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Transforming Governance to Implementation Foreign Loan-Funded Activities in BMKG for Good Governance

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ABSTRACT

Indonesia's archipelagic geography makes maritime transport, fisheries, offshore works, and coastal livelihoods highly exposed to rapidly changing hydro-meteorological hazards, so marine meteorological services function as critical decision infrastructure rather than merely forecast products. This study examines the governance-to-implementation gap in BMKG's Marine Meteorological System Phase II (MMS-2), a technology-intensive modernization program financed by an AFD external loan (€63.7 million) that experienced an extreme implementation lag of around 4.5–5 years, delaying service benefits and increasing fiscal exposure. Using a qualitative single-case design, the research relies on documentary evidence (planning/design artefacts, implementation records, and legal–procedural frameworks) to reconstruct the end-to-end implementation timeline, identify decision choke points, map causal chains through Fault Tree Analysis (FTA), and derive improvement options via the SOAR framework integrated with top-down/bottom-up implementation logics. Findings show the dominant bottleneck was low governance throughput slow, uncertain decision-making that stalled procurement and delivery driven by mutually reinforcing factors: early planning immaturity, regulatory deadlock between national procurement requirements (including TKDN/local content) and lender No Objection procedures, and legal shifts linked to the CFA amendment. Although acceleration emerged after the first drawdown (March 2025), persistent risks remained in fiscal data accountability and late-stage integration under a compressed catch-up corridor to 2028. The study concludes that a two-track "Agile Governance" strategy permanent cross-agency steering plus an autonomous joint task force with harmonized technical–procedural guidance and strengthened data integrity can accelerate delivery while preserving transparency and auditability.

Keyword: Agile Governance; Public Procurement; Policy implementation

INTRODUCTION

Indonesia's position as the world's largest archipelagic state makes maritime activities shipping, fisheries, offshore construction, and coastal livelihoods highly sensitive to wind, waves, currents, and rapidly evolving hydro-meteorological hazards. In such settings, marine meteorological services are not merely "forecast products," but decision infrastructures that shape route selection, port operations, safety margins, and emergency preparedness across a dispersed geography. Research on ship weather

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routing and high-resolution wave forecasting consistently shows that improved metocean information reduces operational risk and supports safer, more efficient maritime operations, especially under extreme sea states (Breunung & Balachandran, 2023; Chen et al., 2025; Grifoll et al., 2022).

The central issue examined in this article is the governance to implementation gap that emerges when a strategically important marine meteorological modernization program is delivered through complex public-sector project arrangements, including procurement compliance and multi-actor coordination. The urgency of addressing this gap is amplified because early warning effectiveness depends on an end to end chain risk knowledge, monitoring and forecasting, communication, and response where delays or weaknesses in any link can undermine the public value of the entire system. Recent syntheses of early warning systems emphasize that implementation barriers are often institutional and operational (not purely technical), and risk communication failures can prevent warnings from triggering protective action even when forecasts are scientifically sound (Fakhruddin et al., 2020; Islam et al., 2025).

A second aspect of urgency concerns the technical backbone required for credible marine forecasts in archipelagic waters: sustained ocean observations and fit-for-purpose modeling. Studies on moored buoy design and wave model assimilation highlight that observational assets and data integration materially improve the reliability of nearshore and offshore wave predictions, which are essential for maritime safety and coastal operations. Yet the same literature also implies that technological capability is inherently system dependent data flow, maintenance, validation routines, and user-oriented dissemination must be continuously governed to keep services operational and trusted (Gonçalves & Guedes Soares, 2022; Majumder et al., 2024).

Within the broader field of project and program studies, persistent delays and performance deviations in public projects are widely associated with weak project governance and poor benefits realization discipline. Empirical and conceptual work shows that governance mechanisms decision rights, accountability structures, oversight, and benefit management shape whether complex projects deliver strategic value rather than only producing incomplete or misaligned outputs. This article positions the MMS-2 context inside that literature by treating the modernization initiative as a public-value project whose success must be assessed through realized service improvement and risk reduction, not just procurement completion. In doing so, it builds on established governance frameworks while shifting attention to the specific vulnerabilities of science and service infrastructure projects (Musawir et al., 2017; Serra & Kunc, 2015).

