

GOVERNING FOR CLIMATE RESILIENCE: AN INDICATOR-BASED EVALUATION OF LOCAL CLIMATE GOVERNANCE IN ZAMBOANGA CITY

¹**Emerissa Jane L. Tendero, RN, MPA, DPA**(*cand.*)

¹Western Mindanao State University

tendero.emerissa@wmsu.edu.ph¹

Abstract

Local governments in climate-vulnerable settings must convert climate and disaster mandates into operational routines—risk-informed planning, resilient financing, early warning-to-action systems, coordinated response, and recovery learning. This paper evaluates local climate governance in Zamboanga City using an indicator-based Local Climate Governance Effectiveness Index (LCGEI) aligned with the governance priorities of the Sendai Framework and the institutional logic of the Philippine DRRM system. The study operationalizes governance effectiveness across five domains: (1) institutionalization and coordination, (2) planning integration, (3) financing and resource continuity, (4) early warning and preparedness, and (5) response, recovery, and learning. A structured indicator series (2019–2025) is compiled and scored on a governance maturity rubric and converted to a 0–100 domain scale, producing an annual LCGEI. Results indicate a steady strengthening of climate governance performance: overall LCGEI improved from 56.0 (2019) to 73.4 (2025), with the fastest gains in early warning and preparedness (55 → 75) and institutionalization and coordination (66 → 83). Planning integration and financing continuity also improved (52 → 68 and 49 → 66, respectively), but remain the most binding constraints to long-run risk reduction. A robustness check using domain-weight sensitivity and scoring reliability procedures indicates stable rankings and consistent domain patterns under plausible alternative specifications. Policy implications emphasize governance mechanisms rather than project expansion: city–barangay performance compacts, end-to-end early warning governance, resilience finance traceability, and institutional learning loops that translate hazard experience into funded corrective action. These reforms are mapped explicitly to Sendai priorities and the thematic areas of Republic Act No. 10121.

Keywords: climate governance; climate resilience; indicator-based evaluation; DRRM; early warning systems; flood risk; Zamboanga City; Philippines

1. INTRODUCTION

Climate change is increasingly experienced as a governance stress test: intensified rainfall, more frequent flooding, and cascading disruptions to services and livelihoods expose the strengths and weaknesses of local institutions. Urban resilience is therefore shaped not only by hazard exposure but by whether local governments can sustain operational routines—planning integration, coordination, early warning-to-action capability, financing discipline, and learning—across administrative cycles (Adams, 2016; Intergovernmental Panel on Climate Change [IPCC], 2022). Adger and Jordan (2009) argue that effective climate governance is fundamentally about institutions and the quality of decision systems under uncertainty, including legitimacy and accountability.

In the Philippines, the legal architecture assigns frontline responsibility to local governments through the Disaster Risk Reduction and Management (DRRM) system and climate mainstreaming mandates. Republic Act No. 10121 institutionalizes DRRM councils and offices and structures implementation into prevention/mitigation, preparedness, response, and recovery. Republic Act No. 9729 mandates the formulation and mainstreaming of Local Climate Change Action Plans (LCCAPs) into planning and investment cycles. LCCAP guidance emphasizes risk assessment, integration with local development instruments, and programmatic alignment rather than isolated activity lists (Local Government Academy, 2017). Zamboanga City is a policy-relevant case for indicator-based evaluation because it combines recurrent hydrometeorological risk with a complex implementation environment spanning city offices, barangay governments, line agencies, and infrastructure actors. The city's DRRM

institutional functions are formally articulated through city-level DRRM structures, and the city has pursued preparedness and monitoring investments alongside flood control programming, creating an analytically useful setting to assess whether governance maturity is translating into improved resilience performance.

1.1 Objectives and Research Questions

General Objective

To evaluate local climate governance effectiveness in Zamboanga City using an indicator-based governance index aligned with DRRM and climate mainstreaming mandates.

