

From Climate Early Warning to Government Action: Anticipatory Governance during Indonesia's 2026 Extreme El Niño

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Abstract

Extreme El Niño events are often treated as meteorological or agricultural problems, yet their consequences also test the anticipatory capacity of public administration. This study examines how climate early-warning information was translated into government action during Indonesia's 2026 extreme El Niño episode. Using qualitative secondary-data analysis, the study synthesizes official documents and updates issued by the Indonesian Agency for Meteorology, Climatology and Geophysics (BMKG), the National Disaster Management Agency (BNPB), the Ministry of Agriculture, and other public institutions up to 2 September 2026, together with scholarly and OECD literature on anticipatory governance. The analysis uses six dimensions: foresight and signal detection, policy translation, inter-agency coordination, preventive resource mobilization, local implementation, and monitoring and adaptive learning. The findings show a strong forecasting and warning capacity. BMKG progressively escalated its alerts from a high probability of strong El Niño to confirmed very strong conditions, while government agencies-initiated weather modification, drought preparedness, water distribution, pumping, irrigation optimization, and cross-sector coordination. However, public evidence is substantially stronger for activities and inputs than for integrated outcome measurement. Significant drought and wildfire impacts continued to be reported, and publicly available documents provide limited evidence linking specific warnings, pre-agreed administrative triggers, interventions, and avoided losses. The article therefore identifies a warning-to-action accountability gap: Indonesia demonstrates substantial anticipatory activity, but the institutionalization and public measurement of the full warning-to-action chain remain incomplete. Strengthening trigger-based protocols, interoperable risk data, pre-arranged financing, local implementation indicators, and post-event learning would improve anticipatory governance for future climate extremes.

Keywords: anticipatory governance; El Niño; public administration; climate risk; administrative capacity; Indonesia

1. Introduction

Climate extremes create governance problems because their effects cross administrative sectors, territorial boundaries, and conventional policy timelines. An El Niño event can simultaneously affect water availability, agricultural production, food prices, forest and land fires, public health, local fiscal pressure, and disaster-response capacity. The administrative challenge is therefore not simply to forecast the hazard. It is to convert uncertain but actionable climate information into timely, coordinated, and accountable public decisions before losses escalate.

This distinction is central to anticipatory governance. Quay (2010) conceptualizes anticipatory governance as a flexible decision approach for acting under climate uncertainty rather than waiting for perfect prediction. Muiderman et al. (2020) similarly emphasize that anticipatory climate governance concerns how imagined or expected futures shape present-day action. More recent OECD work frames anticipatory governance as a public-sector capacity involving future-readiness, observation of signals, exchange of intelligence, institutional structures, leadership support, and the ability to learn and adapt (Tönurist & Orlik, 2025). These perspectives shift analytical attention from forecasting accuracy alone to the institutional process through which forecasts are interpreted, translated, implemented, and revised.

Indonesia provides a particularly important setting for this problem. Its exposure to drought, forest and land fires, agricultural water stress, and regional food-supply disruption makes El Niño a multi-sector governance risk. During 2026, BMKG warnings escalated rapidly. In June, BMKG projected a drier and longer dry season, with 482 climate-season zones covering 56.18% of Indonesia's land area

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expected to experience below-normal rainfall and 437 zones expected to experience a longer-than-normal dry season. By late July, BMKG reported that El Niño was active and could reach very strong intensity. In the first two ten-day periods of August, Niño 3.4 sea-surface temperature anomalies reached +2.77°C and +2.99°C, respectively. By 2 September 2026, BMKG reported a JJA three-month ENSO index of +2.2, confirming a very strong El Niño episode (BMKG, 2026a, 2026b, 2026c, 2026d). Government action also intensified. National coordination forums brought together BMKG, BNPB, the Ministry of Home Affairs, the Ministry of Public Works, BPS, and other agencies. BMKG expanded weather-modification operations and called for integrated drought and fire mitigation. BNPB strengthened drought and wildfire preparedness, water distribution, bore-well and pipeline support, and contingency planning. The Ministry of Agriculture deployed early-warning systems, drought-risk mapping, irrigation optimization, pumping, and coordination with river-basin and local agencies. These actions indicate that climate forecasts were not ignored; they entered the administrative system and produced preventive measures.

Yet the existence of anticipatory activity does not by itself establish anticipatory governance effectiveness. By 24 July 2026, the Ministry of Agriculture reported 44,694 hectares of rice planting affected by drought and 12,304 hectares experiencing crop failure during January-July. BNPB reports in late July and early September continued to identify drought and forest and land fires as dominant disaster events. These outcomes do not prove that government action failed; extreme hazards can generate losses even under effective governance. They do, however, raise an important public-administration question: how can government demonstrate that warnings were translated into the right actions, in the right places, at the right time, and with measurable risk-reduction effects?