Procurement and regulatory compatibility are frequently the “hidden engine” of implementation delays in externally financed or high-specification public projects, particularly where national requirements (e.g., local content and compliance mandates) intersect with lender or donor procedures. ScienceDirect scholarship on local-content policies and procurement barriers demonstrates that such rules can be politically and economically compelling, yet they may also create bottlenecks when supplier ecosystems, certification processes, and approval chains are not ready for specialized technologies. Evidence from Indonesia’s renewable energy procurement illustrates how procedural complexity and credibility concerns can constrain investment and slow executionan insight that is transferable to marine observation and forecasting procurements that require niche equipment, qualification, and long lead times (Deswandri et al., 2022; Halimatussadiah et al., 2024; Tsani et al., 2024).

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To explain why delays persist even when strategic intent is strong, this article draws on implementation research that frames outcomes as the product of interactions between top-down directives, bottom-up operational realities, and the quality of science–policy interfaces. Multiple studies show that implementation deficiencies often arise from misaligned incentives, ambiguous mandates, and insufficient translation mechanisms between high-level policy targets and frontline execution capacities. In particular, research integrating implementation context with science-policy interfaces demonstrates that policy goals can degrade during operationalization unless coordination, learning feedbacks, and shared problem definitions are institutionalized. This theoretical lens helps locate the MMS-2 problem beyond "project management" alone, toward a governance configuration that either enables or constrains delivery (Kieslich & Salles, 2021; Wang & Ap, 2013; Wu et al., 2017).

Externally financed projects add another layer of urgency because time slippage can translate into fiscal costs, commitment-fee exposure, contract renegotiations, and technological obsolescence risks especially in fast-moving digital and sensor ecosystems. Evidence from donor-led or multi-donor funded programs indicates that stringent donor procedures, coordination burdens, and administrative approvals can be a major source of delays and implementation stress, sometimes shifting control away from local executing agencies and complicating accountability. Findings from municipal infrastructure programs financed via multi-donor funds similarly show how restrictions and oversight arrangements interact with local capacity and planning quality, affecting both schedule adherence and cost stability. These patterns inform the article's argument that MMS-2-type delays are often structural and predictable under certain governance conditions (Ha & Kumar, 2021; Issa et al., 2022; Puri et al., 2025).

Given the multi-causal and reinforcing nature of such failures, the article adopts a diagnostic approach that can explicitly model chains of causation rather than relying on single-factor explanations. Fault Tree Analysis (FTA) has a long-standing methodological pedigree for decomposing complex system failures into logical combinations of contributing events, and state-of-the-art surveys show its usefulness for identifying high-leverage intervention points in socio-technical settings. By adapting FTA to a governance–procurement–technology delivery context, this article aims to provide a transparent causal map of how planning immaturity, regulatory gridlock, and institutional coordination failures can combine into extreme implementation gaps. This choice is also meant to strengthen the article's originality: applying FTA to public governance implementation problems in a marine meteorological modernization setting remains relatively uncommon in the literature (Fussell, 1975; Kabir, 2017; Ruijters & Stoelinga, 2015).

Beyond diagnosis, the article responds to the urgency of "unblocking delivery" by proposing an adaptive-yet-accountable governance response, consistent with the growing literature on agile government and steering mechanisms in complex public projects. Systematic reviews and recent empirical studies suggest that agile approaches can improve responsiveness and learning in public-sector digital and service transformations, but they must be reconciled with compliance, transparency, and auditability expectations. Complementary research on steering committees in large infrastructure projects highlights how well-designed oversight bodies can strengthen accountability and decision throughput, reducing corruption risk and implementation drift. Building on these insights, the article frames its contribution as a dual-track

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governance strategy that couples fast decision pathways with enforceable accountability to accelerate execution without eroding public integrity (Chikuni et al., 2025; Mergel et al., 2018; Tai & Awasthi, 2025).

Table 1. Literature Map, Core Insights, and Relevance to Governance to Implementation Challenges in Marine Meteorological Modernization Projects