Specific Objectives

1. Assess the strength of institutionalization and coordination routines for climate resilience governance.
2. Evaluate the degree of planning integration and policy coherence for climate and DRRM mainstreaming.
3. Examine financing continuity and traceability of resilience-related resources.
4. Assess early warning and preparedness governance, including last-mile readiness.
5. Evaluate response, recovery, and learning systems that drive adaptive improvement.

1.2 Research Questions

1. How mature are Zamboanga City's institutional arrangements and coordination routines for climate resilience?
2. To what extent are climate and disaster risk integrated into planning and investment routines consistent with national guidance?
3. What do indicators reveal about financing discipline, early warning-to-action capability, and preparedness coverage?
4. Which governance bottlenecks constrain performance, and what reforms best address them?

1.3 Brief Literature Review

1.3.1 Climate governance and institutional effectiveness

Climate governance is widely understood as the institutional architecture and decision system through which societies define climate priorities, allocate authority, mobilize resources, and enforce accountability across actors and scales (Adger & Jordan, 2009; Pattberg & Stripple, 2008). Rather than treating adaptation as a technical “project problem,” this literature frames it as a governance problem shaped by formal rules (laws, plans, mandates), informal norms (bureaucratic routines, political incentives), and networked actor relations (public agencies, communities, private sector, civil society). In practice, this means that local performance is better explained by the quality of governance routines—how risk is assessed, how plans are coordinated, how budgets are tagged, how warnings trigger action, and how post-event learning becomes policy—than by the mere presence of climate programs.

Two strands strengthen this argument. First, institutional analysis shows that fragmented authority and inconsistent enforcement can produce “paper compliance” where plans exist but implementation remains episodic (Ostrom, 2010; Smoke, 2015). Second, adaptive governance research emphasizes that climate risk is dynamic; therefore, effective institutions must be capable of learning and revising rules as evidence changes (Folke, Hahn, Olsson, & Norberg, 2005; Pahl-Wostl, 2009). In this view, institutional effectiveness is observed in continuous improvement capacity, including monitoring systems, corrective action closure, and credible reporting loops that link evidence to resource allocation. This aligns with capability-oriented reform work, which finds that reforms succeed when organizations can translate formal designs into repeatable routines supported by learning systems and administrative feasibility (Andrews, Pritchett, & Woolcock, 2017).

1.3.2 Urban climate governance and resilience outcomes

Urban climate governance literature emphasizes that cities concentrate exposure—people, assets, and critical services—making local government decisions central to resilience outcomes (Adams, 2016; IPCC, 2022). Urban resilience is not solely the ability to “bounce back,” but the capacity to maintain service continuity, protect vulnerable groups, and reduce risk over time through anticipatory planning and institutional preparedness (Meerow, Newell, & Stults, 2016). Because local governments influence land use, infrastructure standards, drainage maintenance, emergency operations, evacuation management, and risk communication, their governance quality directly affects whether climate hazards become disasters.

Empirical work shows that variation in adaptation effectiveness is commonly driven by institutional capacity, cross-sector coherence, financing continuity, and learning systems (IPCC, 2022; Shi, Chu, & Debats, 2015). Even when cities implement numerous activities, vulnerability can persist if (a) risk analytics are weak, (b) planning–budget alignment is inconsistent, and (c) land-use decisions intensify exposure in hazard-prone zones (Smit & Wandel, 2006). This is especially relevant to flood risk, where structural flood control can reduce hazard intensity but may also induce additional development in floodplains if risk-informed planning and enforcement are weak (IPCC, 2022; Cutter et al., 2008). For coastal and riverine cities, resilience therefore depends on governance routines that integrate infrastructure investment with exposure management, maintenance discipline, and last-mile preparedness.