This article addresses that question by examining the 2026 El Niño episode as a test of anticipatory governance and administrative preparedness. The research question is: How effectively did Indonesia's public-sector governance architecture translate climate early-warning information into coordinated anticipatory action during the 2026 extreme El Niño? The study does not attempt a causal impact evaluation of specific interventions. Instead, it assesses the publicly documented warning-to-action chain and identifies strengths, institutional gaps, and accountability requirements for future climate-risk governance.

The article contributes to public-administration scholarship in two ways. First, it distinguishes forecasting capacity from administrative translation capacity. A government may possess sophisticated climate science yet still face coordination, financing, implementation, or accountability bottlenecks. Second, it proposes the warning-to-action accountability gap as an evaluative concept: the difference between documented anticipatory activities and publicly verifiable evidence showing how those activities changed exposure, vulnerability, or losses.

2. Methods

This study used a qualitative secondary-data design based on documentary analysis. The empirical focus was the Indonesian government response to the 2026 El Niño episode, with a data cut-off of 2 September 2026 for climate conditions and early September 2026 for disaster-response reporting. No survey, interview, field observation, or original meteorological modeling was conducted.

Documents were selected purposively from authoritative public sources when they contained evidence relevant to one or more stages of the warning-to-action process. The main empirical sources were BMKG seasonal forecasts, atmospheric-dynamics analyses, climate bulletins, and press releases; BNPB disaster situation reports and preparedness statements; Ministry of Agriculture releases on drought mitigation, irrigation, pumping, and affected rice areas; and BPS or Bank Indonesia releases used only where macroeconomic context was relevant. The conceptual sources included Quay (2010), Muiderman et al. (2020), the OECD Framework on Management of Emerging Critical Risks (OECD, 2024), and OECD guidelines on anticipatory governance for public-sector organizations (Tönurist & Orlik, 2025). The documents were coded against six analytical dimensions: (1) foresight and signal detection, referring to the generation and escalation of climate-risk information; (2) policy translation, referring to the conversion of warnings into plans, directives, or sectoral measures; (3) inter-agency and multilevel coordination, referring to information exchange and joint action across ministries, agencies, and local governments; (4) preventive resource mobilization, referring to the pre-impact deployment of

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financing, equipment, water-management measures, or operational capacity; (5) local implementation, referring to evidence that national warnings and policies reached affected territories and sectors; and (6) monitoring and adaptive learning, referring to the existence of outcome indicators, feedback, adjustment, and post-action evaluation.

The analysis followed a structured evidence-synthesis procedure. First, a chronology of warning escalation and government responses was reconstructed. Second, evidence was mapped to the six dimensions. Third, each dimension was assessed for the type of public evidence available: warning evidence, activity evidence, implementation evidence, or outcome evidence. The study deliberately avoids numerical scoring because publicly available documents differ in scope and reporting frequency. Instead, it identifies where the documentary record is strong and where important links in the governance chain remain difficult to verify.

A key limitation is that official public documents are not equivalent to complete administrative records. Absence of publicly reported evidence does not mean that an activity or monitoring system does not exist internally. Therefore, findings concerning gaps are framed as gaps in publicly verifiable governance evidence rather than definitive claims of institutional absence. Likewise, the study does not attribute drought, fire, crop loss, or inflation directly to governance performance or to El Niño alone.

Table 1. Analytical framework for assessing the warning-to-action chain

Governance dimension	Core administrative question	Indicative evidence	Primary risk if weak
Foresight and signal detection	Does government detect and communicate an escalating risk early enough for action?	Seasonal forecasts, ENSO monitoring, early warnings, risk maps	Late recognition or uncertainty not translated into preparedness
Policy translation	Are forecasts converted into operational plans and sector-specific measures?	Directives, preparedness plans, trigger protocols, mitigation programs	Forecasts remain informational rather than actionable
Inter-agency and multilevel coordination	Are responsibilities and information connected across agencies and levels of government?	Coordination meetings, joint operations, data sharing, central-local arrangements	Fragmented or duplicative responses
Preventive resource mobilization	Are resources deployed before or at early stages of impact?	Pumps, OMC, water infrastructure, logistics, financing, staffing	Reactive spending after losses have escalated
Local implementation	Do national measures reach exposed places and users?	District actions, water distribution, irrigation support, fire patrols	Implementation gaps and territorial inequality
Monitoring and adaptive learning	Can government show whether action reduced risk and adjust accordingly?	Outcome indicators, avoided-loss metrics, dashboards, after-action reviews	Activity reporting without demonstrable effectiveness

