

TERMS OF REFERENCE

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**Technical Assistance to PLN for development of Climate Adaptation
Strategy – Indonesia**

EGI-2026-0155

Consulting services to perform a diagnosis of climate change risk and adaptation of PLN and a development of a comprehensive adaptation strategy and action plan to support climate resilience in electricity business processes

April 2025

ARTICLE 1. Background and rationale

1.1 PLN

Indonesia is highly vulnerable to the effects of climate change, facing a wide range of climate-induced hazards including floods, droughts, sea-level rise, extreme heat events, and an increased frequency and severity of storms. In addition, Indonesia is exposed to significant geophysical risks, particularly earthquakes and volcanic activity. PT PLN (Persero), Indonesia's national electricity utility, is a critical actor in ensuring the reliable delivery of electricity across the archipelago. Given the essential nature of its services and the geographic diversity of its infrastructure, PLN is exposed to both acute and chronic physical risks, which threaten the continuity of operations, asset integrity, and service delivery.

To strengthen its climate resilience, PLN requires a comprehensive assessment of its current capacity to adapt to climate change and a roadmap for future action. This will support national and international commitments to climate resilience, including Indonesia's Second Nationally Determined Contributions (NDCs), and align with global standards such as the Paris Agreement (Article 7), ISO 14090/91, and climate reporting and rating standards.

This Terms of Reference outlines the objectives, scope, methodology, deliverables, and requirements for engaging a consulting firm to undertake this assignment.

1.2 AFD's proposal

[A few words on AFD current financial support to PLN and approach to support PLN in its adaptation strategy]

ARTICLE 2. Objectives of the assignment

Overall Objective:

To strengthen the system-level climate resilience of PLN by conducting a strategic, operational, and capacity assessment and developing a comprehensive, implementable climate adaptation and resilience roadmap, strategy, and action plan that address systemic gaps, strengthen institutional and operational readiness, are fully integrated into corporate planning, strategy, implementing regulation, investment decisions-making, and long-term transformation pathways.

Specific Objectives:

- **Identify and assess PLN's system-level resilience gaps** across planning, governance, engineering standards, operations, investments, and institutional arrangements, focusing on elements that are currently absent or insufficient to ensure long-term climate resilience of the power system. Evaluate **PLN's institutional, operational, and technical capacity** to anticipate, absorb, adapt to, and recover from climate impacts across governance, system planning, asset management, operations, finance,

human resources, and digital/data systems. **Assess risks of maladaptation at the system and investment level** and **propose safeguards** to ensure that adaptation measures enhance long-term system flexibility, reliability, and affordability.

- Propose strategies and solutions to manage residual climate risk, including financial mechanisms (e.g., internal buffers, insurance, risk pooling) and institutional arrangements.
- **Develop a long-term system resilience vision and strategic pillars**, aligned with PLN's energy transition pathway, defining short-, medium-, and long-term objectives for mainstreaming climate resilience into decision-making and investment processes.
- Design a detailed, action plan with cost estimates, indicators, sequencing, and risk mitigation measures, to enable effective execution across PLN's organizational levels.

ARTICLE 3. Scope of the assignment

3.1 Geographical scope

The assignment will cover all operational zones where PLN operates across Indonesia, spanning central generation assets, transmission and distribution network. The scope also includes cross-cutting business processes that are critical to system resilience, including primary energy, dispatch, and supporting activities.

3.2 Organizational scope

The assessment will include PLN's headquarters, local units, as well as all subsidiaries and sub-holdings, including but not limited to: PLN Indonesia Power, PLN Nusantara Power, PLN Energi Primer Indonesia, PLN Icon Plus, PLN Batam, PLN Enjiniring, PLN Electricity Services, PLN Nusa Daya, PLN Energy Management Indonesia, PLN MCTN. Engagements with critical partners and contractors will be considered where relevant.