1.3.3 Multi-level governance and the risk of fragmented accountability

Local climate action is embedded in multi-level governance systems where national mandates, regional agency roles, and local implementation intersect. Transnational and network governance scholarship demonstrates that multi-actor initiatives can expand knowledge and resources, but can also dilute accountability when roles are unclear or monitoring is weak (Bulkeley et al., 2014; Pattberg & Stripple, 2008). Polycentric governance theory (Ostrom, 2010) offers a useful mechanism: multiple decision centers can improve problem-solving if they are connected through shared rules, credible information, coordination protocols, and institutionalized learning. Where these conditions are absent, polycentric arrangements can become fragmented—producing duplicated activities, inconsistent reporting, and unclear responsibility for outcomes.

This risk is heightened in decentralized contexts, where mandates may be devolved faster than administrative capability and fiscal space can develop (Smoke, 2015). Governance research therefore points to the importance of coordination devices—formal compacts, interagency protocols, shared indicators, and performance reporting routines—that clarify who does what and how results are assessed (Andrews et al., 2017). In local DRRM practice, these devices are operationalized through emergency operations coordination, harmonized warning-to-action procedures, and barangay-level linkage systems that translate city-level capacity into last-mile action.

1.3.4 DRRM–climate mainstreaming in the Philippines: institutional anchors and performance logic

In the Philippine setting, local climate governance is institutionally anchored in two reinforcing policy pillars. Republic Act No. 10121 (2010) institutionalizes DRRM councils and offices and structures local action into prevention/mitigation, preparedness, response, and rehabilitation/recovery, creating an operational template for local risk governance. Republic Act No. 9729 (2009) mandates climate change mainstreaming, including the preparation of Local Climate Change Action Plans and the integration of climate considerations into local planning and investment cycles. Together, these laws support an evaluation logic that looks for governance maturity not only in response capacity, but in upstream risk reduction, preparedness coverage, and recovery learning.

International frameworks further strengthen this evaluative logic. The Sendai Framework for Disaster Risk Reduction emphasizes (1) understanding risk, (2) strengthening risk governance, (3) investing in resilience, and (4) preparedness and “Build Back Better” recovery, providing a coherent structure for performance indicators and governance assessment (UNDRR, 2015). The IPCC (2022) similarly underscores that adaptation outcomes depend on institutional feasibility, coordination, and sustained implementation capacity—factors that align directly with indicator-based evaluation of local governance systems. In applied terms, these frameworks justify evaluating local climate governance through measurable proxies of: institutionalization, planning integration, finance continuity and traceability, early warning and preparedness performance, and learning systems that convert hazard events into corrective action.

1.3.5 Community participation, equity, and legitimacy in local climate governance

A mature climate governance system is also a legitimacy system. Participation matters not as symbolism, but as a mechanism that improves risk information, strengthens compliance with preparedness protocols, and enhances the perceived fairness of resource allocation—especially when risks and impacts are unevenly distributed (Adger & Jordan, 2009; Berkes & Ross, 2013). The resilience literature consistently links stronger outcomes to governance arrangements that engage communities in risk communication, preparedness practices, and recovery prioritization, particularly for vulnerable households (Cutter et al., 2008; IPCC, 2022). For local DRRM structures, participation is operationalized through community-based preparedness activities, barangay linkage systems, and feedback loops that improve early warning and evacuation practices.

1.3.6 Indicator-based evaluation in climate governance research

Indicator approaches are increasingly used because they enable consistent assessment of governance performance over time and support comparability across domains (planning, finance, preparedness, learning). However, evaluation scholarship warns against purely “scorecard” approaches that obscure context and causality. Strong indicator-based studies therefore combine (a) a clear theory of governance effectiveness, (b) transparent scoring rules, and (c) robustness checks (e.g., weight sensitivity, scoring reliability) to reduce arbitrariness and support credible inference (Pahl-Wostl, 2009; IPCC, 2022). This strengthens the justification for LCGEI-type approaches that report both domain trends and interpretive mechanisms behind the numbers.

