Journal of Natural Resources and Environmental Management
http://dx.doi.org/10.29244/jpsl.16.3.362

RESEARCH ARTICLE

OPEN ACCESS

Check for updates

Manifesting Clean Water Rights in Jakarta: A Public Trust Doctrine Analysis of Urban Water Governance Failures

Ardianto Budi Rahmawan[ab]

[a] Department of Administrative Law, Faculty of Law, University of Gadjah Mada, Yogyakarta, 55165, Indonesia
[b] Department of Technology and Energy Law, Faculty of Law, Pecs University, Pecs, Baranya, 7622, Hungary

Article History
Received 28 June 2025
Revised 26 February 2026
Accepted 10 April 2026

Keywords
clean water rights, comparative legal analysis, public trust doctrine, water governance, water privatization

ABSTRACT

Access to clean water is a fundamental human right. Despite being an archipelagic country surrounded by water, Indonesia faces significant challenges in providing its citizens with adequate access to clean water. This study examines Jakarta's water governance through the analytical framework of the Public Trust Doctrine (PTD), comparing institutional failures with the Flint water crisis to identify transferable governance reforms. Using qualitative legal analysis and comparative case methodology, this study analyzes Indonesia's constitutional water rights framework as implemented in Jakarta against documented evidence of implementation gaps, including coverage disparities (60% formal access versus universal constitutional guarantees), water quality violations (93% of groundwater monitoring points exceeding coliform standards), and privatization accountability deficits. The analysis employs three analytical indicators: (1) accountability mechanism (enforcement pathways and oversight structures), (2) enforceability (judicial remedies and statutory compliance), and (3) participation (stakeholder inclusion in decision-making). The comparative analysis identified five systemic governance dimensions in which both Jakarta and Flint demonstrate institutional failures: fragmented regulatory authority, inadequate monitoring infrastructure, weak judicial enforcement, privatization without public interest safeguards, and limited citizen participation. The study outcome proposes an integrated governance model incorporating watershed management councils, strengthened legal frameworks explicitly incorporating PTD principles, and a multi-level accountability mechanism. This research advances the water governance literature by operationalizing PTD principles through specific institutional reforms adapted to the Jakarta urban context while acknowledging limitations in generalizing the findings to other Indonesian regions with different geographic, demographic, and governance characteristics.

Introduction

Water is essential for human survival, economic progress, and ecological sustainability [1]. Although access to clean water is internationally recognized as a fundamental human right, approximately one in 12 people worldwide still lack access to safe drinking water [2]. In Indonesia, specifically Jakarta, this issue is compounded by a paradox: water scarcity despite the country's geographic abundance of freshwater sources. Water is frequently used for both domestic purposes, such as drinking, sanitation, and cooking, and non-domestic uses, including agriculture, industry, and infrastructure [3]. However, the nation's reliance on processed water remains high, with the Indonesian Bureau of Statistics reporting a utilization of 5,501 million m^3 in 2023 [4].

Indonesia's constitutional framework, specifically Article 33 of the 1945 Constitution [5], designates water as a public resource to be managed by the state for the greatest benefit of the people, a principle enshrined in Law No. 17 of 2019 on Water Resources [6]. This legal mandate reflects the principle of the Public Trust

Corresponding Author: Ardianto Budi Rahmawan ardianto.budi@mail.ugm.ac.id Department of Administrative Law, Faculty of Law, University of Gadjah Mada, Yogyakarta, Indonesia.

Doctrine (PTD), which imposes a fiduciary duty on the state to manage natural resources for the benefit of both the present and future generations. Under this framework, the Indonesian government assumes the role of a trustee with a constitutional obligation to ensure equitable access to water resources while maintaining their sustainability and quality for long-term public welfare. This stewardship model establishes a legal foundation that prioritizes collective ownership over privatization, requiring state institutions to balance immediate development needs with the preservation of water resources for future generations to come.

Despite this robust legal foundation, implementation remains weak, particularly in urban areas such as Jakarta, where infrastructure gaps, governance fragmentation, and privatization challenges continue to undermine water equity and security. While these failures have attracted scholarly attention, the existing literature has primarily approached Jakarta's water crisis through technical and infrastructural lenses, focusing on engineering solutions rather than examining the legal accountability mechanisms that govern state obligations toward water access. This doctrinal blind spot is significant because it does not understand how legal frameworks such as PTD can be systematically applied to enforce state accountability, since technical interventions alone remain insufficient to guarantee constitutionally protected water rights. This study addresses that gap by examining Jakarta's water governance through the lenses of PTD and drawing comparative insights from the U.S. Flint water crisis. This study aims to propose a more comprehensive and integrated regulatory framework that protects the constitutional right to access clean water while responding to the unique challenges of urban water management in developing contexts.

Research Gaps and Analytical Novelty

This study addresses three critical gaps in the literature. First, while existing water governance in Indonesia emphasizes infrastructure deficits and technical solutions [7,8], few scholars have examined institutional accountability mechanisms through the PTD framework. Previous studies document service failures but rarely operationalized constitutional principles into enforceable governance structures. Second, comparative water governance literature applying PTD principles has predominantly examined legal systems within common law jurisdictions, leaving underexplored how PTD analytical frameworks can be meaningfully transposed to civil law systems operating under different constitutional architectures [9,10]. This study contributes by systematically comparing Jakarta's governance failures with the Flint crisis, demonstrating how PTD violations manifest across different legal systems and socioeconomic contexts.

This comparative analysis yields transferable lessons for developing urban contexts. Third, existing PTD applications in water law remain largely theoretical [4,11]. This research advances the field by translating principles into specific institutional reforms adapted to the urban challenges of Jakarta. This study developed analytical indicators for measuring PTD implementation (accountability, enforceability, and participation) that can be applied to other jurisdictions. Finally, this study's analytical contribution lies in creating an integrated governance framework that operationalizes PTD through measurable institutional mechanisms rather than abstract legal principles. This approach bridges the gap between constitutional mandates and practical implementation.

This study contributes to the water governance literature in three distinct ways. First, it operationalizes PTD within the context of civil law in a developing country, extending the doctrine's application beyond its traditional common law origins and demonstrating its analytical utility for urban water governance in diverse legal systems. Second, it develops a structured methodology with measurable indicators for identifying PTD violations, moving beyond normative assertions to empirical assessments of institutional performance. Third, it demonstrates through comparative analysis how similar governance failures emerge across vastly different legal, political, and economic contexts, identifying transferable reform mechanisms while acknowledging context-specific adaptation requirements. These contributions advance both the theoretical understanding of the contemporary application of PTD and provide practical guidance for governance reform in rapidly urbanizing developing economies.

Research Objectives and Scope

This study examines Jakarta's water governance through the PTD lens, drawing comparative insights from the U.S. Flint water crisis. This research aims to analyze Jakarta's constitutional water rights framework and implementation gaps using defined analytical indicators, compare Jakarta and Flint governance failures to identify common institutional weaknesses, and propose an integrated regulatory framework to strengthen PTD implementation in Jakarta's urban context.

Scope and Limitations

This study focuses specifically on Jakarta's metropolitan water governance and does not claim generalizability to other Indonesian regions. Indonesia's geographic diversity spanning 17,000 island, demographic variations comprising urban v. rural populations, and decentralized governance structures create distinct water management challenges across regions. Jakarta represents a unique case of extreme urban density with 16,000 people/km^2, centralized privatization experiments, and several land subsidence cases. Findings should be understood within this specific context, although the proposed analytical framework and institutional mechanism may inform governance reforms in other Indonesian urban centers facing similar challenges.

Conceptual Framework

Figure 1 illustrates the analytical framework, demonstrating how PTD serves as a foundational lens for analyzing water governance challenges and proposing reforms. The framework begins with the constitutional foundation established by Article 33 and Law No. 17 of2019 on Water Resources, which embeds PTD into Indonesian law. These principles include the state acting as a trustee, beneficiaries defined as present and future generations, non-alienation of public resources, and intergenerational equity, which requires balancing present needs with the preservation of water access for future generations.

The framework operationalizes these principles through three analytical indicators that enable a systematic assessment of PTD implementation. Accountability measures the enforcement pathways and oversight mechanisms in place. Enforceability examines judicial remedies and statutory compliance mechanisms. Participation evaluates stakeholder inclusion and transparency in the decision-making process. These indicators guide the empirical analysis across four dimensions: legal framework analysis examining statutes, regulations, and case law; institutional assessment of agency roles and coordination; service delivery outcomes, including coverage, quality, and equity; and a comparative case study between Jakarta and Flint.

