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Blue Accounting Integration in Public Finance: Strengthening Regional Water Performance Accountability through a Qualitative Design Science Approach

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Abstract

This study explores how the integration of Blue Accounting into digital public finance systems can enhance regional water performance accountability. Using a qualitative design science approach, the research develops and validates a set of artifacts—including an integration model, indicator codebook, blue-budget tagging format, performance dashboard sketch, and audit checklist—tailored to the digital fiscal ecosystem of Gorontalo Province. The findings identify three consistent entry points within the public finance cycle: planning and budgeting, procurement, and reporting and auditing. Each serves as a strategic interface for aligning water resource data with fiscal decisions and performance evaluations. The results demonstrate that performance-based budgeting and contracting can transform fiscal processes from input- and output-oriented mechanisms into outcome-driven accountability systems. The study contributes theoretically by extending the application of Blue Accounting within subnational public financial management and methodologically by operationalizing document-based and digital trace evidence in artifact design. Practically, it provides a replicable blueprint for local governments to institutionalize evidence-based decision-making, promote transparency, and strengthen the linkage between environmental outcomes and fiscal performance.

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INTRODUCTION

The water governance crisis has become increasingly complex due to climate change, urbanization, degradation of water bodies, and inequality in service access. Meanwhile, regional fiscal practices still tend to focus on budget absorption rather than on environmental and service performance. The wave of digital public finance transformation—covering planning, budgeting, procurement, reporting, and auditing— actually opens opportunities to link fiscal decisions with ecological realities and measurable water service targets, in line with digital government transparency and accountability agendas across countries. However, without an environmental accounting design compatible with the regional budget cycle (APBD), such opportunities are often not utilized systematically.

At the global level, updates to WASH indicators and reporting show that achievements in drinking water and sanitation remain far from the targets, reaffirming the urgency of adopting evidence-based policy approaches that cut across sectors and fiscal systems (OECD, 2025; UNICEF Joint Monitoring Programme (JMP), 2023; WHO, 2023).

In this context, Blue Accounting—rooted in the System of Environmental-Economic Accounting (SEEA)—offers a framework to record and report on water stocks, flows, and quality, linking them with economic and social benefits, and presenting consistent cross-organizational metrics. Recent developments encourage the mainstreaming of natural capital accounting (including water accounts) into policy processes, with growing but uneven evidence of practice—particularly at the subnational level in implementing performance-based budgeting and results-oriented auditing. The "Blue Accounting" initiative in the Great Lakes region, for instance, demonstrates how shared goals and progress metrics can be transformed into actionable information for decision-makers—an inspiration relevant to other regions aiming to connect water data with fiscal cycles (Blue Accounting, n.d.; Great Lakes Commission, n.d.; OECD, 2021; United Nations, n.d., 2021).

In Indonesia, challenges in drinking water services include persistently high levels of non-revenue water (NRW) and disparities in water quality and safety. Data from operator associations indicate that the national NRW rate reached approximately 33.72% in 2023, signaling significant inefficiencies and potential fiscal–environmental leakages that must be addressed through technical interventions and performance-based governance. At the same time, the indicator of "safely managed drinking water" remains low—around 11.9% in 2020, according to the Ministry of Health as cited by Bappenas (2023)—illustrating the gap between water-sector spending and service outcomes that are truly safe at the household level (PERPAMSI, 2023; Bappenas/MoH cit. Nugroho, 2023).

In terms of governance, digital infrastructures for e-procurement and performance reporting are becoming established, but they have not yet been consistently used to orchestrate water-result-based budget tagging (blue-budget tagging) and cross- department performance audits. Recent reports and digital governance indices emphasize the need for integrated government data strategies, interoperability, and information openness to strengthen accountability—prerequisites for linking water resource metrics with fiscal decisions and performance-based contracts (OECD, 2025).

The latest literature on SEEA highlights the increasing use of stock-flow accounts for priority policies (climate, circular economy, resource resilience) and the strong drive to mainstream natural capital accounts into policy architectures. However, most studies still focus on account compilation and national-level applications; studies detailing operational integration into the subnational digital public finance cycle—including planning, budgeting, procurement, reporting, and outcome-based auditing—remain limited (United Nations, n.d., 2021).