3. Results

3.1 Strong and Escalating Climate Early-Warning Capacity

The documentary record shows a clear escalation of climate-risk information across 2026. In June, BMKG warned that the dry season would be drier and longer than normal across large parts of Indonesia. Its June seasonal update projected below-normal rainfall across 482 seasonal zones covering 56.18% of the country's land area and longer-than-normal dry-season duration across 437 zones covering 48.77% of land area (BMKG, 2026a). At that stage, BMKG assessed the probability of at least moderate El Niño at 98% and strong El Niño at 62%.

By late July, BMKG stated that El Niño was already active and could reach very strong intensity, with risks including drought, forest and land fires, and disruption to strategic sectors (BMKG, 2026b). The signal then strengthened materially. BMKG recorded Niño 3.4 anomalies of +2.77°C in the first ten-day period of August and +2.99°C in the second ten-day period, both indicating very strong El Niño conditions (BMKG, 2026c). On 2 September, the agency reported a JJA three-month ENSO index of +2.2 and an August monthly index of +2.83, again classifying the episode as very strong (BMKG, 2026d).

This sequence is important from a governance perspective because it demonstrates that uncertainty was

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progressively reduced and communicated before and during the peak dry-season period. The state therefore possessed an increasingly strong informational basis for anticipatory action. The main governance question is not whether the hazard was visible, but how effectively changing risk levels were linked to administrative escalation.

3.2 Translation of Forecasts into Preventive Government Action

Official documents show that climate information was translated into multiple preventive actions. BMKG promoted cross-sector preparedness, expanded weather-modification operations in priority areas, and emphasized water availability and forest-fire prevention. On 29 June 2026, BMKG presented El Niño risks during a regional-inflation coordination forum attended by the Ministry of Home Affairs, BNPB, BPS, other ministries, and local-government stakeholders. This is evidence that climate information entered broader economic and administrative coordination rather than remaining within the meteorological agency.

The Ministry of Agriculture also adopted explicit anticipatory measures. Government releases describe early-warning systems, mapping of drought-prone areas, optimization of reservoirs and irrigation networks, pumping, pipelines, shallow and deep wells, and coordination with river-basin authorities, public-works agencies, disaster-management bodies, and local governments. These measures reflect an effort to translate a probabilistic climate forecast into concrete production-protection interventions (Ministry of Agriculture, 2026a, 2026b).

BNPB actions similarly combined prevention and response. Official reports refer to contingency planning, integrated patrols, hotspot detection, water sources for firefighting, distribution of clean water, bore wells, pipelines, weather modification, and readiness of personnel and equipment. The pattern indicates substantial administrative mobilization across disaster-risk and service-delivery functions (BNPB, 2026a, 2026b).

3.3 Cross-Sector Coordination Is Visible, but Outcome Accountability Is Fragmented

A major strength of the 2026 response is the visible presence of cross-sector coordination. Climate risk was discussed not only as a disaster issue but also in relation to agriculture, water, inflation, and regional administration. The involvement of BMKG, BNPB, the Ministry of Home Affairs, the Ministry of Agriculture, the Ministry of Public Works, BPS, and local governments reflects the multi-sector nature of the risk and is consistent with OECD principles for emerging critical risks, which emphasize information sharing, capability assessment, strategic planning, and adaptive implementation (OECD, 2024).

However, the public documentary record is much more detailed on agency activities than on integrated outcomes. BMKG reports forecast conditions; BNPB reports disaster events and response activities; the Ministry of Agriculture reports affected land and mitigation operations. These datasets are valuable, but they do not yet form a single publicly visible causal chain showing which warning threshold triggered which intervention, how quickly resources were mobilized, which locations were prioritized, and what losses were reduced relative to plausible alternatives.

This fragmentation matters for accountability. Coordination meetings and operational deployments are evidence of action, but they do not by themselves show administrative effectiveness. An anticipatory governance system should be able to demonstrate not only that agencies acted, but that they acted according to pre-defined risk triggers and that the sequence of actions produced measurable reductions in exposure or vulnerability.