This empirical analysis identifies implementation gaps, including fragmented regulatory authority, privatization without adequate safeguards, weak monitoring and enforcement, limited citizen participation, and infrastructure deficits. These identified gaps inform the development of an integrated governance model that addresses each weakness through specific reform. The model proposes an institutional architecture with clear mandates, regulatory frameworks explicitly incorporating PTD principles, privatization safeguards, and public interest protection. This framework operationalizes the PTD by translating abstract constitutional principles into measurable indicators and concrete institutional reforms. Each analytical dimension examines whether Jakarta's governance structures fulfil their fiduciary obligations to citizens as beneficiaries of public trust.

Foundational Legal Framework		
Constitutional Framework Art. 33 of 1945 Constitution & Law No. 17 of 2019	**Statutory Provisions** PP No. 122 of 2015 & Perpres No.12 of 2025	**Judicial Precedents** MA Cassation Ruling & Court Decisions
Analytical Indicators PTD Implementation Assessment Framework		
Accountability Oversight Structure & Monitoring Systems	**Enforceability** Judicial Remedies & Statutory Compliance	**Participation** Stakeholder Inclusion & Decision Making
Documented Findings – Jakarta Evidence of PTD Implementation Deficits		
Coverage Gap 60% piped waters vs. 100% national target	**Quality Violations** 93% of groundwater exceeds coliform std.	**Litigation Fragility** Protracted Judicial Trajectory (2012-2017)
Proposed Integrated Governance Reforms PTD-Based Institutional Mechanism for Jakarta		
Strengthened Accountability Watershed management councils & Oversight	**Enforceable Legal Framework** Explicit PTD statutory provisions & remedies	**Multi-Level Participation** Citizen Standing & Transparency Mechanism

Figure 1. Conceptual framework. This figure presents the analytical framework used to examine Jakarta's water governance through the PTD. It illustrates the relationship between constitutional foundations, three analytical indicators (accountability, enforceability, and participation), and the identification of governance failures that inform the proposed reform model. The framework situates PTD as both a diagnostic lens and a basis for institutional reform in urban water governance.

Materials and Methods

This study utilized a qualitative legal analysis methodology, relying primarily on documentary research and comparative case analyses. Documentary research involved a systematic examination of legal texts, judicial decisions, and regulatory instruments relevant to the PTD and its implementation. A comparative case analysis was used to evaluate the similarities and differences across jurisdictions, providing a deeper understanding of the legal frameworks and governance practices. The research process followed a structured, step-by-step approach, as illustrated in Figure 2.

Theoretical	*Review PTD literature from Roman Law origins through modern environmental applications. Identified core principles of state trusteeship, beneficiary rights, and non-alienation for adaptation to Indonesian context*
Documentary Analysis	*We analyzed Indonesian constitutional and statutory water law (Art. 33, Law No. 17/2019) and Jakarta governance documents including privatization contracts, monitoring reports, and quality assessments*
Comparative Case Analysis	*Examined Jakarta water governance failures alongside Flint water crisis to identify common institutional weaknesses across different legal system*
Synthesis and Framework Development	*Integrated empirical findings and comparative insights to proposed governance model operationalizing PTD through specific reforms, accountability mechanism and recommendations*

Figure 2. Legal analysis methodology. This figure outlines the four-stage qualitative legal analysis methodology applied in this study, including theoretical framework development, documentary analysis, comparative case analysis, and reform synthesis. It shows the sequence of analytical steps and the integration of doctrinal and comparative methods. The figure demonstrates how multiple sources of evidence were systematically used to evaluate governance failures and formulate reform proposals.

The research methodology followed a systematic four-stage process: (1) theoretical framework development through examination of PTD principles, (2) documentary analysis of Indonesian water law and regulations, (3) comparative case study analysis of Jakarta and Flint water governance, and (4) synthesis and proposal development for integrated governance reforms. Each state employed qualitative analytical techniques, including doctrinal legal analysis to examine statutory frameworks, thematic content analysis to identify governance patterns and failures, and cross-jurisdictional comparison to extract transferable lessons and best practices. The methodology was designed to ensure methodological rigor through the triangulation of multiple data sources, systematic documentation of analytical procedures, and validation of findings through established legal precedents and comparative case evidence.

The methodology consisted of two primary components: First, a theoretical framework analysis, which examined the PTD's relevance to water law, tracing its evolution from Roman law through contemporary natural resource management applications. This historical-legal analysis established an analytical framework for evaluating water governance structures. Second, it comprises documentary analysis focusing on two parallel tracks: the Indonesian water law framework, including constitutional provisions under Article 33, statutory instruments, particularly Law No. 17 of 2019 on Water Resources, and related regulations; and judicial decisions analyzing relevant case law. Third, a comparative case analysis examining both Jakarta's water governance and the Flint water crisis was implemented. The Jakarta analysis covered the privatization timeline from initial contracts through current arrangements, regulatory oversight structures, and their effectiveness. The Flint analysis examined emergency management decisions that precipitated the crisis, water quality violations, public health impacts, and accountability failures across multiple governmental levels. Finally, synthesized findings into an integrated governance model by translating identified problems into institutional reforms and proposing regulatory reforms that explicitly incorporate PTD principles.

Analytical Framework and Indicators

To ensure analytical rigor, this study defined three core indicators for assessing PTD implementation. The first indicator, accountability, examines the presence and effectiveness of mechanisms that hold government agencies and private partners responsible for water service delivery. This is measured through formal oversight structures, including regulatory bodies and reporting requirements, enforcement pathways encompassing penalties for non-compliance and remediation orders, and performance monitoring systems utilizing service quality metrics and public reporting mechanisms.

The second indicator, enforceability, assesses the capacity of legal frameworks to provide citizens with remedies when water rights are violated. This evaluation proceeds through three dimensions: statutory clarity, which examines whether explicit provisions link rights to corresponding obligations; judicial accessibility, which determines citizen standing and the justiciability of water rights claims; and remedial effectiveness, which analyses the potency of court-mandated compliance and compensation mechanisms in achieving practical outcomes.

The third indicator, participation, evaluates the degree of citizen and stakeholder involvement in water governance. This assessment encompasses formal participation channels, such as public hearings and advisory councils, information transparency measuring public access to water quality data and contract terms, and decision-making influence examining whether stakeholder input materially affects policy outcomes rather than merely seeing consultative functions. These three indicators provide a structured analytical framework for comparing Jakarta and Flint while avoiding purely normative assessments, instead grounding the evaluation in observable institutional characteristics and measurable outcomes.

Comparative Methodology

This comparative analysis employs institutional isomorphism as an analytical lens to examine how similar governance failures emerge across different contexts [12]. The comparison focuses on identifying structural similarities while acknowledging fundamental differences that limit direct policy transplantation but enable the recognition of common institutional weaknesses transcending specific contexts. Jakarta and Flint experienced several key structural similarities. Each jurisdiction underwent a transition from public to private or hybrid water management models driven by financial constraints and infrastructure needs. Both cases exhibited regulatory fragmentation across multiple agencies with unclear jurisdictional boundaries and inadequate coordination. Financial pressures in both contexts led to the prioritization of cost reduction over service quality, with decision-makers emphasizing short-term budgetary concerns over long-term public health considerations. Additionally, both crises disproportionately impacted low-income communities that lacked alternative water sources or the political influence to demand immediate remediation.

Flint was selected as a comparative case using three methodological criteria. First, structural similarity: both Jakarta and Flint experienced transitions from public to private or hybrid water management under financial constraints, enabling a comparison of governance failure across different institutional arrangements. Second, PTD relevance: both jurisdictions possess legal frameworks recognizing governmental trusteeship obligations for water resources, although they are implemented through different legal traditions (civil law versus common law). Third, crisis documentation: Both cases generated extensive empirical evidence, including water quality data, regulatory documents, and judicial decisions, providing comparable evidentiary bases for analysis. While acknowledging the fundamental differences in legal systems, political structures, and economic contexts, these shared characteristics enable the identification of common institutional weaknesses in PTD implementation across diverse settings.

However, the comparison acknowledges four fundamental differences that constrain direct policy transfers. The legal system difference between Indonesia's civil law tradition and the United States' common law system affects how judicial oversight operates and how precedent influences future cases. Political structures differ substantially, with Indonesia's centralized governance contrasting with the United States' federal system, featuring multiple layers of oversight and intervention authorities. Economic contexts vary significantly, with Jakarta operating within a developing economy context with different resource constraints and institutional capacities compared with Flint's developed economy setting. Finally, crisis timescales differ markedly, with Jakarta experiencing chronic, long-term degradation over decades, whereas Flint faced an acute crisis compressed into several years.