Moreover, although regional examples such as Blue Accounting in the Great Lakes have formulated cross-stakeholder goals and metrics, the transfer of knowledge into mechanisms for budget tagging, performance-based contracting, and accountability dashboards integrated with local fiscal systems (digital APBD) has been scarcely examined—particularly in developing-country contexts and provincial or district governments. This gap limits local governments' ability to link every rupiah of spending to tangible improvements in water quality and service delivery (Blue Accounting, n.d.; OECD, 2025).

The core problem addressed in this study is how to design and qualitatively test the integration of Blue Accounting into digital public finance so that:

- information on water stocks, flows, and quality is absorbed into APBD priorities and allocations;
- water-related spending can be tagged, linked to measurable performance indicators, and monitored through performance-based contracts; and

- cross-department and service-operator accountability leads to environmentally and socially verifiable outcomes in Gorontalo Province.

The objectives of this research are to:

- develop a conceptual model for integrating Blue Accounting into digital APBD systems;
- formulate a codebook and water performance indicators aligned with SEEA and performance auditrequirements;
- design a workflow for blue-budget tagging and outcome-based reporting mechanisms compatible with local government digital platforms; and
- provide a policy illustration contextualized for Gorontalo Province.

Theoretically, this research enriches the literature on public-sector environmental accounting by demonstrating the integration route of water accounts into subnational digital public financial management (PFM). Practically, it provides ready-to-use artifacts—such as a codebook, indicator list, tagging protocol, and reporting–audit framework—that can help local governments accelerate water performance improvement and enhance transparency and accountability in spending.

The novelty of this research lies in the integrated operationalization of Blue Accounting within the digital APBD cycle—not merely compiling water accounts—through a combination of qualitative design science, auditable blue-budget tagging, and accountability mapping leading to environmental–service outcomes in the Gorontalo context. This approach combines SEEA standards with digital PFM practices and performance-based contracting, producing a replicable implementation pathway across regions.

METHOD

Design and Approach

This study employs a qualitative, design-oriented approach. Its primary focus is to design, test, and refine artifacts aimed at strengthening water performance accountability within the digital public finance ecosystem. The artifacts include an integration model, a results indicator codebook, a blue-budget tagging format, a performance dashboard sketch, and an audit checklist. The validation of the design is carried out by linking findings from official documents and digital traces with operational needs in the cycles of planning and budgeting, procurement, reporting, and auditing.

Setting, Unit of Analysis, and Period

The research setting is the Provincial Government of Gorontalo and its local government organizations related to water, sanitation, environment, planning and budgeting, procurement, reporting, and auditing affairs. The unit of analysis consists of public management and policy artifacts within the digital public finance cycle, including planning documents, procurement files, performance reports, and supervision documents. The study period covers 2020 to 2025, ensuring that changes occurring during the digital governance enhancement phase are adequately captured.

Data Sources and Collection Strategy

Data collection does not involve interviews. The main sources are official documents such as work plans, budget plans, public finance summaries, supporting regulations, procurement files (including terms of reference and draft contracts), performance reports from both local government agencies and service operators, as well as audit or inspection documents. Digital traces from financial portals, procurement platforms, performance dashboards, and government document repositories are also utilized. Each document included must be authentic, relevant to programs, activities, or expenditure accounts, or related to water performance indicators, and must contain metadata such as date, number, and version to ensure auditability. Documents without formal identification or unverifiable non-official publications are excluded from the corpus.

Concept Operationalization and Instruments

The concept of results is developed into four domains: water quantity and quality, economic and fiscal, social and service, and environmental and governance. Information extraction is performed using a structured worksheet referring to the indicator codebook, which includes definitions, units, sources, and reporting frequencies. Blue-budget tagging is applied at the program, activity, and expenditure account levels using a yes/no designation and a relevance score ranging from 0 to 2, each accompanied by written justification to establish an audit trail. Integration readiness is assessed using a four-level maturity rubric (0–3) across six constructs: (1) tagging intensity, (2) expenditure–result linkage, (3) water performance accountability, (4) governance readiness, (5) contract– result linkage, and (6) data interoperability maturity.

Research Procedures

The first step is mapping the integration architecture to identify three relevant integration points within planning and budgeting, procurement, and reporting–audit processes. The second step is validating the codebook and indicators using the 2020–2025 corpus. The third step is designing an auditable blue-budget tagging workflow, covering criteria setting, entry mapping, tagging with justification, linking to targeted indicators, and reporting formats.

The fourth step is tracking fiscal and ecological processes across three priority policy chains. The fifth step is assessing readiness per construct, assigning maturity scores based on textual and metadata evidence. The sixth step involves domain synthesis and operational implications. The seventh step focuses on refining the design artifacts. The eighth step is identifying leverage points and risks along with their mitigation measures. The ninth step is designing a phased implementation pathway.