3.3 Hazards and risks

The consultant will address major physical climate hazards (both acute and chronic) and geological risks (seismic and volcanic) and secondary and cascading effects on the power system, including financial and transition risks. Rather than duplicating existing climate risk assessments, hazard and risk information will be **synthesized as strategic inputs** to identify systemic vulnerabilities, resilience gaps, risks of maladaptation, and options for residual risk management.

3.4 Value Chain Coverage

The assessment will consider PLN's full value chain with a **system-resilience lens**, including:

- **Governance, policy and regulatory environment:** internal decision-making processes, regulatory requirements, policy changes, and institutional capacity to manage climate and systemic risks.
- **Data, digital and information systems:** operational data, digital platforms, control systems, cybersecurity, and data availability for monitoring, early warning, and decision-making.

- **Financial and economic resilience:** revenue stability, cost structures, access to finance, insurance coverage, capital expenditure requirements, and exposure to climate-related financial risks.
- **Raw materials and inputs:** access to raw materials for production, inputs necessary for PLN's production or activity.
- **Workforce and people:** employees, workers, customers, including safety, working conditions and health.
- **Networks and systems:** electricity, water, energy and telecommunication networks;
- **Logistics and transportation:** transport of materials and inputs for the activity, distribution of transportation.
- **Demand and markets:** demand for products and services, customer behaviour, markets and lifestyles.

ARTICLE 4. Method

The method is structured around three integrated phases, applying a **participatory, system-oriented, and solution-driven approach**. Quantitative and qualitative data will be combined with iterative stakeholder engagement and expert validation.

The consultant will integrate with relevant national and international frameworks, including ISO 14090/14091, IPCC, TCFD/IFRS, ESG standards, and the ACT Adaptation Methodology, while ensuring strong alignment with PLN's Climate Resilient Infrastructure Guidelines and other relevant studies or documents.

The Consultant should propose in its technical proposal the number, timing and objectives of field missions to Indonesia required to ensure effective implementation of the assignment and engagement with PLN and relevant stakeholders. While the exact approach may vary depending on the Consultant's team structure, including the presence of experts based in Indonesia or in the region, **in-country engagement is expected during each phase of the assignment**. The proposal should include at least one mission dedicated to the presentation and discussion of the main results and recommendations with PLN and key stakeholders.

4.1 Phase 1: System-Level Diagnostic and Risk Assessment

Purpose: To develop a system-level, evidence-based diagnosis of PLN's climate resilience readiness, by identifying **institutional, operational, and investment gaps** that limit the power system's ability to anticipate, absorb, adapt to, and recover from climate and disaster impacts.

This phase focuses on **diagnosing what is missing**, rather than repeating detailed risk analyses already conducted. Instead, it focuses on **identifying what is currently missing, insufficient, or fragmented** to enable a resilient power system, and on assessing **how existing risk information is (or is not) translated into decisions, standards, and investments**.

Key Activities:

A. Review of existing information and gap analysis

1. Survey existing information and knowledge

- A certain amount of work has already been carried out with PLN. The consultant will review existing work, especially but not limited to: Climate resilient infrastructure guidelines, Climate and Disaster Risks Assessments (CDRA), Climate Risk Assessment, Scoping Study from Accelerating Indonesia's Clean Energy Transition (AICET) Program Phase 1.
- Following the review of existing work, the consultant will identify gaps of analysis and carry out complementary analyses needed for an exhaustive diagnosis of PLN's exposure and vulnerability according to IPCC 2023 methodology: interaction between hazard (triggered by an event or trend related to climate change), vulnerability (susceptibility to harm, which can itself be analysed as susceptibility and adaptive capacity) and exposure (assets at risk).