These differences limit direct policy transplantation but enable the identification of common institutional weaknesses transcending specific contexts. By focusing on structural governance failures rather than specific policy instruments, the comparative analysis yields insights applicable across diverse legal, political, and economic environments while respecting the need for context-specific adaptation. Our analysis focused on identifying legal and institutional reforms that could strengthen the application of the PTD in Jakarta's water governance. This study acknowledges the limitations of data availability for certain dimensions of water quality monitoring and contract details related to privatization. To mitigate these data constraints, this study triangulated the available information through multiple sources, including government reports, academic studies, and comparative case analyses, to ensure robust findings despite incomplete access to proprietary contract terms and real-time monitoring data. Despite these limitations, the analysis provides sufficient evidence to identify patterns of systemic governance failures, demonstrate systemic governance failures, and

propose viable reform pathways that can be implemented within Indonesia's existing legal and institutional framework while strengthening public trust enforcement mechanisms. The data sources employed across these analytical stages and their corresponding analytical focus are summarized in Table 1.

Table 1. Research data sources and analytical framework**.** This table summarizes the categories of data sources used in the study, including legal documents, governance records, environmental monitoring data, case law, and comparative materials. It links each source category to its corresponding analytical focus within the research framework. The table shows how diverse sources were triangulated to assess governance performance through PTD indicators.

Data category	Sources	Analytical focus
Legal framework	Constitution, Water Resources Law No. 17 of 2019 on Water Resources, Regional Regulations	Constitutional basis, regulatory adequacy, implementation gaps
Governance structure	Government reports, PAM (*Perusahaan Daerah Air Minum*) Jaya documents, privatization contracts	Institutional design, accountability mechanisms, and authority distribution
Environmental data	Water quality reports, Environmental agency monitoring	Contaminant levels, distribution systems, and treatment adequacy
Case law	Court decisions on water rights, privatization litigation	Judicial interpretation, rights enforcement, remedies
Comparative material	Flint crisis documents, academic analyses, and official investigations	Regulatory failures, response mechanisms, and reform outcomes

Results and Discussion

Results

The Public Trust Doctrine (PTD) and Manifestation in Indonesian Law

The PTD establishes a fiduciary obligation for governments to manage natural resources as trustees for present and future generations [11,13–15]. This legal principle traces its origins to the concept of res communis (resources belonging to all) in Roman law, which designated certain resources as inherently public [16–18]. Modern PTD applications typically encompass navigable waters, submerged lands, wildlife, and, increasingly, atmospheric resources that are essential for climate stability. Indonesia's water governance framework incorporates PTD principles through a hierarchical legal structure that explicitly establishes state trustee obligations at three distinct levels. At the constitutional level, Article 33, Paragraph 3 of the 1945 Constitution designates the state as a trustee through the phrase "controlled by the state," establishing governmental responsibility for resource stewardship. Second, it identifies beneficiaries as "the people," creating a fiduciary relationship between the government and citizens. Third, it embeds the non-alienation principle through the requirement of utilization "for the greatest prosperity," preventing the transfer of essential resources to private control in ways that would undermine public benefit.

At the statutory level, Law No. 17 of 2019 on Water Resources operationalizes these constitutional principles through specific provisions. Article 2 establishes water resource management principles, including "sustainability, balance, cohesion, togetherness, justice, independence, and transparency," directly reflecting the intergenerational equity concept core to PTD by ensuring that current resource use does not compromise future generations' access. Article 6 stipulates that water resource control (*hak menguasai*) belongs to the state, exercised by the government through three mechanisms: regulating and administering authorization, use, supply, and maintenance; implementing management functions; and establishing standards for water resources. Most significantly, article 7, paragraph 1, explicitly prohibits the privatization of water resources, stating that "water resources cannot be owned and/or controlled by individuals, groups, or business entities," thereby preventing the alienation of the public trust. Articles 6 to 23 establish planning, allocation, and conservation mechanisms that operationalize state trusteeship duties through concrete administrative procedures and accountability requirements.

At the regulatory level, Government Regulation No. 122 of 2015 on Drinking Water Supply Systems [19] details institutional responsibilities for ensuring water quality and access, translating statutory obligations into specific agency mandates and operational protocols, as follows: Notably, however, this regulation predates Law No. 17 of 2019 on Water Resources and was enacted under the older legislative framework of

Law No. 11 of 1974 on irrigation [20], creating regulatory alignment gap that itself exemplifies the institutional fragmentation this study identifies as a core PTD implementation deficit. To make it complex, the recent Presidential Regulation No. 12 of 2025 on the National Medium Term Development Plan 2025–2029 [21] establishes measurable water security targets that, interpreted through PTD lenses, reflect the state stewardship obligation towards present and future generations. These targets include universal access to proper drinking water (100%), household access to safe drinking water, and access to piped water networks, meaning that previous elements obligations are embedded in the national development framework and budgetary allocations.

This hierarchical legal structure theoretically embeds PTD through explicit provisions prohibiting the alienation of water resources while establishing state obligations to manage them for public benefit. However, implementation gaps emerge in enforcement mechanisms and accountability structures, as detailed in the subsequent sections [22]. The disconnect between robust legal articulation and weak practical implementation constitutes the central governance challenge addressed in this study.

The PTD evolved from the Roman law concept of res communis through English common law to its modern environmental applications. Key milestones include the 1892 Illinois Central case, which established governmental trust obligations, the subsequent expansion of groundwater and atmospheric resources, and contemporary applications in climate litigation and resource management. This legal evolution has influenced water governance frameworks across multiple jurisdictions, with countries such as South Africa, India, and the Philippines incorporating trust principles into their constitutional provisions for natural resource management. The doctrine's emphasis on intergenerational equity and governmental stewardship has become particularly relevant in addressing contemporary challenges such as climate change, water scarcity, and environmental degradation in rapidly urbanizing regions.

The landmark 1892 U.S. Supreme Court case Illinois Central Railroad Co. v. Illinois crystallised the modern interpretation of PTD, which establishes three essential elements. First, governments hold certain natural resources in trust for public use [12,23,24]. Second, the state cannot abdicate its trust responsibilities [25,26]. Third, governments must prevent the substantial impairment of public resources through private use [27,28]. Indonesia's legal framework incorporates PTD principles through a hierarchical structure of laws and regulations, as summarized in Table 2.

Table 2. Indonesia's water management legal framework. This table presents the principal constitutional, statutory, and regulatory instruments that embody PTD principles in Indonesia's water governance framework. It identifies each instrument's trust-related function and corresponding implementation gaps. The table demonstrates the contrast between robust normative legal foundations and weaknesses in enforcement and accountability mechanisms.

Legal instrument	PTD manifestation	Implementation gap
1945 Constitution Art. 33(2-3)	State trusteeship of water resources for public benefit	No direct enforcement mechanism, requires implementing legislation
Law No. 17/2019 on Water Resources	Explicit non privatization (Art.7); State Control Rights (Art. 6); Sustainability principes (Art. 2)	Weak accountability provision, unclear delegation boundaries, limited citizen enforcement pathways
Law No. 25/2009 on Public Services [29]	Sets standards for public service delivery, including water	Establishes accountability mechanisms
Government Regulations 122/2015 on Water Supply System	Institutional responsibilities for water supply systems	Fragmented agency mandates, overlapping jurisdictions, inadequate coordination mechanism

Implementation Gaps in Indonesia's PTD framework

The current framework exhibits three critical accountability deficits that collectively undermine effective PTD implementation: inadequate legislative guardrails on state delegations of trust responsibilities to private entities, insufficient institutional architecture for translating constitutional principles into justiciable individual rights, and the absence of clear statutory guidance for judicial interpretation of PTD obligations in the context of privatization. Each deficit was examined in turn. The current framework exhibits three critical accountability deficits that undermine the effective implementation of PTD. First, the framework lacks specific statutory provisions preventing the state from delegating trust responsibilities to private entities without adequate public interest safeguards.

This absence effectively allows constitutional obligations to be subordinated to commercial considerations, as evidenced by Jakarta's privatization arrangements, where contractual obligations to private companies have at times superseded constitutional duties to citizens. Without explicit legislative guardrails defining acceptable delegation boundaries and mandatory public interest criteria, state agencies retain excessive discretion in transferring operational control to private actors to do so. Second, the legal structure lacks the institutional architecture necessary to translate constitutional principles into enforceable rights. While article 33 establishes broad state obligations and Law No. 17 of 2019 on Water Resources articulates management principles, neither creates justiciable individual rights or clear pathways for citizens to compel governmental action when obligations are unfulfilled. Citizens confronting service failures or quality violations face significant barriers in accessing effective remedy. The absence of statutory provisions explicitly granting citizens standing to enforce water rights leaves affected communities reliant on general administrative law remedies, which prove inadequate for addressing systemic governance failures affecting essential public services.

