life-cycle sustainability	Life-cycle costing integrated at design stage; dedicated Regional Asset Maintenance Fund	Financial Management Section, Planning & Design Division, Regional Director	20% increase in annual maintenance-fund allocation; 5-year extension of average project service life

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Area of Concern	Core Strategy	Persons/Units Involved	Expected Outcome
VII. Technical capacity building	Mandatory specialized training (materials, value-for-money analysis, BIM/GIS)	Training Officer, Planning & Design Division, Field Engineers	95% of technical personnel certified in at least one specialized skill area
VIII. Transparency and compliance	Standardized signboards with QR codes linking to online project status/budget/timeline	Project Engineers, Public Information Officer, Regional Director	100% compliance in public project-information posting
IX. Community empowerment	Citizen-monitoring workshops on reading plans, using the online dashboard, and filing MMT reports	Public Information Officer, Community Representatives, LGU Officers	90% of community representatives able to independently submit monitoring reports
X. Framework review and adaptation	Annual audit comparing actual accomplishment against expected outcomes	Regional Director, Planning & Design Division, university research team (consultants)	Protocols adapted from field results; sustained AWM $\geq$ 4.20 for overall effectiveness

Implications for Policy and Practice

For RHQ R6 management, the immediate priority is codifying the Zero-ROW-Delay Policy and the geotagging/real-time reporting requirement, since these directly target the two dimensions rated most vulnerable (external constraints and field-level quality assurance). For regional policymakers and oversight bodies such as the Regional Development Council, the Framework offers concrete, auditable indicators (e.g., percentage of projects with pre-award ROW clearance, MMT attendance rate) that can be incorporated into performance monitoring without requiring new legislation, since it operationalizes existing obligations under the Government Procurement Reform Act (R.A. 9184) and the DPWH's Social and Environmental Management System. For the wider public and stakeholder groups, formalizing MMTs and citizen-monitoring training addresses the study's finding that community trust and long-term project relevance depend on more than passive consultation.

Limitations and Directions for Future Research

This study is limited to a single regional headquarters and a purposive, critical-case qualitative sample, which constrains statistical generalizability to other DPWH regions or local government engineering offices; the pronounced gender imbalance among respondents (70% male) may also underrepresent perspectives relevant to gender-responsive project design. Future research should (a) test the Framework's validity through a follow-up evaluation approximately five years after adoption, (b) specifically investigate the divergence in perception between DPWH personnel and community representatives regarding long-term project durability, to isolate the

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exact source of the quality vulnerability identified here, and (c) extend the comparative design to other DPWH regional offices (e.g., RHQ R7) or to LGU engineering departments to assess the Framework's transferability.

Conclusion

Engineering services management at RHQ R6 currently performs at a High Effectiveness Extent (AWM = 3.4) that is positive but vulnerable, with efficiency as a genuine strength and quality/compliance at a minimum threshold requiring reinforcement. The principal impediments to quality service delivery are external and systemic — chiefly ROW acquisition delays and contractor-related problems — rather than internal management weaknesses, while successful stakeholder coordination stands out as the department's most effective current practice. The Framework for Sustainable Engineering Management proposed here translates these empirical findings into a structured, ten-point implementation scheme designed to institutionalize proven best practices, proactively mitigate systemic external constraints, and integrate climate resilience and life-cycle costing into routine project management — offering RHQ R6, and potentially other DPWH regional offices, an evidence-based pathway toward more resilient, transparent, and durable public infrastructure delivery.

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