

URBAN WATERSHED CONSERVATION UNDER MULTI-ACTOR GOVERNANCE: EVIDENCE FROM ZAMBOANGA CITY, PHILIPPINES

¹Aldrin S. Valerio, MPA, CHRP

¹College of Public Administration and Development Studies
Western Mindanao State University

valerio.aldrin@wmsu.edu.ph¹

Abstract

Urban watersheds that supply drinking water to secondary cities often sit at the intersection of protected-area regulation, local land-use politics, and customary institutions. This article examines governance dynamics shaping watershed protection and conservation in Pasonanca Natural Park (PaNP), Zamboanga City, Philippines—an urban-source watershed that supports municipal water security and biodiversity conservation. Using a qualitative–quantitative case study design, the study integrates (a) institutional and policy analysis of multi-level mandates under the National Integrated Protected Areas System and local government authorities, (b) land-cover assessment using government land-cover products and related protected-area reporting, and (c) documentary review of water-dependency and management constraints. Anchored in scholarship on polycentric and collaborative environmental governance, the analysis assesses how authority, coordination, financing, and legitimacy influence implementation outcomes (Dietz et al., 2003; Emerson et al., 2012; Ostrom, 2010). Findings indicate that PaNP’s statutory protection under national protected-area law is associated with sustained forest dominance, yet governance performance is constrained by institutional fragmentation across agencies and jurisdictions, limited enforcement capacity relative to watershed scale, and weak alignment between principal water beneficiaries and conservation financing. Land-use pressures concentrate along buffer-zone interfaces, where regulatory instruments are less integrated with protected-area management. Indigenous Subanen governance contributes conservation-consistent norms, but participation remains largely consultative rather than decisional, affecting legitimacy and compliance incentives (Dawson et al., 2021; Garnett et al., 2018). The article argues that urban watershed sustainability requires institutional reforms that (1) strengthen cross-boundary coordination and adaptive review cycles, (2) establish stable financing linked to ecosystem service beneficiaries, and (3) formalize co-management arrangements that recognize indigenous authority. These reforms can improve watershed resilience, reduce service vulnerabilities, and align urban water security with equitable conservation outcomes.

Keywords: watershed governance; protected areas; collaborative governance; urban water security; indigenous co-management; Philippines; Pasonanca Natural Park

1. INTRODUCTION

Urban water services depend on upstream ecosystems whose governance frequently spans multiple jurisdictions and actors. In many secondary cities, watershed protection is formally anchored in environmental law, but day-to-day management and land-use control are shaped by local politics, enforcement capacity, and cross-agency coordination (Bennett & Satterfield, 2018; Pahl-Wostl et al., 2007). Where watersheds are also protected areas, governance complexity intensifies: conservation mandates, community livelihoods, and infrastructure-driven water demand generate coordination problems and accountability gaps characteristic of polycentric systems (Ostrom, 2010).

Zamboanga City is a highly urbanized center in Western Mindanao. Its water security is tied to upland catchments that feed surface-water sources, particularly within and around protected landscapes connected to the Tumaga River system (Zamboanga City Water District [ZCWD], 2022). Pasonanca Natural Park (PaNP), a large protected area recognized for biodiversity and watershed services, covers roughly 17,414 hectares and contains multiple watershed sub-systems (ASEAN Centre for Biodiversity, n.d.). The park’s ecological integrity therefore functions as a public-value asset: it underpins water supply reliability while also sustaining

habitat for threatened and endemic species (ASEAN Centre for Biodiversity, n.d.; Pasion et al., 2021).

Despite its importance, urban watershed conservation is rarely determined by legal protection alone. Empirical work on governing common-pool resources underscores that outcomes depend on the fit between rules and local conditions, monitoring and enforcement, and the perceived legitimacy of institutions (Dietz et al., 2003). In protected areas, financing stability and equity in participation shape both effectiveness and fairness (Dawson et al., 2021; Emerton et al., 2018). For urban watersheds, a recurring governance dilemma is benefit–burden mismatch: downstream users capture water benefits, while upstream agencies and communities bear a disproportionate share of conservation costs (Bennett et al., 2021; Ostrom, 2010).