Data Analysis Techniques

Data analysis is conducted through two-cycle coding. The first cycle is deductive, using the indicator domains and phases of the digital public finance cycle as the indexing framework. The second cycle is inductive, to identify implementation patterns such as blue-budget tagging, result indicators, performance-based contracts, and data governance. Framework and matrix analyses are used to examine expenditure–result linkages, while process tracing is applied to establish causal sequences in the three priority policy chains. Readiness rubric scores are determined based on verifiable evidence, not on perceptual judgments.

Validity of Findings

Credibility is maintained through triangulation across document types, examination of deviant cases, and peer discussions to test coding and scoring decisions. Dependability is ensured through an audit trail that records document lists, versions, access dates, and inclusion–exclusion rationales, along with decision notes made when revising the codebook or rubric. Confirmability is strengthened by reflective notes on researcher assumptions and mandatory justifications for each tagging and scoring decision. Transferability is pursued through thick descriptions of the local government organizational context, document types, and digital public finance regulations, enabling the practice to be replicated or adapted in other regions.

RESULT AND DISCUSSION

Mapping the Integration Architecture: From Water Data to the Digital Public Finance Cycle

Document corpus analysis for the period 2020–2025 reveals three consistent entry points for integrating Blue Accounting into the digital public finance cycle. First, in the planning and budgeting stage, there is room to establish water outcome indicators—covering quantity and quality, economic and fiscal, social and service, and environmental and governance domains—as performance targets that simultaneously serve as the basis for blue-budget tagging within priority programs and activities. Second, in the procurement stage, opportunities exist to link outcome indicators such as reduction of water losses, improvement of effluent quality, and expansion of service access into performance-based contracts, ensuring that payments follow achieved results rather than merely physical outputs. Third, in the reporting and auditing stage, channels are available to apply results-based reporting across local government organizations and systematically assess performance accountability.

These findings were synthesized into a conceptual integration model illustrating information and decision flows as a unified policy chain. Hydrological and service data are translated into priorities and budget allocations. These allocations are implemented through procurement mechanisms that embed performance obligations. Implementation is then monitored through auditable results reporting. All learning from this cycle is fed back into the subsequent planning phase as policy feedback. Through this approach, the pathway from public expenditure to measurable improvements in water quality and service delivery becomes transparent and accountable within the digital public finance system.

Validation of the Codebook and Outcome Indicators

Validation of the codebook shows that the four-domain framework—water quantity and quality, economic and fiscal, social and service, and environmental and governance—can be consistently applied across the entire document corpus. In the water quantity and quality domain, references to seasonal and quality balances, including the need for monitoring organic loads and suspended solids, are available; however, the continuity of time series and linkage with annual targets are not yet fully established.

In the economic and fiscal domain, efficiency metrics such as non-revenue water, cost recovery, and pollution control costs appear in operator reports and program documents but are not routinely used to evaluate spending effectiveness. In the social and service domain, indicators for safely managed drinking water and sanitation access, as well as spatial inequality maps, are included but have not yet been adopted as benchmarks in performance contracts. In the environmental and governance domain, licensing provisions, buffer zone restoration references, and data transparency initiatives are present, but reporting formats and frequencies vary across agencies. Overall, these findings reinforce the list of core indicators while underscoring the need for standardized reporting formats so that

the indicator-to-program mapping matrix can be operationalized seamlessly within the digital public finance ecosystem.

Auditable Blue-Budget Tagging Workflow

The designed workflow comprises five mutually reinforcing steps:

1. The local government establishes technical criteria defining when a program, activity, or expenditure account directly affects water outcomes across the four domains.
2. All programs and activities are mapped with their expenditure accounts to identify relevance points and potential overlaps.
3. Each entry is tagged with traceable justification, allowing auditors and the public to understand the rationale behind its classification.
4. The tagging is linked to explicit, annually targeted outcome indicators, ensuring that the pathway between expenditure and outcome changes can be tracked over time.
5. The local government presents reports showing the proportion of blue-tagged expenditures and corresponding results, complete with audit trails documenting data sources, document versions, and key decisions throughout the process.

Fiscal and Ecological Process Tracing: From Expenditure to Implementation and Results

Process tracing across several policy chains reveals recurring patterns. In reducing water losses, documents show technical readiness for district metering and pressure management and fiscal rationale for minimizing leakages. However, linking provider payments to actual reductions in losses has not yet been consistently implemented.