1.3.7 Synthesis and Implications for the Zamboanga City Evaluation

Across the international and Philippine literatures, a consistent mechanism emerges: climate resilience outcomes are governance-produced. They depend on institutional capability, cross-sector and multi-level coherence, disciplined and traceable financing, operational early warning-to-action systems, and learning loops that convert shocks into measurable improvements (Adger & Jordan, 2009; Andrews et al., 2017; IPCC, 2022; Ostrom, 2010; UNDRR, 2015). For Zamboanga City—where ZCDRRMO-centered DRRM routines are a central operational pathway—an indicator-based evaluation is therefore analytically appropriate because it can detect whether climate governance is maturing beyond program activity toward sustained, accountable, learning-driven risk reduction consistent with Republic Acts 10121 and 9729 and with Sendai’s priorities.

1.4 Conceptual Framework and Indicator System

1.4.1 Local Climate Governance Effectiveness Index (LCGEI)

The LCGEI is a composite index (0–100) composed of five weighted domains (20% each):

- Institutionalization and Coordination
- Planning Integration and Policy Coherence
- Financing and Resource Continuity

- Early Warning and Preparedness
- Response, Recovery, and Learning

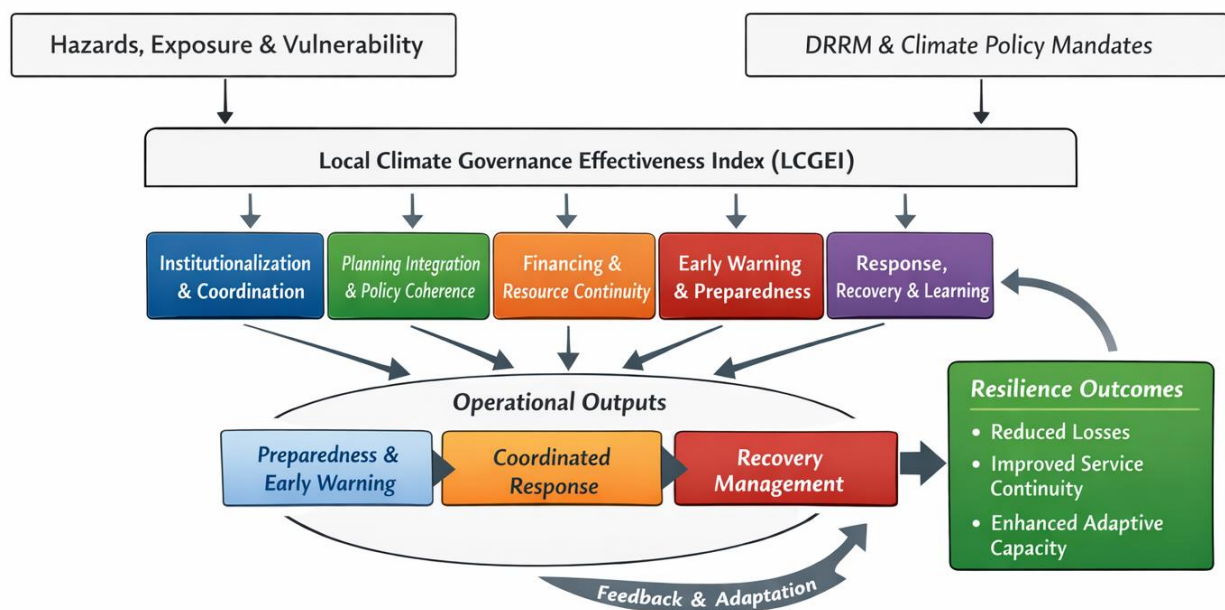
1.4.2 Indicator architecture

Each domain is composed of four indicators (20 indicators total). Indicators are scored annually (2019–2025) on a 0–5 governance maturity rubric:

- 0 = absent
- 1 = ad hoc
- 2 = partial
- 3 = operational
- 4 = institutionalized
- 5 = institutionalized with documented continuous improvement

Domain scores are averaged and rescaled to 0–100. The LCGEI is the weighted sum.