This article analyzes PaNP as an urban watershed governance case to address the question: How do multi-actor governance arrangements influence watershed protection outcomes and implementation performance in an urban protected area context? The contribution is twofold. First, it synthesizes institutional fragmentation and coordination constraints as mechanisms shaping land-use pressure and enforcement limits. Second, it frames policy options that align ecosystem-service beneficiaries, protected-area institutions, and indigenous governance for more adaptive and equitable watershed stewardship (Emerson et al., 2012; Garnett et al., 2018).

2. Study Area: Pasonanca Natural Park and the Zamboanga Urban Watershed

PaNP is located within Zamboanga City and spans upland forests and watershed systems linked to surface-water resources (ASEAN Centre for Biodiversity, n.d.). It is recognized as a biodiversity stronghold, with extensive dipterocarp forests and documented threatened species (ASEAN Centre for Biodiversity, n.d.; Pasion et al., 2021). The park’s watershed functions connect directly to urban consumption patterns through municipal water abstraction and treatment systems (ZCWD, 2022).

As an urban-proximate protected landscape, PaNP faces distinctive interface pressures. Buffer-zone land uses—settlement expansion, agriculture, and infrastructure—create edge effects and encroachment risks that are not fully addressed by protected-area rules alone (Bennett & Satterfield, 2018). These dynamics are characteristic of “scale mismatch” in environmental governance: decision authority and financing are distributed across institutions whose jurisdictions do not map neatly onto ecological boundaries (Ostrom, 2010; Pahl-Wostl et al., 2007).

3. CONCEPTUAL FRAMEWORK

The analysis draws on three complementary governance lenses:

Commons governance and institutional fit. Effective watershed protection requires rules that match ecological boundaries, credible monitoring, graduated sanctions, and conflict-resolution mechanisms (Dietz et al., 2003). Fragmentation weakens these design features.

Polycentric and multi-level governance. Watershed governance is typically distributed across multiple centers of decision-making (national agencies, LGUs, protected-area boards, utilities, communities). Polycentricity can enhance problem-solving but also produces coordination costs and accountability gaps without strong bridging arrangements (Ostrom, 2010).

Collaborative governance regimes. Cross-boundary environmental problems often require structured collaboration among state and non-state actors, supported by shared motivation, joint

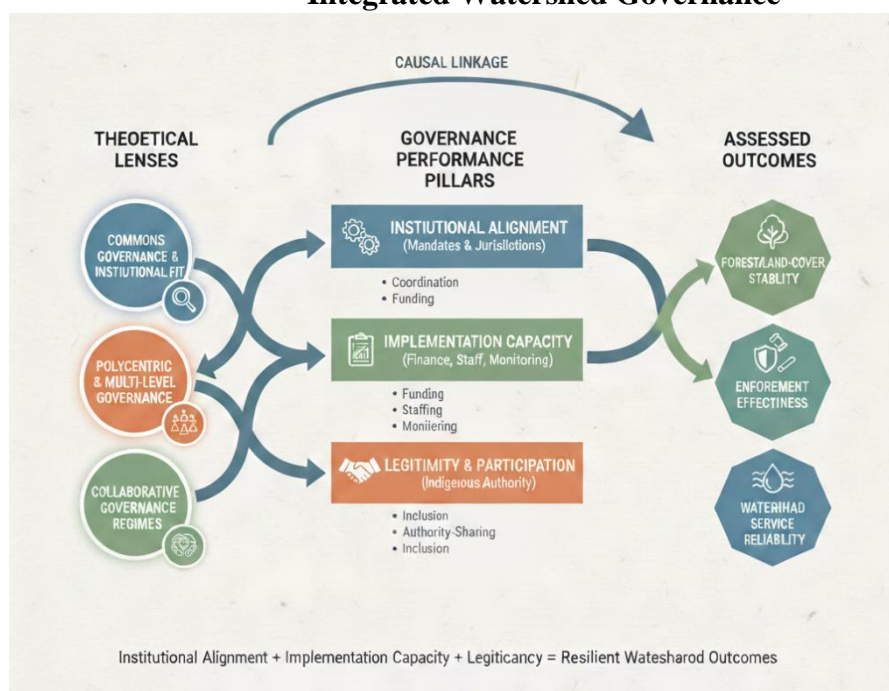
capacity, and procedural legitimacy (Emerson et al., 2012). Where indigenous institutions are involved, equity and authority-sharing are central to legitimacy and compliance (Dawson et al., 2021; Garnett et al., 2018).