Third, courts lack clear statutory guidance on how to interpret PTD obligations when they conflict with privatization policies or development priorities, creating legal uncertainty and inconsistent enforcement issues. The reversal in Jakarta Residents v. PAM Jaya exemplifies this judicial ambiguity, where the initial recognition of constitutional water rights was subsequently overturned without establishing clear precedential guidance for future cases. This inconsistency leaves water rights advocacy dependent on unpredictable judicial interpretations rather than established legal doctrine, thereby weakening the enforcement mechanism necessary for effective PTD implementation. These gaps create a disconnect between constitutional mandates and their practical implementation. The hierarchical legal structure articulates PTD principles with impressive clarity at the normative level; however, it fails to establish institutional mechanisms to ensure that these principles constrain actual government behavior or provide citizens with meaningful recourse when violations occur. The following section demonstrates how these theoretical weaknesses manifest in Jakarta's water governance failures, producing outcomes that are fundamentally inconsistent with constitutional obligations despite formal legal compliance with statutory requirements.

Jakarta's Water Governance Crisis: Implementation Gaps

Jakarta's water management challenges epitomize the implementation gap between constitutional guarantees and practical water access [30]. Despite official statistics claiming near-universal access, field studies have revealed a more complex reality. The disconnect between official coverage statistics and actual service quality demonstrates how quantitative metrics can obscure qualitative failures, as many residents technically "served" by the piped network receive intermittent, contaminated, or unaffordable water that fails to meet the basic human needs for safe and reliable access. This statistical misrepresentation undermines accountability mechanisms by creating an illusion of compliance with constitutional obligations, while millions of Jakarta residents continue to face daily water insecurity. This highlights the urgent need for governance reforms that prioritize substantive rights fulfilment over bureaucratic performance indicators. In more detail, illustration on the water access and pollution in Jakarta districts can be summarized in Figure 3.

With a population density exceeding 16,000 people per km² [31], Jakarta faces unique water governance challenges compared with rural areas. These urban challenges derive from three interconnected factors: (1) infrastructure inadequacy, (2) privatization failures, and (3) groundwater depletion (GWD). The privatization of Jakarta's water services began in the 1990s, driven by infrastructure investment needs, but was implemented without adequate accountability mechanisms. Jakarta water privatization timeline and outcomes can be summarized in Table 3.

The court decision in Jakarta Residents v. Jakarta Environmental Agency PAM Jaya (Case No. 527/Pdt.G/2012/PN JKT.PST) initially ruled against privatization, but was later overturned [32]. The case originated from a 1997 concession agreement in which PAM Jaya delegated operations to PT PAM Lyonnaise Jaya (Paljya) and PT Aetra Air Jakarta under a contractual structure that guaranteed private profit escalation while constraining public tariff adjustments, producing chronic service failures that were disproportionately borne by low-income residents. In 2012, the Coalition of Jakarta Residents Opposing Water Privatization/ *Koalisi Masyarakat Menolak Swastanisasi Air Jakarta* (KMMSAJ) filed a citizen lawsuit (*gugatan warga negara*), arguing that the arrangement violated Article 33 (3) of the 1945 Constitution, which mandates state control over natural resources for the people's benefit. The Central Jakarta District Court ruled in favor of the residents in March 2015, finding the operators negligent in fulfilling the human right to water, a finding reinforced by the Constitutional Court's simultaneous annulment of Law No. 7 Year 2004 on Water Resources,

the Jakarta High Court reversed this decision in 2016 on the grounds of contractual continuity, and the Supreme Court ultimately restored the original ruling in October 2017, annulling both concession contracts and ordering the return of water services to public management.

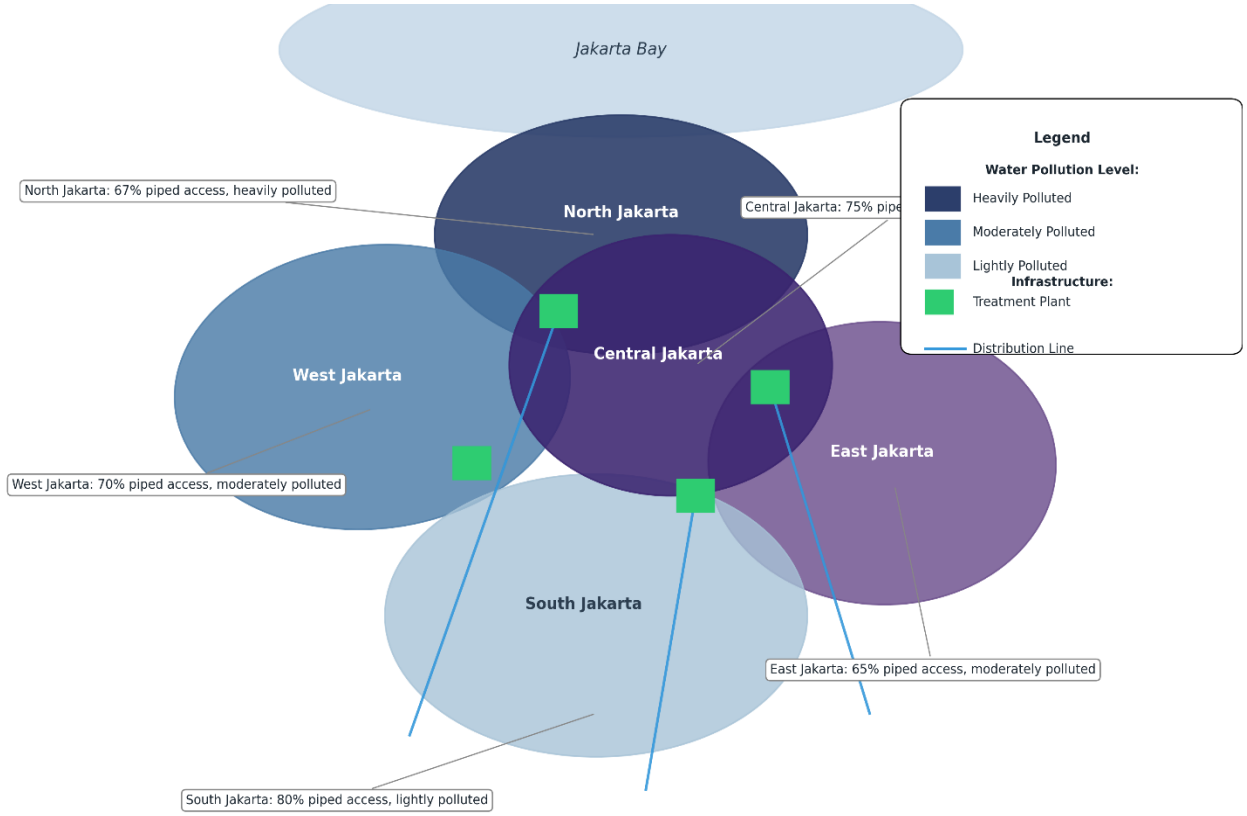

Figure 3. Water access and pollution in Jakarta Districts. This figure illustrates disparities in piped water access and pollution levels across Jakarta's districts. It presents the spatial relationship between service coverage and environmental degradation, highlighting inequalities in water access and exposure to contamination. The figure demonstrates that districts with lower infrastructure coverage often experience higher environmental risks, reflecting uneven fulfilment of public trust obligations.

Table 3. Jakarta water privatization timeline and outcomes. This table summarizes the evolution of Jakarta's water privatization arrangements.

Period	Privatization model	Key actors	Coverage achieved (%)	Major issues
1995–2023	Full-service concession	PT Aetra Air Jakarta (East); PT PAM Lyonnaise Jaya (West)	65	Tariff increases, service inadequacy, contract disputes, court challenges
2023–present	Asset-focused privatization	PT Moya Indonesia (infrastructure); PAM Jaya (service delivery)	67.65	Limited coverage improvement, continuing affordability issues, Infrastructure-service coordination gaps

This legal uncertainty reflects the tension between economic efficiency and public rights frameworks. The judicial trajectory of this landmark case, progressing from the District Court's recognition of citizens constitutional water rights through the High Court's reversal favoring private contractual interests to the Supreme Court's ultimate restoration of the original ruling at cassation, illustrates the structural vulnerability of public trust enforcement in Indonesia. While the final outcome vindicated citizen standing, the protracted litigation spanning five years exposed a critical institutional gap: the absence of clear statutory guidance on how courts should interpret PTD obligations when they conflict with privatization agreements. This ambiguity means that water rights protection remains contingent on appellate correction rather than predictable doctrinal application, rendering constitutional guarantees functionally insecure despite their ultimate judicial reaffirmation.

Furthermore, PAM Jaya's piped water infrastructure further compounds these issues. Although treatment plants produce water that meets quality standards, aging distribution systems introduce secondary contamination. Turbidity levels in some areas reach 20,000 NTU (standard: < 100 NTU), while bacterial contamination occurs through corroded iron pipes [33]. This systemic failure directly violates citizens' constitutional right to clean water.