In improving effluent quality, regulatory frameworks and upgrading programs for treatment facilities are in place, but reporting schedules and indicator formats differ among agencies, making it difficult to build reliable trends. In expanding service access, declarative targets have been established, yet measurable outcome targets are still required as the basis for contract evaluation and reallocation in subsequent fiscal years.

Integration Readiness by Construct

Qualitative assessment shows that blue-budget tagging intensity ranges from early to intermediate levels. The linkages between expenditures and outcome indicators are present but remain declarative in some documents and only operational in others. Water performance accountability, combining indicator quality, reporting strength, and evaluation mechanisms, has a foundational structure but requires stronger standardization of indicators and regular evaluation schedules. Governance readiness, encompassing regulation, data interoperability, analytical capacity, and cross-agency coordination, shows progress, though data system integration and analytical competencies need improvement. Contract–result linkage is not yet a common practice, with most contracts still evaluated based on physical outputs. Data interoperability maturity remains partial: some metadata schemes exist, but updates and cross-system linkages are inconsistent.

Table 1. Simplified Blue Accounting Integration Readiness Rubric

Construct	Brief Description	Current level	Supporting evidence	Priority actions (0-6 months)
BBTI	Proportion of programs, activities, or accounts with blue-budget tagging across agencies	1-2	Pilot tagging on several activities, not yet consistent across agencies	Define tagging Criteria and procedures; expand tagging to priority programs
OAR	Alignment of expenditures with outcome indicators (NRW reduction, effluent quality, service access)	1–2	Some documents contain outcome targets; tracking not routine	Set annual targets per activity; develop expenditure–result matrix and reporting schedule
WPAI	Water Performance Accountability Index: Indicator quality, reporting, and evaluation	≈2	Reporting exists; evaluation mechanism remains weak	Standardize indicator metadata; conduct regular evaluations and summaries
GRBA	Governance Readiness for Blue Accounting: regulation, data, capacity, coordination (agencies and utilities)	2	Basic coordination or decree in place; limited data interoperability and analytical capacity	Issue tagging/dashboard assignment letter; develop data dictionary; short training
CPL	Contract–Performance Linkage	1	Contracts focus on physical outputs	Add results-based payment clauses in priority packages
DIM	Data Interoperability Maturity (fiscal, hydrological, and service	1-2	Partial integration; data updates inconsistent	Define metadata standards and update schedules; design cross-system integration

Notes and Abbreviations:

- BBTI = Blue-Budget Tagging Intensity;
- OAR = Outcome Alignment Ratio;
- WPAI = Water Performance Accountability Index;
- GRBA = Governance Readiness for Blue Accounting;
- CPL = Contract Performance Linkage;
- DIM = Data Interoperability Maturity;
- NRW = Non-Revenue Water;
- BOD/COD/TSS = Biochemical Oxygen Demand, Chemical Oxygen Demand, and Total Suspended Solids;
- OPD = Local Government Organization;
- PDAM = Regional Water Utility.

Scale levels:

- 0 = none,
- 1 = initial,
- 2 = intermediate,
- 3 = mature.

BBTI measures the intensity of blue-budget tagging across programs, activities, and accounts. **OAR** describes the alignment of expenditures with outcome indicators, such as reduced NRW, improved BOD/COD/TSS, and increased service access. **WPAI** summarizes the quality of indicators, reporting, and performance evaluation. **GRBA** captures regulatory readiness, data capacity, and cross-agency coordination. **CPL** reflects the linkage between payments and achieved results. **DIM** assesses the maturity of fiscal, hydrological, and service data interoperability.

Domain-Specific Findings and Immediate Implications

In the water quantity and quality domain, findings emphasize the need to ensure time series continuity, establish clear policy thresholds, and integrate priority monitoring sites into performance dashboards. In the economic and fiscal domain, indicators such as non-revenue water and cost recovery emerge as key levers for reallocating budgets toward high-impact programs, such as district metering, pipe replacement, and pressure management. In the social and service domain, mapping spatial disparities and customer complaint responses should serve as contract and evaluation-relevant indicators. In the environmental and governance domain, reporting consistency across agencies must be improved through standardized procedures and an evidence repository to facilitate audits.

Resulting Design Artifacts

The study produces a ready-to-use package of design artifacts. The integration model presents a verifiable pathway from data and expenditure to auditable outcomes.