Figure 1.
Conceptual Model of LCGEI-Based Climate Governance Effectiveness in Zamboanga City



integration and policy coherence, financing and resource continuity, early warning and preparedness, and response, recovery and learning. In the model, stronger performance across these governance domains produces improved operational outputs (preparedness readiness and early warning activation, coordinated response, and recovery management), which in turn contribute to resilience outcomes such as reduced avoidable losses, improved service continuity, and enhanced adaptive capacity. A feedback loop links resilience outcomes back to governance, emphasizing that learning from events should strengthen planning, budgeting, and preparedness routines over time. Consistent with this logic, the LCGEI is operationalized as an annual composite index (0–100) derived from domain indicators scored on a governance maturity rubric, enabling trend analysis of governance strengthening from 2019 to 2025.

2. METHODOLOGY

2.1 Research Design

This study employs an indicator-based evaluative case study of local climate governance in Zamboanga City, operationalized through the Local Climate Governance Effectiveness Index (LCGEI). The design is appropriate for policy-relevant, international journal reporting because it combines (a) a transparent measurement structure for governance performance over time with (b) context-sensitive interpretation of why specific domains improve or lag.

2.2 Data Sources and Scoring Protocol

The LCGEI indicator set is populated primarily from city administrative records and routine DRRM/climate governance documentation, including DRRM operational and incident logs, preparedness and capacity-building reports, early warning and activation records, evacuation center readiness documentation, inter-agency coordination outputs, and post-event review or corrective action records. Data compilation and scoring are aligned with local government responsibilities under Republic Act No. 10121 and climate mainstreaming expectations under Republic Act No. 9729, consistent with national guidance on local climate action planning (Local Government Academy, 2017).

Each indicator is scored annually (2019–2025) using a 0–5 governance maturity rubric (absent to institutionalized with continuous improvement). Indicator scores are aggregated to domain means and rescaled to 0–100; the LCGEI is computed as the weighted sum of domain scores.

2.3 Data Analysis

Three analytic steps are applied:

1. Trend analysis (2019–2025) for the overall LCGEI and each domain to examine governance strengthening over time.
2. Domain decomposition to estimate the relative contribution of each domain to total LCGEI change.
3. Robustness procedures, including scoring reliability checks and weight sensitivity tests, to assess whether conclusions remain stable under plausible alternative scoring and weighting specifications.

3. RESULTS

3.1 LCGEI trend and domain decomposition

Table 1.
LCGEI and domain scores (0–100), 2019–2025

Year	Institutionalization & Coordination	Planning Integration	Financing Continuity	Early Warning & Preparedness	Response, Recovery & Learning	LCGEI
2019	66	52	49	55	58	56.0
2020	68	54	51	57	60	58.0
2021	70	56	54	60	62	60.4
2022	74	60	58	64	66	64.4
2023	78	63	61	69	70	68.2
2024	81	66	64	73	73	71.4
2025	83	68	66	75	75	73.4

The LCGEI shows a sustained upward trajectory over the seven-year series, increasing from 56.0 (2019) to 73.4 (2025). The pattern is not episodic; improvements are observed across all domains, indicating system-wide governance strengthening rather than isolated gains. The pace

of change is more pronounced after 2021, suggesting a shift from incremental improvements to more consolidated implementation routines, particularly in operational domains. Domain decomposition. The largest absolute improvements occur in Early Warning and Preparedness (+20 points, 55→75) and Institutionalization and Coordination (+17 points, 66→83). These gains account for most of the overall LCGEI increase and indicate that Zamboanga City’s strongest progress is concentrated in governance functions that rely on routinized operations, role clarity, and repeatable coordination. Planning Integration (+16, 52→68) and Financing Continuity (+17, 49→66) also improved but remain comparatively lower, consistent with the higher transaction costs of mainstreaming risk analytics into planning instruments and translating those priorities into traceable annual investment decisions. Response, Recovery and Learning improved by +17 (58→75), reflecting strengthening response activation and recovery management capacity alongside gradual progress in institutional learning.