From these perspectives, the study treats governance performance as a function of:

- (a) institutional alignment across mandates and jurisdictions;
- (b) implementation capacity (financing, staffing, monitoring); and
- (c) legitimacy and participation, including indigenous authority.

Outcomes are assessed in terms of forest/land-cover stability, enforcement effectiveness, and watershed service reliability.

Figure 1.
Integrated Watershed Governance



4. METHODS

4.1 Research design

A qualitative–quantitative case study design was employed to examine governance arrangements and link them to observed conservation pressures and management constraints. This approach is consistent with institutional analyses of environmental governance that integrate rules-in-use, actor roles, and outcome indicators (Emerson et al., 2012; Ostrom, 2010).

4.2 Data sources and evidence base

Policy and institutional documents on protected-area governance and local land-use authority (e.g., enabling protected-area statutes and relevant LGU mandates).

Government land-cover products and protected-area reporting used to identify land-use pressure patterns and forest-cover trajectories (e.g., NAMRIA outputs and protected-area reports) (National Mapping and Resource Information Authority [NAMRIA], 2023; DENR–Biodiversity Management Bureau [DENR–BMB], 2022).

Water-sector planning and technical documents that contextualize urban water dependency on watershed sources (ZCWD, 2022).

Peer-reviewed literature on collaborative, polycentric, and equity-centered conservation governance (Bennett & Satterfield, 2018; Dawson et al., 2021; Dietz et al., 2003; Emerson et al., 2012; Garnett et al., 2018; Ostrom, 2010).

4.3 Analytical strategy

Evidence was analyzed in three steps:

1. Institutional mapping of actors (DENR units, Protected Area Management Board arrangements, LGU functions, water utility roles, indigenous councils) and their formal authorities and responsibilities.
2. Policy coherence review to identify overlaps, gaps, and boundary conditions between protected-area rules and buffer-zone land-use regulation.
3. Governance–pressure synthesis linking institutional fragmentation and capacity constraints to land-use pressures at interfaces, enforcement limitations, and financing instability, interpreted using commons and collaborative governance theory (Dietz et al., 2003; Emerson et al., 2012; Ostrom, 2010).

5. RESULTS

5.1 Multi-actor governance structure and institutional fragmentation

The Pasonanca Natural Park (PaNP) watershed is governed through a multi-actor arrangement characterized by multiple centers of authority. National environmental agencies exercise primary authority over protected-area management and enforcement, while local government units retain jurisdiction over land-use regulation outside park boundaries. The Protected Area Management Board (PAMB) serves as the primary policy-setting body but does not exercise direct operational control over enforcement activities. Water-system actors rely heavily on watershed ecosystem services for urban supply but remain institutionally detached from conservation financing and enforcement responsibilities.

A central empirical finding is the institutional separation between watershed beneficiaries and watershed managers. Urban water users and the local water utility derive substantial benefits from the watershed, yet responsibility for protection, monitoring, and enforcement rests largely with environmental agencies and protected-area institutions. This arrangement reflects a common governance risk in common-pool resource systems, where downstream benefits are diffuse while stewardship costs are concentrated upstream.