Literature cluster	What the literature emphasizes	Key implication for MMS-2-type cases
Early warning systems & risk communication	EWS effectiveness depends on end-to-end functionality and communication-to-action, not forecasts alone	Delays or weak governance can break the value chain even with good science
Marine observations & wave forecasting	Buoys, assimilation, and localized modeling improve forecast reliability for maritime operations	Modernization must govern data flow, maintenance, and validation, not only procurement
Project governance & benefits realization	Governance structures enable strategic value delivery and reduce project failure risk	Treat modernization as public-value delivery (service impact), not just asset delivery
Procurement, local content & procedural bottlenecks	Compliance regimes and local content can create delays when capacity and rules mismatch	Regulatory compatibility and approval chains can become systemic blockers
Implementation research & science–policy interfaces	Implementation gaps arise from misalignment between policy intent and operational reality	Needs cross-actor coordination, learning loops, and mandate clarity
Agile government & steering mechanisms	Agility improves adaptation; steering can improve accountability/decision speed	Combine adaptive execution with auditable accountability to unblock delivery

Source: Author, 2025

Anchored in the above map, this article approaches the MMS-2 implementation challenge as a governance design problem: how to transform an externally financed, technology-intensive public project from procedural stagnation into accountable delivery that produces measurable service gains. Conceptually, it connects project governance and benefits realization to policy implementation theory, then operationalizes the connection using FTA to identify dominant causal pathways and leverage points. Practically, it proposes an "agile governance" response steering, task-force execution, and harmonized technical-procedural guidance aimed at compressing decision latency while preserving transparency and auditability. The article's scientific contribution is thus twofold: it offers a replicable diagnostic method for extreme implementation gaps, and it advances an actionable governance architecture for sustaining high-quality climate and marine services at national scale.

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METHODOLOGY

This study employs a qualitative single-case design that treats BMKG's Marine Meteorological System Phase II (MMS-2) as a policy implementation problem embedded in a foreign-loan–funded public project setting. The unit of analysis is the end-to-end implementation trajectory from upstream planning and legal readiness to procurement execution and contract delivery because the observed implementation gap is assumed to emerge from interactions among governance arrangements, decision rights, and delivery practices rather than from a single operational fault. Methodologically, the study is evaluative and problem-solving: implementation performance is interpreted through good-governance principles as normative criteria to diagnose constraints and to derive corrective governance options (Brunet, 2019; Musawir et al., 2020).

Data are primarily documentary to preserve an auditable trail of decisions, constraints, and milestones. The document corpus includes: (i) planning and design artefacts, (ii) implementation and (iii) the governing legal procedural framework. These materials are used to reconstruct a chronological project timeline and to identify "decision choke points" where implementation stalled, repeatedly reset, or deviated from intended performance (Kayesa & Shung-King, 2021; Siegner et al., 2018).

Analysis is conducted in three integrated stages. First, a structured document review builds the implementation timeline and codes recurring constraints into thematic domains Second, Root Cause Analysis is operationalized using Fault Tree Analysis (FTA): the "top event" is defined as the extreme implementation delay, then decomposed into intermediate events and basic events substantiated by documentary evidence, producing a causal map and leverage points for intervention. Third, improvement options are formulated using the SOAR framework (Strengths, Opportunities, Aspirations, Results) and translated into an implementable governance strategy using a synthesis of top-down and bottom-up implementation logics, ensuring recommendations are both institutionally feasible and operationally executable with measurable results.

To strengthen trustworthiness, the study applies triangulation across document types and maintains an explicit audit trail linking each causal claim in the fault tree to at least one corroborating record. Internal validity is enhanced via pattern matching between the reconstructed timeline and the fault-tree structure, while sensitivity checks test whether alternative causal pathways explain the same delays with equal or stronger documentary support. Because evidence is document-based, conclusions are presented as governance and procedural explanations grounded in recorded decisions and formal processes, and the proposed "agile governance" arrangements are framed as actionable designs to be validated through subsequent execution monitoring.

RESULTS AND DISCUSSION

1. Implementation Performance and the "Acceleration Turn"

The results indicate that MMS-2 experienced a pronounced implementation gap that manifested as a long period in which project intentions and formal plans did not translate into executable procurement and field delivery. Instead of progressing linearly from design to contracting to deployment, the project trajectory showed repeated stalls at the transition points where technical packages needed administrative clearance, financing procedures needed confirmation, and procurement documentation needed lender-aligned approval. This pattern matters because the modernization objective improving marine observation, modeling, and service delivery cannot materialize until

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hardware, platforms, and integration activities are executed and accepted in the field. Consequently, the most visible performance symptom in the early period was not "technical failure," but low throughput in decisions and approvals that gate execution.