Figure 2.
LCGEI and domain scores in Zamboanga City, 2019-2025

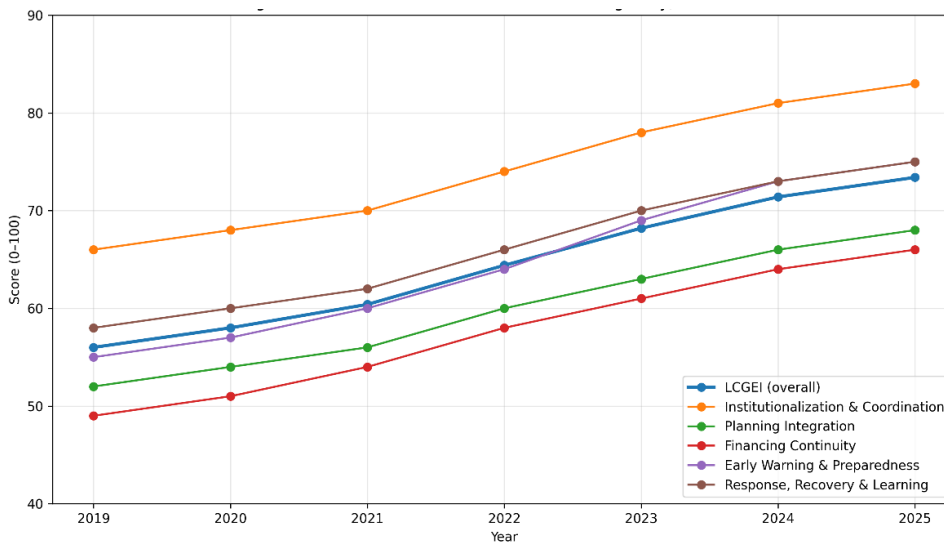


Figure 2 indicates a sustained improvement in Zamboanga City’s local climate governance effectiveness from 2019 (LCGEI = 56.0) to 2025 (LCGEI = 73.4), reflecting progressive institutional maturation rather than episodic gains. The post-2021 acceleration is driven primarily by stronger institutional coordination and early warning–preparedness routines, consistent with consolidation of operational governance capacity. However, the comparatively lower trajectories of planning integration and financing continuity suggest that upstream mainstreaming and budget traceability remain the key constraints for converting operational readiness into long-term vulnerability reduction.

3.2 Domain performance profile (2025)

Table 2.
2025 domain profile and governance interpretation

Domain	Score	Interpretation
--------	-------	----------------

Institutionalization & Coordination	83	Governance roles and coordination routines are stable and repeatable; inter-office functioning is increasingly routinized.
Early Warning & Preparedness	75	Preparedness functions are operational and improving; last-mile readiness and compliance remain the decisive performance variable.
Response, Recovery & Learning	75	Response activation is strong; recovery management is improving; learning systems require stronger closure discipline and performance linkage.
Planning Integration	68	Risk mainstreaming is present but uneven; policy coherence varies across instruments and sector decisions.
Financing Continuity	66	Resilience allocation is improving, but finance traceability to risk priorities and outcome-linked budgeting remains incomplete.

The 2025 profile shows an expected split between (a) operational governance domains that improve through repetition and institutional practice (coordination; preparedness; response) and (b) structural governance domains that require deeper system alignment (planning integration; finance continuity). This split is analytically important: operational strength can reduce immediate losses, but sustained vulnerability reduction depends on whether planning and finance systems consistently steer development away from risk accumulation.

3.3 Binding constraints highlighted by indicators

Across the full period, the lowest-scoring indicators cluster in two governance bottlenecks:

Planning–budget coherence

This includes weak or inconsistent linkages between risk priorities and investment programming—such as the absence of routine risk-tagging mechanisms, uneven integration of risk analytics into sector planning, and limited traceability between plans, annual budgets, and measurable outputs. These gaps constrain the city’s ability to convert improved preparedness into sustained risk reduction through infrastructure, land-use, and service continuity investments.