Privatization failures are marked by chronic underinvestment in several factors. Since network expansion, inequitable service distribution that prioritizes wealthier districts over low-income neighborhoods, and persistent gaps in coverage have driven extensive groundwater extraction, with approximately 32% of residents relying primarily on groundwater [34,35]. This unsustainable extraction has contributed to land subsidence of 0 to 28 cm/year according to studies, creating a compound environmental crisis [36]. The resulting land subsidence exacerbates the vulnerability of Jakarta to flooding. It compromises critical infrastructure, including buildings, roads, and water distribution networks, thereby creating a self-perpetuating cycle in which infrastructure damage further reduces access to piped water services and increases dependence on groundwater extraction. This environmental degradation represents a clear breach of the PTD, as the state's failure to provide adequate water services has forced citizens to deplete a shared natural resource in ways that threaten the long-term sustainability and habitability of the entire metropolitan region.

Water Quality Crisis and Public Health Implications

Jakarta's water quality issues present a critical public health challenge that directly undermines citizens' constitutional right to clean water. Figure 4 presents the water quality measurement results from Jakarta's major rivers and groundwater monitoring points. The contamination levels documented across these monitoring sites represent a systematic violation of the state's constitutional obligation under article 33 of the constitution to manage water resources for the people's greatest benefit, as citizens are effectively denied access to safe water despite living in a water-abundant archipelagic nation. Moreover, these water quality failures disproportionately impact low-income communities that lack access to alternative water resources or treatment technologies, creating environmental justice concerns that compound constitutional right violations with socioeconomic inequities.

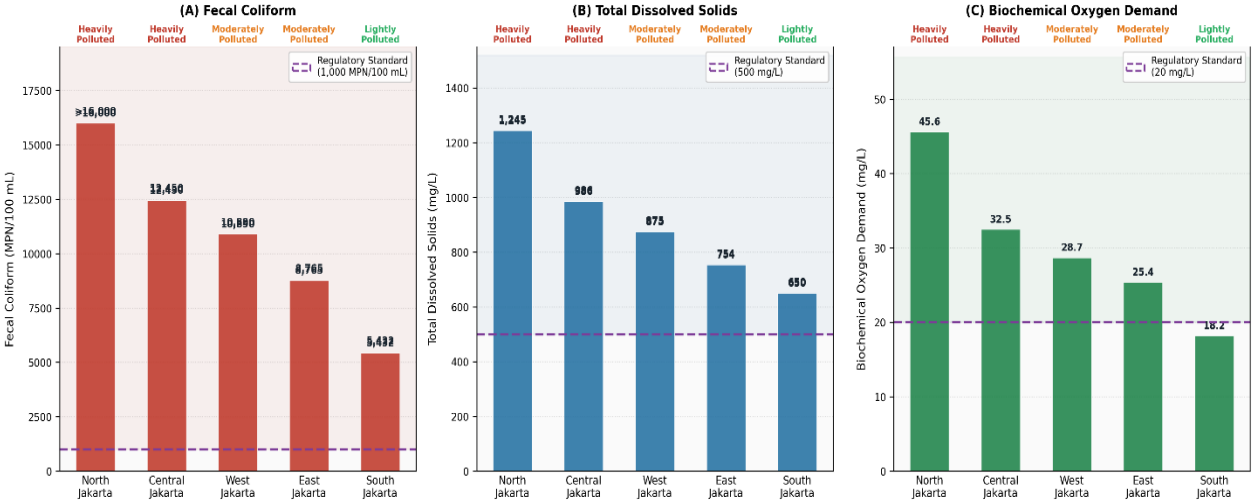

Figure 4. Water quality parameters in Jakarta's main water sources [37]. This figure presents contamination levels across major rivers and groundwater monitoring points in Jakarta, including indicators such as fecal coliform, total dissolved solids, and other pollutants. It compares observed values against regulatory standards and shows spatial differences in water quality conditions. The figure highlights the scale of water quality deterioration and its implications for public health and state trusteeship obligations.

All major rivers exhibit severe contamination exceeding safety standards, with fecal coliform levels ranging from 443% to over 1,500% above the permissible limits. Northern groundwater shows saltwater intrusion (70% total dissolved solids/TDS exceedance), whereas southern groundwater remains within acceptable parameters. This spatial gradient demonstrates unequal public trust protection across socioeconomic zones, with low-income northern communities experiencing a disproportionate resource degradation. Analysis of

official monitoring data revealed alarming levels of contaminants across multiple water sources. Major rivers, including the Ciliwung, Sunter, and Kalibaru Timur, consistently exhibit pollution levels that exceed regulatory standards, particularly for fecal coliform, total coliform, and ammonia [37]. The Ciliwung River, which flows through Central Jakarta, experiences the highest levels of contamination, characterized by visible pollution and foul odors, indicating the presence of severe organic and industrial waste pollution. Key water quality parameters by Jakarta district can be seen in the Table 4 below.

Table 4. Key water quality parameters by Jakarta District [37]. This table presents water quality indicators across Jakarta District, including fecal coliform, dissolved solids, biological oxygen demand, and heavy metal contamination. It highlights spatial variations in pollution severity and compares observed conditions with regulatory standards. The table demonstrates unequal environmental burdens and differing levels of trust resource impairment across districts.

District	Fecal coliform (MPN/100mL)	Total dissolved solids (mg/L)	BOD (mg/L)	Heavy metals	Classification
North Jakarta	> 16,000	1,245	45.6	Detectable Pb, Hg	Heavily polluted
Central Jakarta	12,450	986	32.5	Detectable Pb	Heavily polluted
West Jakarta	10,890	875	28.7	Low detection	Moderately polluted
East Jakarta	8,765	754	25.4	Low detection	Moderately polluted
South Jakarta	5,432	650	18.2	Below detection	Lightly polluted
Regulatory Standard	*< 1,000*	*< 500*	*< 20*	*Nondetectable*	-

Examined through the PTD framework, this spatial distribution of contamination reveals the unequal fulfilment of trusteeship obligations. The doctrine requires equitable access to trust resources by all beneficiaries. However, the data demonstrate that northern Jakarta residents, predominantly from lower-income communities, experience disproportionate trust impairment, raising both constitutional and environmental justice concerns about whether the state adequately protects the interests of all beneficiaries equally. This contamination extends to groundwater sources, with 93% of monitoring points showing elevated total coliform levels and 60% exceeding total dissolved solids standards [38].

Northern Jakarta faces the most severe contamination, which is driven by dense settlements, inadequate sanitation, and industrial activities. Contamination poses significant public health risks, particularly for low-income communities that rely on untreated groundwater for drinking and household use. Industrial discharge from textile, chemical, and food processing facilities contributes heavy metals and organic pollutants that persist in aquifer systems for decades. Without immediate intervention and stricter enforcement of environmental regulations, contamination will continue to spread southward, potentially affecting millions of residents who depend on these water sources.

These contamination patterns represent a systematic breach of the state's fiduciary obligations under the PTD. As a trustee, the government bears the responsibility of maintaining water resources in a condition suitable for beneficial public use. The documented contamination levels demonstrate the failure to fulfil this duty, as the trust corpus (water resources) has been permitted to degrade beyond safe use standards, effectively denying beneficiaries access to the essential resources the state is constitutionally obligated to protect.

Discussion

Comparative Analysis: Jakarta and Flint Water Governance Failures

The Flint's water crisis (2014–2019) provides valuable comparative insights into Jakarta's water governance reforms. Both cases demonstrate how governance failures can undermine the PTD and threaten public health in the United States. Figure 5 presents a comparative timeline of the key governance decisions in both cases. In Flint, the emergency financial manager's decision to switch water sources without proper treatment protocols parallels Jakarta's inadequate oversight of private water utilities and of industrial discharge permits. Both crises reveal how cost-cutting measures and regulatory capture can prioritize short-term financial savings over long-term public health outcomes. The protracted legal battles and community mobilization efforts in Flint offer a roadmap for Jakarta's civil society organizations seeking accountability and compensation for water-related health damages. Key governance failures in the Jakarta and Flint water crisis comparison can be summarized in Table 5.