Table 1
Governance actors, roles, and observed institutional gaps in PaNP

Governance actor	Primary formal role	Observed governance gap
National environmental agencies	Protected-area authority and enforcement	Enforcement constrained by staffing and budget limitations
Protected Area Management Board (PAMB)	Policy formulation and strategic direction	Limited operational control over enforcement
Local government units	Land-use regulation outside park boundaries	Limited influence within protected-area jurisdiction
Water utility	Major downstream beneficiary of watershed services	No fixed contribution to conservation financing
Indigenous councils	Customary stewardship and resource use regulation	Consultative participation without binding decision authority

5.2 Policy coherence and cross-boundary implementation gaps

Protected-area statutes provide a strong legal basis for conservation within park boundaries. However, implementation gaps emerge at jurisdictional interfaces where land-use pressures concentrate. Local ordinances regulating settlement expansion and land conversion apply only outside protected-area boundaries, creating a governance seam between national conservation authority and local land-use control.

While policy objectives across institutions broadly align toward watershed protection, implementation remains fragmented across jurisdictions. The absence of integrated planning frameworks and joint enforcement protocols allows land-use pressures to accumulate along buffer zones, gradually weakening watershed integrity even where core forest protection remains effective.

5.3 Land-use pressure patterns and forest-cover implications

Land-cover analysis indicates that PaNP remains predominantly forested, consistent with expectations under statutory protection. However, non-forest land uses are present and spatially concentrated in accessible areas and buffer zones where monitoring coverage is thinner and competing land-use claims are more likely to occur.

Table 2.
Land-cover distribution in Pasonanca Natural Park (2022)

Land-cover class	Area (hectares)	Share of total area (%)
Forest	14,380	82.6
Shrubland	1,420	8.2
Agriculture	1,120	6.4
Built-up areas	214	1.2
Water bodies	280	1.6

Forest cover exceeds the commonly cited watershed protection threshold of 80 percent. However, agricultural and built-up land uses—together accounting for over 7 percent of total area—signal ongoing conversion pressure. Over the period examined, increases in agricultural and built-up areas amounted to approximately 580 hectares, with losses concentrated along western and southern buffer zones adjacent to urban barangays.

5.4 Watershed protection performance indicators

To assess conservation effectiveness beyond land-cover patterns, the study examined key watershed protection performance indicators, comparing observed values with commonly used benchmarks.

Table 3
Watershed protection performance indicators

Indicator	Benchmark value	Observed value
Forest cover	≥ 80%	82.6%
Urban water supply reliance on watershed	≤ 70%	74%
Ranger density	1 ranger per 1,000 hectares	1 ranger per 4,300 hectares

Although forest cover meets the benchmark for watershed protection, water-supply reliance exceeds recommended thresholds, increasing system vulnerability. Most notably, ranger density falls well below accepted benchmarks, indicating limited enforcement capacity relative

to watershed scale. This imbalance suggests that current conservation outcomes are maintained under conditions of institutional strain rather than robust governance capacity.

5.5 Financing and resource allocation gaps

Financing instability emerges as a persistent constraint. Protected-area management relies primarily on national appropriations and limited user fees, which are insufficient to support sustained enforcement and monitoring. Despite the watershed’s central role in urban water provision, no institutionalized mechanism exists to channel a fixed share of water-service revenues toward watershed protection.

This absence of beneficiary-linked financing reinforces a benefit–burden mismatch, wherein downstream users benefit from ecosystem services without proportionate contribution to conservation costs, limiting long-term investment in protection and restoration.

Table 4

Governance performance summary across key dimensions

Governance dimension	Empirical observation	Performance implication
Financing stability	No dedicated watershed fund or fixed revenue share	High vulnerability
Enforcement capacity	Ranger density far below benchmark	Capacity deficit
Boundary governance	Weak integration between protected-area and LGU land-use controls	Interface risk
Indigenous participation	Consultative but non-decisional	Legitimacy gap

5.6 Indigenous governance, participation, and legitimacy

Subanen indigenous governance contributes customary norms regulating hunting, tree cutting, and water use that align with conservation objectives. These practices support ecological integrity, particularly in remote areas where formal enforcement presence is limited. However, indigenous participation in formal governance structures remains largely consultative, without binding decision authority.