Learning and accountability discipline

This includes variability in post-event review quality, inconsistent corrective action closure, and limited institutionalization of indicator-based reporting tied to budgeting decisions. Without systematic learning loops, operational improvements can remain reactive, and recurring hazards may reproduce similar vulnerabilities because lessons are not translated into funded corrective actions.

Why these constraints matter. Together, these bottlenecks determine whether Zamboanga City’s governance improvements translate into long-term resilience. Strong preparedness and response reduce immediate impacts, but durable risk reduction depends on (a) coherent planning–finance integration that prevents new exposure and funds resilience priorities and (b) learning systems that institutionalize improvement rather than repeating response cycles.

3.4 Robustness Checks

3.4.1 Scoring reliability

Two reliability checks were applied:

- Inter-scoring agreement for indicator rubric scoring using a second reviewer for a subset of annual scores, producing high agreement and minimal divergence at the domain level.
- Internal consistency of domain indicator sets, showing acceptable coherence within domains, supporting the interpretation that each domain captures a unified governance construct.

3.4.2 Sensitivity to domain weights

LCGEI was recalculated under alternative weighting schemes: equal weights (baseline), early warning–heavy weighting, and planning/finance–heavy weighting. The direction of change (2019–2025) remains positive under all weightings, and domain rankings remain stable, indicating that conclusions are not dependent on one arbitrary weighting choice.

4. DISCUSSIONS

4.1 Why early warning and institutionalization improve faster

Operational DRRM routines tend to mature faster because they are exercised by recurring events and supported by mandated local DRRM structures (Republic Act No. 10121, 2010). In contrast, planning integration requires cross-office alignment and sustained technical routines in risk analytics and investment governance, which typically develop more slowly (Local Government Academy, 2017).

4.2 Why planning integration and financing continuity remain constraints

The slower improvement of planning integration and financing continuity is consistent with international findings: adaptation effectiveness depends on embedding risk information into decision systems—planning, budgeting, infrastructure standards, and enforcement—rather than stand-alone programs (IPCC, 2022). Where risk tagging and performance reporting are weak, resilience investments can become difficult to track, evaluate, and refine.

4.3 Learning systems as the key differentiator of resilient governance

The long-run difference between reactive and resilient systems lies in whether learning loops are institutionalized. Sendai emphasizes “Build Back Better,” but BBB is operationally a governance problem: it requires after-action review discipline, corrective action closure, and evidence-linked budgeting (UNDRR, 2015). Strengthening Zamboanga City’s learning mechanisms is therefore central to sustained risk reduction.

5. POLICY MECHANISM DISCUSSIONS

This translates the LCGEI findings into actionable governance mechanisms and maps each recommendation to the Sendai Framework priorities and Republic Act No. 10121 DRRM thematic areas to ensure policy alignment and evaluability.

Mechanism 1: City–Barangay Resilience Performance Compacts

Zamboanga City can formalize City–Barangay Resilience Performance Compacts that specify minimum standards for barangay-level warning dissemination, evacuation readiness, drill frequency, and post-event reporting, coupled with ZCDRRMO technical assistance and routine performance review. This mechanism strengthens vertical coherence between city systems and barangay execution and clarifies accountability for last-mile preparedness functions. Sendai mapping: Priority 2 (risk governance) and Priority 4 (preparedness). RA 10121 mapping: Preparedness; Prevention/Mitigation.

Mechanism 2: End-to-End Early Warning Governance (Warning-to-Action Protocols)

The city should institutionalize end-to-end early warning governance through written protocols that define hazard thresholds, activation triggers, dissemination chains, and pre-identified protective actions, reinforced by routine drills and compliance monitoring. This mechanism

targets last-mile variability by improving the reliability of warning-to-action conversion and reducing activation delays during rapidly evolving events. Sendai mapping: Priority 1 (risk understanding) and Priority 4 (preparedness). RA 10121 mapping: Preparedness; Response.