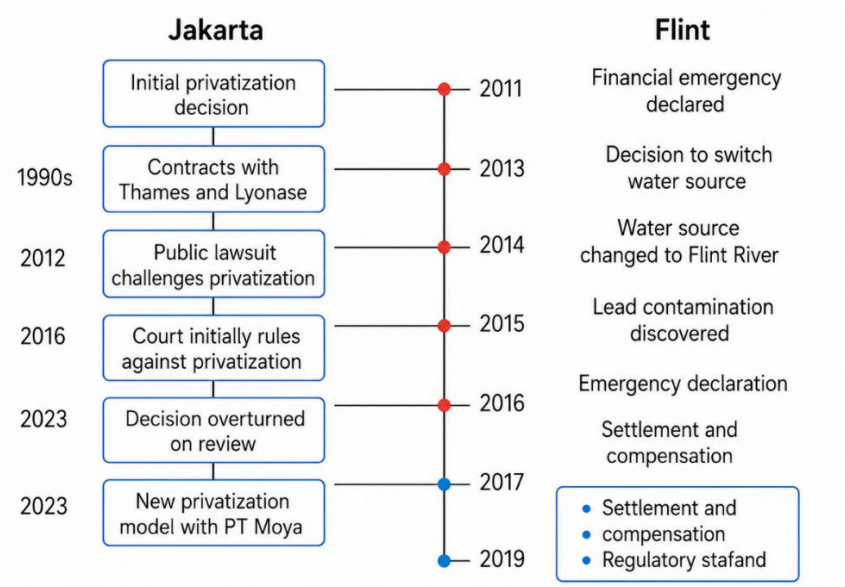

Figure 5. Comparative Timeline of Water Governance Decisions: Jakarta and Flint. This figure compares major governance decisions and crisis milestones in Jakarta and Flint over time. It highlights how regulatory failures, delayed responses, and accountability breakdowns developed in each case despite differing legal and political contexts. The figure illustrates shared structural patterns of Public Trust Doctrine failures and supports the comparative analysis of transferable governance lessons.

Table 5. Comparative analysis of water governance failures: Jakarta and Flint. This table compares the key governance failures and their consequences in Jakarta and Flint [39,40].

Analytical dimension	Jakarta, Indonesia	Flint, Michigan	Common governance failure
Accountability	Fragmented oversight across Jakarta Environmental Agency, PAM Jaya, and ministry with no unified authority; private partners face minimal contractual penalties for services failure.	State department environmental quality (DEQ) ignored environmental protection agency (EPA) warnings about corrosion; emergency manages bypassed elected officials; monitoring Responsibility dispersed preventing coordinated response.	Dispersed regulatory authority creates accountability gaps where no single entity bears responsibility for protecting public trust; institutional fragmentation enables mutual blame-shifting.
Participation	Jakarta High Court's reversal in Jakarta Residents v. Jakarta Governor PAM Jaya weakened citizen standing; limited statutory remedies for service failures leave communities dependent on ineffective administrative procedure.	Initial governmental denial of contamination; delayed state and federal intervention despite mounting evidence; protracted litigations for victims with limited compensation.	Weak judicial enforcement of public trust obligations; citizens lack effective legal remedies during crisis; enforcement depends on agency discretion rather than mandatory duties.
Regulatory capture	Private contractor influence on service standards and compliance timelines; performance targets weakened through renegotiation; commercial interest shape regulatory interpretation.	Cost cutting priorities overrode public health consideration under emergency management; financial advisor recommendation superseded technical expert warnings.	Economic interest prioritized over public health; inadequate separation between regulators and regulated entities; financial consideration dominate decision making despite health risks.
Crisis response	Persistent quality issues met with incremental response; no comprehensive remediation plan; problems acknowledged but systemic reforms delayed indefinitely.	Initial denial of crisis followed by emergency declaration after public pressure; federal oversight eventually imposed but only after extensive harm.	Delayed recognition of systemic failures; reactive rather than preventive governance; institutional resistance to acknowledging crisis until political pressure becomes overwhelming.

Cases demonstrate that water governance breakdowns originate from comparable underlying factors: placing economic interests above public health concerns, dispersed and unclear regulatory responsibilities, and insufficient mechanisms to ensure accountability. Nevertheless, the Flint situation ultimately generated more robust accountability measures through court-mandated enforcement and federal oversight institutional frameworks that remain underdeveloped in Indonesia's governance structure [39,40].

The Flint crisis reveals the importance of independent water quality monitoring systems, clear lines of regulatory authority, strong judicial enforcement of public trust obligations, multilevel accountability mechanisms, and formalized community participation channels. These elements provide a blueprint for governance reforms in Jakarta [41]. Critically, the Flint experience demonstrates that these governance components must function as an integrated system rather than an isolated mechanism, as the failure of any single element can compromise the entire public-trust framework and endanger citizen welfare. Additionally, the crisis highlighted the necessity of proactive transparency measures and early warning systems that can prevent governance failures before they escalate into public health emergencies, which is particularly relevant for Jakarta's complex urban water management challenges.

Integrated Governance Model: Balancing Rights Protection with Resource Management

Based on an analysis of Jakarta's water governance failures and comparative insights from successful models, this study constructs an integrated governance framework that operationalizes the PTD as an analytical instrument for evaluating institutional accountability in urban water management. Figure 6 illustrates the proposed model. Drawing on both empirical findings from Jakarta's governance deficiencies and lessons derived from comparative international cases, the synthesizes recurring structural variables such as institutional hierarchies, accountability mechanisms, and mandatory public participation mechanisms into a context-sensitive analytical model applicable to the Indonesian environment. The model functions as a diagnostic and evaluative instrument, offering a theoretically grounded basis through which scholars and policymakers may assess the degree to which water governance arrangements fulfil or undermine public trust obligations, rather than prescribing policy outcomes.

Figure 6. Proposed integrated water governance model for Jakarta. This figure presents the integrated governance model proposed to strengthen implementation of the PTD in Jakarta. It illustrates the interaction among institutional architecture, accountability mechanisms, regulatory safeguards, participatory governance, and infrastructure management. The model demonstrates how these elements function collectively to improve protection of clean water rights.

The model encompasses five pivotal dimensions of governance: First, it emphasizes institutional architecture by designing a multi-tiered governance system with clearly delineated roles and coordination protocols. Second, it advocates for a robust regulatory framework that explicitly incorporates the PTD. Third, it

introduces accountability mechanisms, such as judicial oversight, independent evaluations, and participatory processes. Fourth, it includes safeguards to protect public interests in privatization contexts. Fifth, it addresses infrastructure management to guarantee system dependability and equitable access to services.

The resolution of the Flint water crisis demonstrated that restoring public trust requires not only technical remediation but also structural institutional reform [31], particularly the establishment of formalized multistakeholder oversight bodies capable of bridging governmental authority and community accountability. Drawing from Brazil's river basin committees (RBCs) model [42], which empirical studies have identified as effective in providing localized, need-based water governance through institutionalized civil participation, this study identifies the establishment of Jakarta watershed management councils with formalized participation from government agencies, civil society organizations, academic institutions, and community representatives. These councils would function as formalized advisory and monitoring bodies, operationalizing the participatory dimension of the PTD within Jakarta's administrative context. Therefore, proposed regulatory reforms to strengthen PTD implementation in Indonesia can be summarized in the Table 6 below.

Table 6. Proposed regulatory reforms to strengthen PTD implementation – integrated reform framework. This table presents proposed regulatory and technical reforms designed to strengthen PTD implementation in Jakarta's water governance. It identifies intervention domains, current conditions, proposed reforms, associated PTD elements, and implementation priorities. The table illustrates how legal, institutional, and technical reforms can be integrated into a comprehensive governance framework.

Reform category	Domain/ Intervention	Current status/ Framework	Proposed reform/ Target	PTD element advanced/ Priority	Estimated cost (USD millions)
PART A: REGULATORY REFORMS					
Regulatory	Water resource planning	Centralized planning with limited local input	Watershed-based planning with formalized stakeholder participation	Public participation in resource decisions	-
Regulatory	Privatization contracts	Limited public interest safeguards; Profit-oriented	Explicit public service obligations, Performance-based penalties, Affordability requirements	Protection of public access rights	-
Regulatory	Water quality standards	Fragmented monitoring; Limited enforcement	Independent monitoring authority; mandatory disclosure; citizen enforcement rights	Preservation of resource quality	-
Regulatory	Infrastructure development	Investment focused on profitable areas	Equity requirements; cross-subsidisation; universal service obligations	Equitable resource distribution	-
Regulatory	Judicial oversight	Limited standing for citizens; Inconsistent rulings	Expanded standing rights, PTD-specific judicial training, and clear public interest standards	Enforcement of trust obligations	-
PART B: TECHNICAL INTERVENTIONS					
Technical	Distribution network rehabilitation	30% leakage; bacterial contamination	< 10% leakage; zero bacterial contamination	High/immediate	450–600
Technical	Advanced treatment systems	Conventional treatment struggling with source contamination	Multi-barrier treatment for all contaminants	High/medium-term	300–400
Technical	Resilient storage systems	Vulnerable to flooding; Service interruptions	Continuous service during emergencies	Medium/medium-term	150–200
Technical	Groundwater management	Uncontrolled extraction; Land subsidence	Stabilized extraction; Artificial recharge	High/long-term	250–350
Technical	Decentralized systems for underserved areas	Limited coverage in informal settlements	Modular systems for > 95% coverage	Medium/medium-term	

This model directly addresses the implementation gaps identified in the analysis while preserving the centralized coordination necessary for large-scale resource management. The framework explicitly references public trust principles throughout regulatory instruments, creating multiple accountability pathways for citizens [43]. In addition, these technical interventions must be integrated with governance reforms to ensure sustainable implementation. The PTD provides the legal foundation for these investments by establishing access to clean water as a fundamental right that requires proactive protection [44,45].