A key result is the emergence of an "acceleration turn" after major administrative and legal alignments were clarified, particularly in the early quarters of 2025 when the draft notes significant movement after the CFA amendment context. This suggests that implementation speed was highly sensitive to governance readiness rather than solely to engineering capacity, meaning that once the administrative bottleneck was reduced, delivery activities could resume and begin to generate measurable physical progress. In practical terms, the project shifted from a phase dominated by institutional survival and procedural uncertainty into a phase dominated by completion pressure, where the immediate managerial question became how to convert restored legality and compliance into rapid delivery across multiple packages and sites.

The documented achievements show that physical progress became more visible through package-level milestones, which is important because it indicates that once procurement and contracting begin to move, technical work can advance through recognizable checkpoints such as testing preparation, factory acceptance readiness, and equipment realization. The draft highlights Package 3 related to modeling systems (including big data and AI components) and references preparatory steps such as Pre-Factory Acceptance Test activities for high-performance computing and software ensemble components, signaling that the project began to re-enter a technical execution rhythm. This matters for service outcomes because modeling platforms and compute infrastructure are core enablers of forecast improvements, data assimilation, and higher-fidelity products that users can operationalize.

Another result concerns Package 1 on weather radars, where the draft notes that realized goods had high local content, reaching approximately 90%. This is not only a procurement statistic; it indicates that the project attempted to comply with domestic requirements while advancing delivery, which can be interpreted as an execution strategy to reduce political and regulatory friction in a sensitive procurement environment. At the same time, emphasizing local content in highly specialized systems can have dual effects: it may facilitate compliance and legitimacy, yet it may also introduce market and certification constraints if local supply readiness is uneven. The result therefore strengthens the argument that MMS-2 performance must be interpreted through the interaction between procurement policy and technical delivery, not through engineering factors alone.

The results also identify a critical governance issue that persisted even as physical achievements began to accelerate: fiscal accountability and data reliability in reporting. The draft flags concerns that, despite acceleration in physical realization, weaknesses in data accountability could create future audit exposure, undermine reporting credibility, and complicate state debt management coordination. This finding is central because foreign-loan projects are assessed not only by outputs but also by the integrity of financial tracking, procurement records, and milestone documentation that justify disbursements and safeguard institutional legitimacy. In other words, acceleration without strengthened accountability can trade short-term speed for long-term reputational and compliance risk, which would be counterproductive to good-governance objectives.

Finally, the results imply that MMS-2 is now operating under a compressed "catch-up corridor" toward technical completion by 2028, where late delivery increases the need

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for disciplined sequencing and integration management. When progress is delayed and then accelerated, integration risk tends to rise because multiple components converge late, leaving less buffer time for system testing, interoperability fixes, training, and handover.

Table 2. MMS-2 Acceleration Signals and Performance Risks

Performance dimension	What improved (acceleration signals)	What remained risky (performance risks)	Why it matters for completion
Physical progress by package	Visible movement in key packages including modeling system readiness milestones and radar realization	Integration and concurrency risks increase when many components progress late	Late convergence can compress testing and commissioning windows
Procurement or compliance direction	High local content realization noted for radar-related goods	Compliance complexity can still generate rework and documentation burden	Procurement bottlenecks can reappear if rules are not harmonized
Financial and reporting performance	Administrative acceleration and responsiveness to policy change	Fiscal data accountability issues may trigger audit findings and credibility loss	Disbursement legitimacy depends on traceable, reliable evidence
Governance responsiveness	Post-clarification movement suggests decisions became faster	Sustained decision throughput is needed to maintain pace through 2028	Without stable governance, acceleration can stall again

Source: Author, 2025

In discussion terms, Point 1 shows that MMS-2 performance is best understood as a shift from a governance-constrained phase to an execution-constrained phase, where the primary risk is no longer "whether the project can move," but "whether the project can move fast enough with accountable control." The acceleration turn is a positive signal, but the results emphasize that acceleration must be paired with disciplined integration planning and strengthened fiscal accountability to preserve good-governance standards while achieving technical completion. This interpretation sets the stage for the next point, which explains the structural causes that generated the long delay and why those causes must be addressed systematically rather than episodically.

2. Structural Root Causes as an Interacting System

The root-cause results indicate that the MMS-2 delay was structural and multi-causal rather than attributable to a single operational breakdown, meaning that multiple conditions interacted to produce prolonged stagnation. The draft frames these structural causes around three dominant drivers: planning immaturity, regulatory gridlock between national procurement requirements and lender procedures, and major legal shifts linked

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to the CFA amendment. Interpreted as a system, these drivers create reinforcing effects: weak planning maturity increases revision cycles, revision cycles intensify procurement and approval burdens, and legal shifts reset timelines while unresolved issues accumulate. The combined effect is a delay mechanism that reproduces itself unless governance interventions target the system rather than isolated symptoms.