This limitation affects both equity and effectiveness. Where customary institutions lack meaningful authority, opportunities for locally grounded monitoring, social enforcement, and adaptive management are underutilized—especially in boundary zones where formal enforcement capacity is weakest.

6. DISCUSSION

6.1 Effectiveness under statutory protection: Necessary but insufficient

PaNP’s protected status supports forest retention and watershed function, demonstrating the value of strong legal designation. Yet, governance effectiveness is not guaranteed by law alone. The case illustrates the gap between formal rules and implementation conditions—a theme central to commons governance research (Dietz et al., 2003). The key limiting factors are institutional fragmentation, financing gaps, and capacity constraints.

6.2 Urban demand and governance scale mismatch

Urban water demand increases the strategic value of PaNP’s watershed services (ZCWD, 2022). However, the institutions consuming these services—utilities and downstream users—are not structurally integrated into watershed protection responsibilities at a level commensurate with benefits. This creates a scale mismatch: ecological stewardship is

organized through protected-area governance, while the primary drivers of demand and potential financing are organized through water-service systems (Ostrom, 2010).

6.3 Collaborative governance as a corrective mechanism

The evidence supports the argument that PaNP requires a more explicit collaborative governance regime, with defined joint goals, shared capacity, and institutionalized cross-boundary procedures (Emerson et al., 2012). Collaboration is not merely stakeholder consultation; it is a governance architecture that enables co-production of rules, joint monitoring, and coordinated enforcement across jurisdictions.

6.4 Equity and co-management: From consultation to authority-sharing

Indigenous governance integration is a practical and normative issue. The broader conservation literature emphasizes that equitable governance improves both legitimacy and outcomes (Dawson et al., 2021; Garnett et al., 2018). For PaNP, the implication is to move from consultative participation to structured authority-sharing arrangements that formalize indigenous roles in decision-making, monitoring, and enforcement, thereby expanding governance reach where state capacity is thin.

7. Conclusion and Policy Recommendations

7.1 Conclusion

This study shows that PaNP's statutory protection is associated with strong baseline conservation outcomes, but urban watershed sustainability is constrained by institutional fragmentation, limited enforcement capacity, and weak alignment between ecosystem-service beneficiaries and conservation financing. Buffer-zone governance remains a critical vulnerability, where disjointed regulatory instruments allow land-use pressure to concentrate at jurisdictional seams. Subanen customary institutions provide conservation-consistent governance, but limited authority within formal structures reduces legitimacy and foregoes a potentially powerful compliance mechanism.

7.2 Policy recommendations

Institutionalize cross-boundary coordination. Establish formal coordination protocols linking protected-area governance, LGU land-use planning, and water-sector stakeholders, with shared targets and joint monitoring indicators (Emerson et al., 2012; Ostrom, 2010).

Create stable, beneficiary-linked financing. Operationalize watershed financing instruments (e.g., watershed user fees or ecosystem service payments) that connect downstream water-service benefits to upstream protection and restoration investments (Bennett et al., 2021; Emerton et al., 2018).

Strengthen enforcement capacity and monitoring systems. Increase ranger coverage and logistical support, complemented by community-based monitoring arrangements that extend surveillance reach and reduce response gaps (Dietz et al., 2003).

Formalize co-management with indigenous institutions. Upgrade indigenous participation from consultation to authority-sharing in key decisions and enforcement design, consistent with evidence linking indigenous stewardship to ecological integrity and equity outcomes (Dawson et al., 2021; Garnett et al., 2018).

Integrate buffer-zone land-use governance with protected-area objectives. Align local ordinances and comprehensive land-use planning with protected-area management plans to reduce edge conversion pressures and create coherent land-use controls across boundaries (Bennett & Satterfield, 2018; Pahl-Wostl et al., 2007).

Embed adaptive governance cycles. Require periodic policy and performance review (e.g., every 3–5 years) that uses monitoring data to revise rules, budgets, and coordination mechanisms in response to climate variability and demand growth (Pahl-Wostl et al., 2007).

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