Infrastructure and Technical Improvements

In addition to governance reforms, Jakarta must undertake extensive technical and infrastructure upgrades to ensure the realization of citizens' rights to safe and reliable water. These improvements are essential to address the long-standing issues related to water quality, unequal access, and system vulnerabilities. Priority interventions include expanding water treatment capacity, upgrading distribution networks and enhancing flood management systems. Figure 7 illustrates the priority infrastructure interventions for improving water quality, access, and resilience.

This analysis identified four technical priority areas. The first is distribution network rehabilitation. Jakarta's aging pipe network suffers from extensive leakage (25–30%) and contamination pathways. A systematic replacement program focusing on high-risk areas with corroded iron pipes would significantly improve water quality and reduce non-revenue water loss [46]. Second, treatment technology updates are required. Current water treatment facilities struggle with high turbidity and contamination levels in source waters. Advanced treatment technologies, including membrane filtration and advanced oxidation processes, are necessary to address Jakarta's complex contamination profile [47]. Third, resilient storage systems are required. Jakarta's frequent flooding disrupts water services when safe water is critical. Integrated water management through elevated storage systems, backup power supplies, and decentralized treatment capabilities can maintain services during emergencies [48,49]. Fourth, groundwater management. Addressing the groundwater crisis requires both regulatory measures (strict extraction limits) and technical solutions (artificial recharge systems and rainwater harvesting). Ongoing land subsidence presents an existential threat to Jakarta that directly intersects with water management [50].

Figure 7. Priority water infrastructure interventions for Jakarta. This figure summarizes the principal infrastructure interventions proposed to improve water quality, access, and system resilience in Jakarta. It includes priority measures related to treatment systems, distribution rehabilitation, resilient storage, and groundwater management. The figure illustrates how technical interventions complement governance reforms to support sustainable realization of water rights.

Conclusions

This study demonstrates that Jakarta's water governance failure constitutes a systematic deviation from PTD principles embedded in the Indonesian constitutional framework, as evidenced by three measurable indicators: accountability, enforceability, and participation, which collectively reveal critical implementation

gaps despite robust legal articulation in the 1945 Constitution and Law No. 17 of 2019 on Water Resources. Comparative analysis with the Flint's water crisis confirms that PTD violations are not isolated to Jakarta but reflect structural governance deficits that transcend different legal and socioeconomic contexts, suggesting that the gap between constitutional water rights and practical implementation is a systemic challenge in jurisdictions where public trust obligations remain institutionally underdeveloped. Theoretically, this study contributes an operationalizable PTD framework that bridges abstract legal doctrine and measurable governance performance, offering a transferable analytical tool for jurisdictions seeking to assess and strengthen water rights protection beyond purely normative approaches to water rights protection. From a policy standpoint, the findings underscore that legal reform alone is insufficient, since durable water governance transformation requires the simultaneous strengthening of judicial enforceability, institutional accountability structures, and meaningful citizen participation as mutually reinforcing pillars of public trust. Ultimately, Jakarta's water crisis represents both a constitutional failure and a governance opportunity, demonstrating that PTD can serve not merely as a theoretical construct but as a practical blueprint for translating constitutional water rights into a lived reality for urban residents across Indonesia and beyond.

Author Contributions

ABR: Conceptualization, Methodology, Investigation, Writing - Review & Editing.

AI Writing Statement

During the preparation of this work, authors used ChatGPT for language editing, grammar checking and improving sentence clarity. All analytical work including legal interpretation, comparative analysis, data analysis, and formulation of arguments was conducted independently by authors without AI assistance.

Conflicts of interest

There are no conflicts to declare.

References

1. Kirana, K.C. Pengelolaan Sumber Daya Air Berdasarkan Perspektif Hukum Indonesia. *Jurnal Indonesia Sosial Teknologi* **2021**, *2*, 1981–1988.
2. WHO (World Health Organization). *WHO Global Water, Sanitation and Hygiene Annual Report 2023*; WHO: Geneva, Switzerland, 2025; ISBN 978-92-4-010607-9.
3. Mongisidi, J.G.; Supit, C.J.; Mangangka, I.R. Analisis Sistem Penyediaan Air Bersih Di Desa Ranomerut Kecamatan Eris Kabupaten Minahasa. *Jurnal Sipil Statik* **2019**, *7*, 1015–1025.
4. BPS (Badan Pusat Statistika). *Statistik Air Bersih 2019-2023*; Badan Pusat Statistika: Jakarta, ID, 2024;
5. Indonesian Government. Republic of Indonesia the 1945 Constitution of the Republic of Indonesia. Available online: https://www.hukumonline.com/pusatdata/detail/lt4ca2eb6dd2834/undang-undang-dasar-1945/consolidations/ (accessed on 18 May 2026).
6. Indonesian Government. Republic of Indonesia Law Number 17 of 2019 on Water Resources. Available online: https://www.hukumonline.com/pusatdata/detail/lt5dae6d0230590/undang-undang-nomor-17-tahun-2019/translations/ (accessed on 18 May 2026).
7. Pambudi, A.S.; Kusumanto, T. Water resources governance in Indonesia towards environmental sustainability along with social and economic development. In *Environmental Governance in Indonesia: Environment & Policy*; Triyanti, A., Indrawan, M., Nurhidayah, L., Marfai, M.A., Eds.; Springer: Cham, Switzerland, 2023; Volume 61, pp. 289–311, ISBN 978-3-031-15903-9.
8. Pambudi, A.S.; Pramujo, B. Strengthening Water Governance and Regulatory Effectiveness for Equitable Access in Indonesia. *Journal of Governance and Local Politics* **2025**, *7*, 219–231.
9. Blumm, M.C.; Guthrie, R.D. Internationalizing the Public Trust Doctrine: Natural Law and Constitutional and Statutory Approaches to Fulifilling the Saxion Vision. *University of California Davis Law Review* **2012**, *44*, 1–71.