Planning immaturity appears in the results not as an abstract deficiency but as a direct contributor to execution failure because immature specifications and baseline assumptions are vulnerable to obsolescence during long idle periods. When a technology-intensive program pauses, equipment standards change, vendor offerings evolve, and integration architectures become harder to finalize without updates, which then triggers redesign loops. These redesign loops are governance-expensive because each revision requires justification, documentation, and renewed approvals, especially under foreign-loan constraints. The discussion implication is that "planning quality" must be evaluated by its resilience to time and compliance scrutiny, not just by completeness at the moment of drafting.

Regulatory gridlock is presented in the results as a central delay engine because the project sat at the intersection of domestic procurement rules, local content expectations, and lender processes such as No Objection requirements. In practice, this environment increases decision latency: each step must satisfy multiple audiences, and any mismatch in interpretation generates rework and additional cycles. The discussion here is that regulatory gridlock is not solved by urging actors to "work harder," but by harmonizing procedural pathways so that compliance becomes predictable, parallelizable, and supported by shared technical documentation standards. Without harmonization, procurement becomes a negotiation arena rather than an execution pipeline, which structurally inflates timelines.

The CFA amendment factor functions in the results as a schedule-reset shock that changes the project's risk profile and deadlines, which can create both opportunity and pressure. On one hand, the legal change can unlock stalled processes and reframe constraints, enabling the acceleration turn observed in 2025; on the other hand, it can compress the remaining delivery window and elevate fiscal and reputational stakes. The discussion implication is that legal resets must be accompanied by rapid re-baselining mechanisms updated schedules, controlled change management, and clarified decision rights otherwise the project simply shifts from "stuck" to "rushed," increasing the probability of integration faults, documentation gaps, or accountability weaknesses.

The results further imply that these causes are mutually reinforcing through time: prolonged delay increases obsolescence pressure, which increases the need for redesign, which increases approval burdens, which increases further delay. This is why the draft's emphasis on "technological leapfrogging" is analytically important: a modernization project that cannot keep pace with its own technological environment will repeatedly face the temptation or necessity to upgrade, and upgrading in a heavily regulated context is governance-intensive. In discussion terms, the project must manage leapfrogging proactively through a disciplined rapid redesign approach that locks a new baseline quickly and channels changes through auditable, time-bounded procedures.

A final causal insight is that institutional coordination is embedded across all three drivers: planning maturity requires cross-unit consensus, regulatory alignment requires cross-agency interpretation, and legal resets require high-level decisions that implementing units cannot make alone. If coordination is informal or ad hoc, decision

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latency becomes structural, and the project remains vulnerable to renewed gridlock. The draft's proposal of a permanent steering mechanism and an operational joint task force can therefore be read as a direct response to this coordination problem: it replaces episodic negotiation with standing decision architecture and daily delivery capability, which is consistent with good-governance objectives when paired with transparency and accountability safeguards.

Table 3. Dominant Root Causes and Their Reinforcing Effects

Dominant root cause	Immediate mechanism	Reinforcing effect over time	Observable project outcome
Planning immaturity	Baseline/specifications vulnerable to revision	Obsolescence triggers redesign loops and repackaging	Repeated revisions and delayed procurement readiness
Regulatory gridlock	Multi-regime compliance creates approval density	Rework increases documentation cycles and decision latency	No-objection/procurement steps dominate the critical path
CFA/legal change	Deadlines and constraints reset	Compressed timelines elevate integration and fiscal risk	Acceleration pressure after long stagnation
Coordination fragmentation	Decision rights dispersed across actors	Escalation cycles replace fast resolution	Slow throughput despite technical capacity

Source: Author, 2025

In discussion terms, Point 2 concludes that the delay is best modeled as a causal system with reinforcing loops, which means the response must be system-level and sequenced: strengthen planning resilience, harmonize procurement pathways, formalize coordination and decision rights, and operationalize rapid re baselining after legal changes. Treating any single driver as the sole cause would produce partial fixes that the remaining drivers could easily overwhelm. This systems interpretation directly supports the rationale for a dual-track "agile governance" strategy that simultaneously addresses top-level decision constraints and frontline execution capacity.