B. System-Level Climate Risk Contextualization (Complementary physical risk analysis)

2. Where gaps are identified, the Consultant may conduct **targeted, complementary analyses** strictly to support a system-level diagnosis. Hazard and Risk Contextualisation:

- Confirm whether hazard and risk mapping has already been conducted and is fit for purpose.
- Where required, consolidate existing spatial and historical data on major climate-related hazards (floods, heatwaves, droughts, sea-level rise) and geological risks (seismic, volcanic).
- Analyses physical risks projections for several scenarios (at least SSP5-8.5) and for several time horizons (to 2030, 2050, 2100).
- Overlay PLN's infrastructure (including power production, transmission and distribution networks) and operational footprint onto hazard maps.
- Use GIS tools to produce visual maps showing risk exposure hotspots (the consultant will build on existing assessments rather than conduct asset-level modelling).

3. Vulnerability and Criticality Assessment:

- Develop criteria to evaluate asset vulnerability and service criticality.
- Conduct interviews with operational managers to identify system sensitivities.
- Quantify service disruptions and potential financial losses
- Score each major component of PLN's value chain according to exposure, sensitivity, and adaptive capacity.

Findings will be synthesised to inform **system resilience priorities**, without duplicating detailed hazard or asset-level assessments.

C. PLN's Adaptation and Resilience Maturity Diagnosis

By applying ACT Adaptation's methodology and/or other credible international methodologies, the consultant will qualify to what extent PLN has implemented adaptation measures along its value chain. The indicators to be considered are the following:

4. Governance and strategy

- Internal governance: the consultant will analyse PLN's strategic objectives over the different time horizons. It will assess adaptation leadership and responsibilities, i. e. how well PLN has formalized an organisational structure that clearly defines roles and responsibilities, permits effective delivery of actions and is capable of remaining flexible to new opportunities for improved actions.
- Consistency with external adaptation strategies and dialogue with interested parties. The consultant will evaluate whether the company considers sectoral, regional and/or national adaptation efforts. It will assess whether the company exchanges and engage with relevant interested parties regarding adaptation to climate change.
- Environmental and social safeguards. The consultant will assess how climate risk considerations are integrated into the Company's Environmental and Social Safeguards framework to ensure that climate-related strategies and investments are designed and implemented in a manner that avoids significant harm to other environmental and social objectives, including biodiversity, community health and safety, pollution prevention, resource efficiency, and livelihoods. This assessment will consider the alignment between climate risk management processes and the Environmental and Social Management System (ESMS), including project screening, risk categorization, mitigation measures, and stakeholder engagement, taking into account ongoing technical assistance supported by the World Bank.

5. Integration of Climate Risk into Decision-Making

- Data and value chain: climate data and scenarios and criticality of the value chain. The consultant will assess whether PLN considers historical and current climate events and draws up climate projections. It will also evaluate the company's maturity in terms of analysis of the relevant and critical value chain components with respect to climate change.
- Physical climate risk analysis: risks and opportunities. The consultant will assess whether for the activities and value chain components determined as at-risks, all the relevant and material risks have been considered and qualified. The consultant will assess PLN's maturity in terms of identification of potential climate-related opportunities as analysed by the company for the complete value chain. The consultant should take into account the Climate Resilient Infrastructure Guidelines that has been developed.

6. Maladaptation and Residual Risk Assessment

The Consultant shall assess risks that may arise from adaptation decisions themselves, and risks that cannot be fully eliminated, including:

- Identification of potential maladaptation risks at system and investment levels,
- Identification of residual risks that remain even after feasible structural or operational measures,
- Initial safeguard principles and strategic options for residual risk management (e.g. policy safeguards, decision rules, financial instruments).

7. Assessment of PLN's transition risks

- Policy and regulatory risk analysis, considering existing and forthcoming regulations
- Technology risk review: assessment of PLN's exposure to disruptive technologies
- Market risk assessment: examination of demand-side shifts, evolving electricity pricing mechanisms and competitiveness of low-carbon alternatives
- Reputational and legal risks review: evaluation of risks related to ESG performance litigation, or stakeholder pressure
- Scenario analysis: stress-testing the company financial performance under various climate and policy transition scenarios