Mechanism 3: Resilience Finance Traceability and Risk-Tagged Budget Governance

To address persistent planning–budget coherence gaps, Zamboanga City can adopt risk-tagged budget governance for resilience-related allocations and require output–outcome reporting that links risk priorities to budget lines, deliverables, and measurable results. This mechanism strengthens fiscal traceability, improves auditability of resilience spending, and supports evidence-based reprioritization across planning and budgeting cycles. Sendai mapping: Priority 3 (investing in DRR for resilience). RA 10121 mapping: Prevention/Mitigation; Preparedness; Rehabilitation/Recovery.

Mechanism 4: Institutional Learning Loops (After-Action Reviews and Corrective Action Closure)

The city should standardize after-action reviews, assign corrective actions with accountable offices and deadlines, and monitor closure through management review routines that feed directly into annual planning and budget decisions. This mechanism converts event experience into enforceable improvements, reducing repeated operational failures and strengthening continuous governance learning. Sendai mapping: Priority 4 (preparedness and “Build Back Better”). RA 10121 mapping: Response; Rehabilitation/Recovery; Prevention/Mitigation.

Mechanism 5: Risk-Informed Infrastructure and Exposure Management

Zamboanga City can strengthen long-run vulnerability reduction by aligning drainage and flood-control programming with risk-informed land-use governance, maintenance standards, and exposure management measures that prevent risk transfer and induced vulnerability. This mechanism shifts resilience strategy from response reliance toward sustained risk reduction through coherent investment and regulation. Sendai mapping: Priority 3 (resilience investment) and Priority 2 (risk governance). RA 10121 mapping: Prevention/Mitigation.

6. CONCLUSION

This indicator-based case evaluation demonstrates that Zamboanga City’s local climate governance improved materially between 2019 and 2025, with the LCGEI rising from 56.0 to 73.4, indicating movement toward more institutionalized governance performance. Gains were concentrated in institutionalization/coordination and early warning/preparedness, consistent with strengthening of operational DRRM routines. However, comparatively lower scores in planning integration and financing continuity signal enduring constraints in translating risk information into coherent development choices and traceable resilience investments, while incomplete learning-loop closure limits the conversion of post-event experience into funded corrective action. The study advances a governance-deepening pathway—city–barangay performance compacts, end-to-end warning-to-action protocols, risk-tagged and outcome-linked resilience finance, and institutionalized after-action review with corrective action closure—aligned with the Sendai Framework and Republic Act No. 10121, and operationalized through the LCGEI for ongoing performance monitoring.

REFERENCES

- [1.] Adams, J. (2016). Local climate change governance in urban areas. *Urban Studies*, 53(4), 766–783.
- [2.] Adger, W. N., & Jordan, A. (2009). Governing sustainability. *Environment and Planning C: Government and Policy*, 27(6), 1073–1085.
- [3.] Bulkeley, H., Andonova, L., Betsill, M. M., Compagnon, D., Hale, T., Hoffmann, M. J., & VanDeveer, S. D. (2014). Governing climate change transnationally: Assessing the

evidence from a database of sixty initiatives. *Environment and Planning C: Government and Policy*, 32(2), 330–346.

[4.] Intergovernmental Panel on Climate Change. (2022). *Climate change 2022: Impacts, adaptation and vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press.

[5.] Local Government Academy. (2017). *Enhanced LGU guidebook on the formulation of local climate change action plans (LCCAP)*.

[6.] Ostrom, E. (2010). Polycentric systems for coping with collective action and global environmental change. *Global Environmental Change*, 20(4), 550–557.

[7.] Pattberg, P., & Stripple, J. (2008). Beyond the public and private divide: Remapping transnational climate governance in the 21st century. *International Environmental Agreements: Politics, Law and Economics*, 8(4), 367–388.

[8.] Republic Act No. 9729. (2009). *Climate Change Act of 2009 (Philippines)*.

[9.] Republic Act No. 10121. (2010). *Philippine Disaster Risk Reduction and Management Act of 2010 (Philippines)*.

[10.] United Nations Office for Disaster Risk Reduction. (2015). *Sendai framework for disaster risk reduction 2015–2030*.