3. Procurement and Regulatory Compatibility as the Critical Path

The findings show that procurement and regulatory compatibility effectively became the project's critical path, meaning that technical work could not proceed until procedural alignment was resolved. This is significant because it shifts the explanation of delay away from engineering complexity toward governance throughput: the "slowest component" was not the hardware, the software, or the installation logistics, but the combined sequence of approvals, compliance checks, and lender-facing documentation. When a project is externally financed and technologically specialized, procurement steps

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are not routine; they require careful justification, eligibility compliance, and evidence standards that can multiply review cycles. The practical result is that time is consumed before physical work even begins, and once physical work starts, it must race to catch up.

Another result is that domestic requirements, including local content expectations, can be both enabling and constraining depending on how they are operationalized in specialized procurements. The draft's note that radar-related goods achieved high local content suggests that procurement can be structured to demonstrate compliance and legitimacy, potentially reducing political friction. However, where local supply ecosystems or certification processes are not aligned with highly specialized metocean technologies, local content rules can create bottlenecks that force retendering, specification adjustment, or prolonged qualification steps. The discussion implication is that policy intent (supporting domestic industry) must be translated into procurement design that is realistic for the technology class, otherwise compliance becomes a source of delay rather than a driver of value.

The results also underscore how lender procedures, particularly No Objection requirements, can introduce substantial latency when documentation standards and technical expectations are not fully synchronized between implementer and lender. In complex systems, technical ambiguity is expensive because it generates clarification cycles, revised submissions, and repeated review rounds. This is not an argument against lender procedures; rather, it demonstrates that the effectiveness of such procedures depends on the presence of shared templates, pre-agreed acceptance criteria, and joint technical working routines that reduce interpretive uncertainty. Without these instruments, each procurement package becomes a bespoke negotiation, prolonging the time to contract and reducing the time available for installation and commissioning.

A further result is that procurement delay tends to raise the probability of technical change, which then feeds back into procurement delay. This occurs because long lead times make original specifications less current, creating pressure to update requirements, adjust architectures, or reconfigure integration plans to match available technologies and evolving service needs. Each update, however, triggers renewed compliance work and new approval cycles, especially where budgets, scopes, and performance criteria are sensitive. The discussion implication is that procurement systems must be designed to accommodate controlled change quickly through rapid redesign governance and time-bounded change-control otherwise the project enters an endless loop where time produces change and change consumes more time.

The results on fiscal accountability reinforce the importance of procurement traceability, because disbursement legitimacy is inseparable from procurement evidence and documented milestones. When procurement is delayed or repeatedly revised, financial reporting can become fragmented, and it becomes harder to maintain a clean, auditable link between contracts, deliverables, physical progress, and disbursement claims. This creates a governance risk: even if the project accelerates physically, weak traceability can still generate audit findings and credibility concerns. In discussion terms, "good governance" in procurement-heavy projects requires both speed and proof, meaning acceleration must be accompanied by strengthened documentation discipline and real-time monitoring of procurement and disbursement alignment.

The evidence of an acceleration phase suggests that once procurement barriers are reduced, technical execution can progress, but this also increases the importance of integration planning because late procurement compresses the schedule for deployment,

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testing, and user-service rollout. In a compressed corridor, procurement decisions must actively anticipate integration dependencies, otherwise the project may complete procurement outputs without achieving operational outcomes. The discussion implication is that procurement governance should be tied to service readiness milestones data flow availability, model commissioning, operational training, and dissemination capacity so that procurement progress directly supports the public-value objectives of marine meteorological modernization.

4. Accountability, Transparency, and Fiscal Data Integrity

A major result is the identification of fiscal accountability and data integrity as a critical governance issue that persists even during physical acceleration. The draft highlights that weaknesses in data accountability can generate future audit exposure and undermine credibility in reporting to debt-management stakeholders, which is a high-stakes risk in foreign-loan programs. This finding is important because it demonstrates that project performance is multi-dimensional: physical progress alone is insufficient if the evidence base for that progress is not reliable and traceable. In projects where disbursement depends on documented milestones and compliance verification, governance quality is inseparable from the integrity of reporting systems and the discipline of record-keeping across units and contractors.