10. Hapsari, M.A.; Suswoto; Ariyani, N. Public Trust Doctrine in Indonesia: Expectation and Prospect. *IOP Conf. Ser.: Earth Environ. Sci.* **2022**, *1030*, 012024, doi:10.1088/1755-1315/1030/1/012024.
11. Cantor, A. The Public Trust Doctrine and Critical Legal Geographies of Water in California. *Geoforum* **2016**, *72*, 49–57, doi:10.1016/j.geoforum.2016.01.007.
12. World Bank. *Pathways to Integrated Urban Water Management for Greater Jakarta*; World Bank: Washington DC, USA, 2021;
13. McCaskill, J.; Haworth, J.; Harrington, J. A Case Study of Public Trust, Collective Action, and Water. *JPAG* **2019**, *9*, 30–40, doi:10.5296/jpag.v9i1.14129.
14. Castillo, K. Climate Change & The Public Trust Doctrine: An Analysis of Atmospheric Trust Litigatin. *San Diego Journal of Climate & Energy Law* **2015**, *6*, 221–245.
15. Paromita, G. Public Trust Doctrine: Implications for Democratisation of Water Governance. *NUJS Law Review* **2016**, *9*, 67–91.
16. Blackmore, A.C. Getting to Grips with the Public Trust Doctrine in Biodiversity Conservation: A Brief Overview. *Bothalia ABC* **2018**, *48*, 1–8, doi:10.4102/abc.v48i1.2308.
17. Arman, Z.; Arianto, T. The Study of Public Trust Doctrine Theory in Environmental Cases: Case Study of the New Mining Law. *eScience Humanity Journal* **2023**, *4*, 92–99.
18. LoPreiato, E. The Public Trust as an International Solution to Climate Inaction. *German Law Journal* **2024**, *25*, 481–496, doi:10.1017/glj.2024.17.
19. Indonesian Government. Republic of Indonesia Government Regulation Number 122 of 2015 on Drinking Water Supply System. Available online: https://www.hukumonline.com/pusatdata/detail/lt568cda4ed5b81/peraturan-pemerintah-nomor-122-tahun-2015/translations/ (accessed on 18 May 2026).
20. Indonesian Government. Republic of Indonesia Law Number 11 of 1974 on Irrigation. Available online: https://www.hukumonline.com/pusatdata/detail/367/undangundang-nomor-11-tahun-1974/document/ (accessed on 18 May 2026).
21. Indonesian Government. Republic of Indonesia Presidential Regulation Number 12 of 2025 on the National Medium Term Development Plan 2025–2029. Available online: https://www.hukumonline.com/pusatdata/detail/lt67bc3f4056777/peraturan-presiden-nomor-12-tahun-2025/ (accessed on 18 May 2026).
22. Maskur, M.A. Kebijakan Pengelolaan Air Pasca Putusan Mahkamah Konstitusi Tentang Undang-Undang Sumber Daya Air. *Jurnal Konstitusi* **2019**, *16*, 510–531, doi:10.31078/jk1634.
23. Rahayu, P.; Woltjer, J.; Firman, T. Water Governance in Decentralising Urban Indonesia. *Urban Studies* **2019**, *56*, 2917–2934, doi:10.1177/0042098018810306.
24. Rosso, R. On Seven Principles of Water Governance. *Water* **2025**, *17*, 1–16, doi:10.3390/w17060896.
25. US Supreme Court. Illinois Central R. Co. v. Illinois, 146 U.S. 387 (1892). Available online: https://supreme.justia.com/cases/federal/us/146/387/ (accessed on 18 May 2026).
26. Blumm, M.C.; Schwartz, Z. The Public Trust Doctrine Fifty Years after Sax and Some Thoughts on Its Future. *SSRN Journal* **2020**, doi:10.2139/ssrn.3567536.
27. Oakes, A.R. Judicial Resources and the Public Trust Doctrine: A Powerful Tool of Environmental Protection? *Transnational Environmental Law* **2018**, *7*, 469–489, doi:10.1017/S2047102518000213.
28. Ali, F.; Lestari, D.L.; Putri, M.D.; Azmi, K.N. Analysis of the Institutional Development of Drinking Water Supply Systems in XYZ City, Indonesia Coastal Area. *River* **2023**, *2*, 158–168, doi:10.1002/rvr2.49.
29. Indonesian Government. Republic of Indonesia Law Number 25 of 2009 on Public Service. Available online: https://www.hukumonline.com/pusatdata/detail/lt4a715279424d7/undangundang-nomor-25-tahun-2009/ (accessed on 18 May 2026).
30. Nursantosa, I.; Paskalis, T.; Hariyadi, M.; Ramhadan, M. Analisis Pengelolaan Sumber Daya Air oleh BUMN, BUMD dan BUMS Sebagai Bentuk Kerjasama dalam Meningkatkan Perekonomian Nasional. *Jurnal Ilmiah Wahana Pendidikan* **2023**, *9*, 219–230.
31. BPS (Badan Pusat Statistik). *Jumlah Penduduk Menurut Kabupaten/Kota Di Provinsi DKI Jakarta (Jiwa) 2023*; Badan Pusat Statistik: Jakarta, ID, 2024;

32. Central Jakarta District Court. Decision of the Central Jakarta District Court Number 527/PDT.G/2012/PN.JKT.PST Available online: https://www.hukumonline.com/pusatdata/detail/lt59e42724c6ebf/putusan-pengadilan-negeri-jakarta-pusat-nomor-527-pdtg-2012-pnjktpst/ (accessed on 18 May 2026).
33. Dinas Lingkungan Hidup DKI Jakarta. *Pemantauan Kualitas Air Tanah Di Provinsi DKI Jakarta Tahun 2023*; Dinas Lingkungan Hidup DKI Jakarta: Jakarta, ID, 2023;
34. Nurfaizah, A. Swastanisasi Air di DKI Jakarta Berakhir, Cakupan Pelayanan Baru 65 Persen. Available online: https://www.kompas.id/baca/metro/2023/02/01/pekerjaan-rumah-menanti-pam-jaya-pascabe
rakhirnya-kontrak-dengan-aetra-dan-palyja (accessed on 25 February 2026).
35. Rismansyah, M.R.; Suryanti, N.; Astriani, N. Remunisipalisasi Pengelolaan Air Bersih oleh Pemerintah Provinsi DKI Jakarta Sebagai Upaya Perlindungan Keuangan Daerah dan Pemenuhan Hak Atas Air Bagi Warga Jakarta. *Maj. Huk. Nas.* **2020**, *50*, 133–157, doi:10.33331/mhn.v50i1.57.
36. PAM JAYA (Perusahaan Umum Daerah Air Minum Jaya). Annual Report Perusahaan Umum Daerah Air Minum Jaya (PAM JAYA). 2023. Available online: https://pdampusat.com/front_assets/pdf/Laporan%20Tahunan%20PAM%20JAYA%202023.pdf (accessed on 25 February 2026).
37. Dinas Lingkungan Hidup DKI Jakarta. *Laporan Pemantauan Kualitas Lingkungan Air Sungai Provinsi DKI Jakarta*; Dinas Lingkungan Hidup DKI Jakarta: Jakarta, ID, 2023;
38. Ghiffari, M.N.; Nandita, P.T. Mengatasi Penurunan Tanah Dan Krisis Air di Jakarta. *Economic Brief: Environmental Policy Update* **2024**, *1*, 1–21.
39. Ismowati, M. Profile of Pam Jaya and Private Partners in Clean Water Supply Jakartan (Case Study Year 1998-2012). *KnE Social Sciences* **2018**, *3*, 481–493, doi:10.18502/kss.v3i10.2928.
40. Jacobson, P.D.; Boufides, C.H.; Chrysler, D.; Bernstein, J.; Citrin, T. The Role of the Legal System in the Flint Water Crisis. *Milbank Quarterly* **2020**, *98*, 554–580, doi:10.1111/1468-0009.12457.
41. Ruckart, P.Z.; Ettinger, A.S.; Hanna-Attisha, M.; Jones, N.; Davis, S.I.; Breysse, P.N. The Flint Water Crisis: A Coordinated Public Health Emergency Response and Recovery Initiative. *Journal of Public Health Management and Practice* **2019**, *25*, 1–11, doi:10.1097/PHH.0000000000000871.
42. Masten, S.J.; Davies, S.H.; Mcelmurry, S.P. Flint Water Crisis: What Happened and Why? *Journal American Water Works Association* **2016**, *108*, 22–34, doi:10.5942/jawwa.2016.108.0195.
43. OECD (Organisation for Economic Co-operation and Development). *Water: Water Resources Governance in Brazil*; OECD Publishing: Paris, 2015; ISBN 978-92-64-23812-1.
44. Woodhouse, P.; Muller, M. Water Governance—An Historical Perspective on Current Debates. *World Development* **2017**, *92*, 225–241, doi:10.1016/j.worlddev.2016.11.014.
45. Johnson, R.W.; Goeppele, C.; Jansen, D.; Paschal, R. *The Public Trust Doctrine and Coastal Zone Management in Washington State*; Washington Department of Ecology: Olympia, USA, 1991;
46. Ness, S.E. Water We Cannot See: Codifying a Progressive Public Trust to Protect Groundwater Resources from Depletion. *Vanderbilt Law Review* **2023**, *76*, 953–997.
47. Delinom, R.M. Groundwater Management Issues in the Greater Jakarta Area, Indonesia. In Proceedings of International Workshop on Integrated Watershed Management for Sustainable Water Use in a Humid Tropical Region, University of Tsukuba, Tsukuba, Japan, 31 October 2007; pp. 40–54.
48. Saleh, T.; Affiandi, Z.N.; Widiaputri, N.A.; Sholichah, P.A.; Pusponegoro, F.; Alridho, L.R.; Dwijayanti, S.; Alghifary, D.R.; Nugraha, I.M.S.; Adityosulindro, R.M.S.; et al. *Pedoman Teknis Smart Water & Smart Wastewater Management: Pemanfaatan Teknologi Cerdas Dalam Pengelolaan Air Bersih dan Air Limbah Untuk Ibu Kota Nusantara*; Direktorat Transformasi Hijau Kedeputian Tranformasi Hijau dan Digital Otorita Ibu Kota Nusantara: Balikpapan, ID, 2024;
49. Herlambang, A. Teknologi Penyediaan Air Minum untuk Keadaan Tanggap Darurat. *Jurnal Air Indonesia* **2018**, *6*, 52–63, doi:10.29122/jai.v6i1.2455.
50. Muhajir, M.; Sumardjono, M.S.W.; Manurung, T.; Ferdinand, J. Harmonisasi Regulasi Dan Perbaikan Tata Kelola Sumber Daya Alam Di Indonesia. *Jurnal Antikorupsi INTEGRITAS* **2019**, *5*, 1–13.