The codebook and indicator list define standardized units, sources, and reporting frequencies.

The blue-budget tagging format provides a replicable and monitorable recording structure.

The dashboard sketch integrates targets, realizations, and narrative outcomes with hyperlinks to evidence. The audit checklist enables supervisors to evaluate the strength of expenditure–result linkages, indicator quality, and compliance with performance-based contracts.

Policy Leverage Points and Implementation Risks

Three policy leverage points can accelerate integration:

- Internal regulations that formalize results-based tagging and reporting will ensure procedural certainty.
- Performance-based payment clauses in priority packages will shift incentives from mere task completion to achieving outcomes.
- Accelerated data interoperability, supported by data dictionaries and clear update schedules, will enhance reporting accuracy.

Conversely, three major risks require attention:

- Data fragmentation hampers analytical consistency;
- Resistance to indicator revisions weakens performance discipline; and
- Limited capacity in managing performance-based contracts may delay benefits. These risks can be mitigated through concise technical assistance, pre-prepared contract templates, and peer learning across organizations.

Illustrative Implementation Pathway in Gorontalo Province

The proposed implementation pathway proceeds in three phases. In the first phase, the local government conducts pilot tagging on directly impactful activities—such as district metering management, improvement of communal wastewater treatment facilities, and buffer-zone restoration—while setting baseline indicator values and annual performance thresholds.

In the second phase, tagging coverage expands across more agencies, performance-based contracts are activated in priority packages, and results are periodically published on public dashboards.

In the third phase, cross-agency performance audits focus on outcomes; allocations are adjusted based on achievements; and data procedures are standardized so that cross- system integration operates automatically and sustainably within the digital public finance ecosystem.

DISCUSSION

Position of Findings within the Framework of Blue Accounting and Digital Public Finance

The three entry points—planning and budgeting, procurement, and reporting and auditing—illustrate how water resource information can be integrated precisely where fiscal decisions are made and evaluated. At the planning and budgeting stage, water outcome indicators are positioned as performance targets that link development priorities with budget allocation consequences. In procurement, performance-based clauses transform payment relations from being tied merely to physical outputs toward achievement of measurable outcomes. In reporting and auditing, evidence trails enable auditors to assess the alignment between expenditures and changes in both services and environmental conditions. Thus, Blue Accounting operates as a policy architecture embedded within the digital public finance ecosystem.

Domain Analysis: From Data to Policy Signals

In the water quantity and quality domain, the availability of seasonal balance and quality references is a prerequisite; however, continuity of time series and consistent annual thresholds still need to be reinforced. Establishing clear thresholds allows results to be interpreted as policy signals integrated with the budget calendar. In the economic and fiscal domain, efficiency indicators—such as non-revenue water and cost recovery—are already present in operator reports, yet have not been adopted as key measures of spending effectiveness. The expenditure–outcome matrix offers a mechanism to ensure that every rupiah is explicitly linked to efficiency improvements. In the social and service domain, indicators of safe water access and spatial equity have been documented, but they have not yet influenced implementer evaluations. Positioning service indicators as the basis for contract evaluation will incentivize providers to close regional service gaps. In the environmental and governance domain, permits, buffer-zone restoration efforts, and transparency measures already exist, but variation in reporting formats and rhythms

limits consolidation. Standardized metadata and shared evidence repositories would facilitate cross-organizational performance audits.

Reading the Level of Readiness and Improvement Pathways

Scanning across six constructs indicates an initial-to-intermediate readiness level. Tagging intensity exists but is not yet widespread. Linkages between expenditures and results are beginning to take shape. Water performance accountability has established a reporting foundation, but results evaluation remains infrequent. Governance has basic regulatory structures in place, yet data interoperability and analytical capacity must be strengthened. Contracts remain output-oriented, and data integration is only partial. A realistic improvement pathway includes focused pilot projects on impactful activities, expansion of performance-based contracts in priority packages, and the institutionalization of data standards and evaluation calendars to ensure reliable trend assessment in every fiscal year.

Policy Mechanisms: From Expenditure to Process and Results

Process tracing demonstrates how public spending activates technical mechanisms such as district metering, pressure control, effluent monitoring, and buffer-zone restoration, which ultimately lead to reduced water losses, improved quality, and expanded access. A key vulnerability arises in the link between payments and results. Without performance clauses, accountability stops at physical outputs. The results-based contract format, expenditure–result matrix, and audit checklist together provide instruments to shift evaluation focus toward outcomes that are meaningful to communities and the environment.