8. This assessment will inform later strategy and action planning phases. Adaptive capacity and adaptation activities

- Organisation: decision-making processes, internal learning system and diversification of activities. The consultant will assess the methods, indicators and tools set up by PLN to enable and implement decisions to reduce the material physical risks analyse and maximise opportunities. It will assess the existence or development of an internal learning system that enables PLN to learn from its own experience in terms of physical risks and adaptation. It will evaluate PLN's maturity when diversification of activities is required in order to counterbalance physical climate risks (ex: diversification of power sources).
- Finance: financial capacity and mainstreaming of climate adaptation into investment decisions. The consultant will assess the financial resources and capacity engaged in adaptation measures and in coping with losses relating to the physical risks identified. It will assess the integration of climate adaptation into investment decisions (i.e. whether investment decisions are compatible with increasing physical climate risks).
- Technologies and nature-based solutions for adaptive capacity. The consultant will assess PLN's technical maturity by considering the existence and availability of technology and/or nature-based solutions for the improvement of its adaptive capacity.
- Human: competence and expertise, training and capacity building, adaptation measures for working conditions. PLN has been providing an exhaustive adaptation training pathway to its staff, whose training modules are currently being developed. The consultant will assess the skills, knowledge and expertise regarding physical risks and adaptation to climate change that the company has access to. It will take into account the availability of training related to

physical risks and adaptation within the company. Finally, it will take into account whether the company has a plan or adaptation measures in order to reduce the potential negative consequences of climate change on its employees' health and working conditions.

9. The Consultant shall further assess PLN's readiness to implement system-level adaptation through:
- Institutional Review: mapping roles, mandates, policies, and accountability frameworks
 - Inventory of Existing Measures: identifying current resilience-related actions and assessing whether they reflect best practice or ad hoc responses
 - Capacity Mapping: identifying gaps in human, technical, financial, and data capacities
 - Opportunity Identification: identifying co-benefits related to innovation, digitalization, efficiency, reputation, and access to climate finance.

Phase 1 Deliverables:

- Inception Report and Workplan
- Diagnostic report including:
 - Climate Risk and Adaptation Maturity Scorecard.
 - Recommendations to mainstreaming adaptation across PLN's operations and governance systems, including identification of critical gaps and early wins. The recommendations should take into account the conclusions of the Climate Resilient Infrastructure Guidelines and other previous assessment.
 - System-Level Diagnostic and Gap Analysis Report
 - Climate and Geophysical Risk Exposure Overview (system-level)
 - Institutional and Operational Capacity Assessment
 - Maladaptation and Residual Risk Assessment (including risk matrix)
 - Transition risk assessment
 - Stakeholder Engagement Summary
 - Adaptation Risk Assessment and Safeguard Recommendations
 - Recommendations to enhance PLN's internal Climate Risk and Opportunity Mapping platform
 - Executive Summary to inform Phase 2 - Strategy Development

Indicative phase duration: 2 months – 60-80 person-days

4.2 Phase 2: Development of the adaptation strategy

Purpose: To formulate a **clear, forward-looking, and system-level climate adaptation and resilience strategy for PLN**, translating the diagnostic findings from Phase 1 into a **coherent strategic vision, priorities, and institutional arrangements**.

This phase focuses on **setting direction and structure**, rather than defining detailed actions. It establishes **how climate resilience will be embedded into PLN's governance, planning, and investment decision-making**, in alignment with the energy transition pathway and national development priorities.

The development of the adaptation strategy should take into account the conclusions and recommendations of the Phase 1.

Key Activities:

1. Strategic Visioning and Direction Setting Workshops:

- Conduct facilitated sessions with PLN leadership and key departments to define a long-term vision for adaptation to climate change and system resilience, aligned with PLN's mandate as a national electricity utility.
- Discuss plausible climate scenarios, strategic foresight, and desired adaptation outcomes.
- The output will be a **shared, board-level strategic narrative** for adaptation and resilience.

2. Strategic Pillars and Objective Definition:

- Define **strategic pillars for system resilience**, covering governance, planning, infrastructure, operations, finance, risk management, human resources, and digital systems.
- Draft adaptation goals for short (0-3 years), medium (3-7 years), and long-term (7+ years) **strategic objectives**.
- Ensure objectives are Specific, Measurable, Achievable, Relevant, and Time-bound (SMART).