The results also emphasize that transparency in such a project is not merely publication of information, but the stability and clarity of performance signals over time. When schedules are repeatedly revised or progress narratives shift without consistent evidence, stakeholders lose a stable reference point for evaluating performance, which weakens trust and complicates coordination. This is especially critical when the project is in a catch-up corridor, because decisions must be fast and the consequences of error are amplified. The discussion implication is that transparency must be operationalized through consistent milestone definitions, standardized reporting formats, and a shared "single source of truth" for physical progress and disbursement performance.

Another result is the implied shift in accountability focus that can occur during high-pressure phases: organizations may optimize toward survival milestones (e.g., avoiding cancellation, meeting administrative thresholds) rather than toward service outcomes. While such optimization is understandable in a constrained setting, it can crowd out benefits realization thinking unless outcome-oriented metrics are explicitly built into the accountability framework. The draft's framing of the post-acceleration period as needing stronger accountability suggests a recognition that governance must now realign incentives toward technical completion, operational readiness, and public value. The discussion implication is that accountability must explicitly track the pathway from procurement and installation to forecast capability and user-facing service improvements.

The draft's proposal to strengthen accountability and transparency through probity advice and the involvement of internal oversight (APIP) indicates a results-based governance mechanism: embed oversight early to reduce later audit shocks and to stabilize compliance evidence. This is an important discussion point because it reframes oversight as a delivery enabler rather than as a punitive endpoint. When oversight is integrated into procurement and documentation workflows, it can reduce rework, clarify evidence requirements, and help the project maintain speed without sacrificing integrity. However, for this approach to work, probity advice must be structured with clear service-

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level expectations (e.g., turnaround times, standardized templates, decision logs) so that it accelerates rather than slows execution.

The results further suggest that monitoring must explicitly couple disbursement performance with physical progress, because mismatches between the two create both financial and reputational risk. A project can appear physically active while disbursement lags due to documentation gaps, or disbursement can advance without robust physical evidence, creating audit exposure. The discussion implication is that integrated dashboards and milestone reconciliation routines are essential in foreign-loan projects, especially in late acceleration phases. These routines should link contract deliverables, acceptance tests, site deployment status, and payment/disbursement claims in a way that is reviewable by both internal oversight and external stakeholders.

In addition, the findings imply that accountability challenges are exacerbated when responsibilities are distributed across many units without a clear data governance model. When each unit maintains its own records and definitions, inconsistencies emerge, and reporting becomes a negotiation rather than a fact pattern. This is not merely a technical data problem; it is a governance design problem that requires assigned ownership, standardized definitions, and enforced version control for documents and milestones. The discussion implication is that a joint task force should include a dedicated accountability and evidence-management function to ensure that acceleration does not produce documentation debt that later converts into audit risk.

CONCLUSION

The modernization of maritime meteorological services through BMKG's MMS-2 program financed by an AFD external loan (€63.7 million) experienced an extreme implementation lag of around 4.5–5 years, delaying service benefits and increasing fiscal exposure. This study frames the delay as an implementation and project-governance problem, examining planning–performance documents and relevant regulations on loans and procurement, then mapping causal chains using Fault Tree Analysis (FTA) and deriving improvement options through SOAR alongside top-down/bottom-up implementation theory. The central finding is that the "main bottleneck" is not merely technical, but rather low governance throughput slow and uncertain decision-making that ultimately stalled procurement and delivery.

Structurally, the MMS-2 delay is driven by three mutually reinforcing factors: (1) insufficient readiness in early planning, making specifications vulnerable to obsolescence and triggering repeated changes; (2) regulatory deadlock between national procurement requirements (including TKDN/local content rules) and AFD lender procedures that slowed the No Objection process; and (3) major legal changes through the CFA amendment that altered deadlines and reshaped the project's risk profile. Although BMKG avoided loan cancellation through the first drawdown in March 2025, the challenge then shifted to accelerating execution while remaining accountable toward technical completion by 2028.

Because the root causes are systemic, the operational conclusion is the need for a two-track "Agile Governance" strategy: (i) a permanent cross-agency steering committee to speed up legal decisions and reduce coordination deadlocks, and (ii) a joint autonomous task force supported by harmonized technical and procedural guidance to streamline procurement, strengthen real-time reporting, and safeguard accountability. During the acceleration phase, strengthening data integrity and transparency consistent

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milestone definitions, standardized reporting formats, and a single source of truth becomes essential so that faster physical progress does not translate into audit risk or weakened fiscal credibility.

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