3.4 Persistent Impacts Reveal Implementation Stress, Not Automatically Governance Failure

Despite substantial preventive action, significant impacts remained visible. The Ministry of Agriculture reported that, as of 24 July 2026, 44,694 hectares of rice planting had been affected by drought during January-July, including 12,304 hectares of crop failure (Ministry of Agriculture, 2026b). BNPB reports in late July described drought and forest and land fires as dominant disaster events. A 22 July report noted, among other cases, that drought in Bogor Regency affected 16,291 households or 52,602 people and documented ongoing water-distribution and fire-management operations (BNPB, 2026c). On 1 September 2026, BNPB again reported that disaster incidents remained dominated by forest and land fires and drought (BNPB, 2026d).

These impacts should not be interpreted simplistically. Extreme El Niño conditions can overwhelm even well-prepared systems and affected-area statistics do not establish a counterfactual of what would

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have occurred without intervention. At the same time, continuing impacts create an administrative need to identify where preparedness was sufficient, where it arrived late, where infrastructure constrained implementation, and where local capacity differed. The absence of such comparative outcome reporting limits the ability to distinguish unavoidable residual risk from preventable administrative loss.

The evidence therefore suggests a shift in the evaluative question. Rather than asking whether government acted, the more rigorous question is whether anticipatory actions were targeted, timely, and adaptive enough to reduce risk across different local contexts.

3.5 The Warning-to-Action Accountability Gap

The central finding is a warning-to-action accountability gap. Indonesia's public institutions generated high-quality risk signals and documented multiple anticipatory interventions. What is less visible in the public record is the institutional mechanism connecting forecast thresholds to mandatory administrative actions and then to measurable outcomes. The gap is therefore not a simple absence of action. It is a gap between action and verifiable performance logic.

A mature warning-to-action system would specify at least six linked elements: the risk signal, an agreed trigger threshold, the responsible agency, the pre-authorized action, the expected implementation time, and an outcome indicator. For example, a specified drought-warning threshold could automatically activate district-level irrigation audits, pump mobilization, water-allocation adjustments, fire patrol escalation, and targeted social-service preparedness. The same system would then record whether these actions occurred within the required period and whether affected populations, hectares, hotspots, or service disruptions were reduced.

The current public record provides many pieces of this chain but not consistently as a unified administrative accountability system. This limits policy learning because it is difficult to compare which combinations of early action were most effective across provinces and sectors.

Table 2. Evidence from the 2026 El Niño episode and its governance interpretation

Documented evidence	Governance signal	What can be concluded	What cannot be concluded
June 2026 BMKG forecast: 482 ZOM below-normal rainfall; 437 ZOM longer dry season	Early foresight and territorial risk identification	Government had substantial advance warning of a broad dry-season risk	That all exposed districts converted the warning into adequate action
Late July-August BMKG updates: El Niño active and then very strong	Escalating risk signal and need for administrative escalation	Risk information became more certain and severe over time	That agency response intensity automatically matched each escalation
Cross-sector coordination involving BMKG, BNPB, ministries, BPS and local stakeholders	Horizontal and vertical coordination	Climate risk entered multi-sector government decision processes	That coordination produced integrated targets or uniform local implementation
OMC, water distribution, bore wells, pipelines, pump mobilization and irrigation optimization	Preventive and responsive resource mobilization	Government used concrete operational instruments before and during impacts	The net causal effect or avoided losses of each intervention
44,694 ha rice affected by drought and 12,304 ha crop failure by 24 July	Residual impact and implementation stress	Material agricultural risk remained despite mitigation	That losses were caused by administrative failure or El Niño alone
BNPB reports continued dominance of drought and fires into early September	Persistence of hazard and need for adaptive management	The event required sustained rather than one-off preparedness	The counterfactual scale of disaster without government interventions

4. Discussion

The findings suggest that Indonesia is comparatively strong in anticipation as forecasting but less publicly demonstrable in anticipation as an integrated administrative performance system. This distinction is consistent with anticipatory-governance scholarship. Forecasting identifies plausible or probable futures; governance determines how institutions act on those futures in the present (Muiderman et al., 2020). The 2026 El Niño episode shows that sophisticated climate information is a necessary but insufficient condition for anticipatory public administration.

The first implication concerns administrative capacity. In climate-risk governance, capacity should not be defined only by the technical competence of meteorological agencies or the availability of emergency

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equipment. It also includes translation capacity: the institutional ability to convert signals into decisions across organizational boundaries. Translation capacity requires agreed thresholds, clear mandates, pre-arranged financing, interoperable data, local operating procedures, and the authority to act before losses are fully observable.