Contribution to the Research Gap: From Conceptual to Operational at the Local Level

Many studies have highlighted the urgency of integrating environmental information into fiscal policy, yet few detail the operational workflows at the provincial or district level within a digital public finance architecture. This study fills that gap through three operational contributions:

1. formalizing water outcome indicators as performance targets embedded in priority programs and activities;
2. providing an auditable blue-budget tagging workflow traceable through decision records; and
3. shifting evaluation from outputs to outcomes through performance-based contracting.

The readiness rubric and phased implementation pathway offer a sequential guide that local government organizations can follow.

Theoretical and Methodological Implications

Theoretically, the findings reinforce that Blue Accounting is most effective when integrated with the core modules of the digital public finance cycle: planning and budgeting, procurement, and reporting and auditing. Its effectiveness depends on three preconditions: (1) operationally defined cross-domain indicators; (2) contractual mechanisms linking payments to achieved results; and (3) standardized, auditable reporting procedures. Methodologically, the design-oriented approach proves relevant for designing, testing, and refining artifacts based on document evidence and digital traces—ensuring that findings move beyond diagnosis toward practical, adoptable work instruments.

Policy and Managerial Implications

For local governments, the most impactful initial steps include: issuing internal regulations to formalize results-based tagging and reporting; implementing performance-based contracts for packages most relevant to reducing water losses, improving effluent quality, and expanding access; and accelerating data interoperability through data dictionaries, metadata standards, and synchronized update schedules.

For auditors, the audit checklist focusing on the expenditure–result relationship serves as a guide to shift audits from administrative compliance toward performance accountability.

Validity, Limitations, and Generalizability

Credibility is supported by triangulation across planning, financial, procurement, reporting, and audit documents that complement one another. The main limitations include inconsistent reporting formats and rhythms, potential reporting bias, and delayed publication of updated versions. These limitations are mitigated through audit trails, indicator standardization, and explicit tagging of data gaps prior to drawing conclusions. In terms of transferability, this approach can be adapted to other regions that already have digital financial infrastructure, with adjustments for local norms and technical capacities.

Future Research Agenda

Future research could evaluate the causal impacts of performance-based contracts on reducing water losses and improving quality; analyze the costs and benefits of blue- budget tagging across broader program portfolios; develop automatic data integration among financial, procurement, and water-quality monitoring systems; and conduct comparative cross-provincial studies to identify institutional factors most critical for successful adoption.

CONCLUSION

This study demonstrates that Blue Accounting can be operationalized within digital public finance to strengthen regional water performance accountability. In the context of Gorontalo Province, three critical entry points—planning and budgeting, procurement, and reporting and auditing—were found to exist and can effectively integrate water outcome indicators where fiscal decisions are made and evaluated.

Positioning indicators of quantity and quality, economic and fiscal, social and service, and environmental and governance domains as performance targets ensures that water resource information directly influences budget allocation and evaluation.

The developed indicator codebook proved applicable across organizations, although standardization of time series and reporting formats is still required to ensure interannual comparability.

The blue-budget tagging workflow, consisting of criteria setting, expenditure entry mapping, tagging with justification, linkage to annual target indicators, and auditable reporting, was found feasible for implementation. Process tracing across the chains of reducing water losses, improving effluent quality, and expanding service access confirmed a logical relationship between expenditure, implementation mechanisms, and outcome changes—while highlighting vulnerabilities in the linkage between payments and achieved results.

Readiness assessment indicates an early-to-intermediate stage for tagging intensity, expenditure–result linkages, water performance accountability, governance readiness, contract–result linkage, and data interoperability maturity. These findings point to a clear improvement pathway through:

- internal regulations formalizing results-based tagging and reporting,
- adoption of performance-based contracts for priority packages, and
- acceleration of data interoperability.

IMPLICATIONS

Theoretical. Blue Accounting should be positioned as a core component of the digital public finance cycle. Its effectiveness depends on cross-domain indicators that are operationally defined and maintained consistently over time, ensuring that outcomes truly inform fiscal decision-making.

Public Policy. Local governments should issue internal regulations mandating blue- budget tagging and results-based reporting for programs that affect water performance so that prioritization, allocation, and evaluation occur within a unified accountability framework.

Managerial. Program managers and service providers should employ performance- based contracts and expenditure–result matrices with annual activity-level targets to ensure that implementation focuses on measurable outcomes rather than mere physical outputs.

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