The second implication concerns coordination. The Indonesian response demonstrates substantial coordination activity, but public administration research should distinguish coordination forums from coordination performance. Effective coordination requires more than attendance at meetings or parallel agency programs. It requires shared objectives, synchronized timing, compatible indicators, and mechanisms for resolving territorial and sectoral trade-offs. Water allocated to agriculture, urban consumption, fire control, or hydropower, for example, may involve competing administrative priorities during severe drought.

The third implication concerns accountability under uncertainty. Traditional administrative accountability often evaluates whether budgets were spent and activities completed. Anticipatory governance requires an additional form of accountability: whether early action was reasonable given the information available at the time. This is challenging because successful prevention may produce an absence of visible disaster. Governments therefore need *ex ante* indicators and counterfactual-oriented evaluation designs capable of estimating avoided disruption, even when exact causal attribution is impossible.

The fourth implication concerns multilevel governance. National agencies can issue high-quality warnings and mobilize central resources, but climate impacts are experienced locally. District governments, BPBDs, agricultural services, irrigation managers, village institutions, and local communities become the final administrative interface. Variation in infrastructure, fiscal space, staffing, data capacity, and political attention can therefore produce uneven implementation. A national anticipatory system should identify not only where climatic exposure is high but also where local administrative capacity is weak.

The fifth implication concerns adaptive learning. Tõnurist and Orlik (2025) emphasize observation, exchange of intelligence, institutional structures, competencies, and learning as enabling conditions of anticipatory governance. Indonesia's multiple 2026 interventions create an opportunity for systematic after-action learning. Which districts activated preparedness earliest? Which pump, irrigation, water-distribution, or fire-prevention measures were most effective under which conditions? Which coordination arrangements reduced delays? Without standardized post-event evaluation, each El Niño risks becoming an emergency-management episode rather than a cumulative institutional-learning process.

Based on these findings, the article proposes an institutionalized warning-to-action protocol. First, BMKG risk thresholds should be translated into standardized sectoral trigger levels. Second, each trigger should have predefined administrative actions, responsible units, financing sources, and implementation deadlines. Third, a common dashboard should integrate climate exposure, agricultural stress, water availability, fire risk, response deployment, and service impacts. Fourth, local governments should report both activities and outcome indicators using comparable definitions. Fifth, after-action reviews should be required after each major climate episode and linked to revision of preparedness plans and budgets.

This model would also reduce the risk of over-centralization. Anticipatory governance should not imply that all decisions are made by central agencies. Rather, the central government should provide risk intelligence, standards, interoperable data, financing rules, and minimum trigger protocols, while local governments retain flexibility to adapt actions to local water systems, cropping patterns, ecosystems, and social vulnerabilities.

Finally, the concept of the warning-to-action accountability gap offers a broader contribution to public administration. Many contemporary governments possess expanding capacities for prediction through climate science, big data, artificial intelligence, health surveillance, and economic nowcasting. Yet the public value of predictive capacity depends on whether administrative systems can act on signals fairly, promptly, and accountably. The El Niño case illustrates that the frontier of governance is increasingly not prediction itself but institutionalized translation from prediction to preventive action.

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5. Conclusion

The 2026 extreme El Niño provides a revealing test of anticipatory governance in Indonesia. Official evidence demonstrates strong and progressively updated climate early-warning capacity, visible national coordination, and substantial preventive mobilization across weather modification, drought preparedness, water distribution, irrigation, pumping, agricultural risk management, and fire prevention. These are important governance strengths.

At the same time, the documentary analysis identifies a warning-to-action accountability gap. Public reporting is richer on forecasts, activities, and sector-specific responses than on the integrated performance chain linking warning thresholds, administrative triggers, implementation speed, territorial coverage, and measurable avoided losses. Continued drought, agricultural impacts, and forest and land fires do not prove governance failure, but they underscore the need to distinguish unavoidable residual risk from weaknesses in timing, targeting, coordination, or local implementation.

For public administration, the key lesson is that climate preparedness should be evaluated as an institutional translation problem. Forecasting capacity must be connected to pre-agreed action triggers, cross-agency data interoperability, pre-arranged financing, local implementation standards, outcome indicators, and systematic after-action learning. Such reforms would move Indonesia from a system that is demonstrably active in anticipation toward one that can more clearly demonstrate the effectiveness, equity, and accountability of anticipatory action.

The study is limited by its reliance on publicly available secondary documents and cannot measure the complete internal decision process or causal effect of specific interventions. Future research should combine administrative records, subnational comparative cases, budget and response-timing data, remote-sensing indicators, agricultural-loss data, and interviews with implementing officials to test the warning-to-action framework more rigorously.

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