This step establishes **what must change structurally and institutionally**, not yet how each action will be implemented.

3. Alignment with Sectoral, National, and International Frameworks:

- Map strategy elements to Indonesia's NDCs, energy transition plans, and relevant international standards, including: Long Term Strategy Low Carbon and Climate Resilience, National Medium-Term Development Plan (RPJMN), Electricity Supply Business Plan (RUPTL), and National Electricity General Plan (RUKN), ESG disclosure and risk rating standards, as well as other relevant standards.
- Incorporate cross-sectoral adaptation themes (e.g. public health, biodiversity, water management, gender).

4. Integration of Nature-Based Solutions:

- Identify ecosystems and green infrastructure that can contribute to risk reduction.
- Assess feasibility and cost-effectiveness of nature-based interventions.

5. Institutional and Governance Integration:

- Recommend structures and policies for embedding adaptation into core planning, operations (in coherence with the Climate Resilient Infrastructure Guidelines), and procurement processes.
- Define roles, mandates, and coordination mechanisms to strengthen coordination across departments and stakeholders in managing residual climate risk. Recommendations of roles and responsibilities among PLN Divisions, Unit, Sub Holding, and Subsidiaries concerning climate adaptation.
- Ensure coherence across strategy, operations and budgets
- Establish guiding principles for adaptation (e.g. equity, sustainability, no-regret, cost-effectiveness)
- Identify key enablers (regulatory, institutional, technological) for strategy execution

Deliverables:

- PLN adaptation strategy document, including:
 - Short, medium, and long-term vision and strategic narrative
 - Strategic pillars and objectives across time horizons
 - Alignment with national and international frameworks
 - Institutional and governance arrangements
 - Guiding principles and key enablers
- Strategic Summary for Executive and Board-Level Review
- Institutional alignment and capacity building plan (taking into account PLN's existing and under-development capacity building material).

Indicative Phase duration of phase 2: 3 months – 50-70 person-days

4.3 Phase 3: Formulation of the Adaptation Action Plan and Roadmap

Purpose: To translate the adaptation diagnosis and risk exposure overview into a practical, prioritized, and costed implementation roadmap, aligned with PLN's governance, investment planning, and operational processes.

Key Activities:**1. Identification and Prioritisation of Adaptation Actions:**

- Organize participatory consultations, workshops to identify adaptation options across all business units.

- Consolidate and screen adaptation options based on relevance to the key risks and gaps identified in Phases 1 and 2. Identify and prioritise adaptation measures across governance, infrastructure, systems, human resources, and finance.
- Apply multi-criteria prioritisation framework (including impact on risk reduction, feasibility, cost, urgency, and institutional readiness) to rank measures.

2. Residual Risk Management Planning:

- Explore options such as risk pooling, sovereign risk insurance, resilience bonds, contingency financing, and mutualized funds.
- Develop scenarios for residual risk coverage and financial resilience.

3. Design of the Monitoring and Evaluation (M&E) Framework:

- Select KPIs that reflect resilience outcomes (e.g., downtime avoided, service continuity).
- Propose institutional structures for regular progress monitoring aligned with PLN's reporting practices.

4. Risk and Barrier Analysis:

- Identify and analyse key risks to implementation (regulatory, institutional, technological, financial).
- Recommend mitigation strategies such as regulatory reforms, capacity building, or pilot testing.

5. Financial Planning and Resource Mobilization:

- Estimate costs of proposed actions.
- Identify funding sources (public budget, concessional finance, donor grants, climate funds).
- Propose mechanisms for co-financing or blended finance.

Deliverables:

- Adaptation action plan (detailed and Costed Adaptation Action Plan)
- Implementation roadmap with milestones detailing responsible units and required resources including timelines, milestones, and others.
- Risk matrix and mitigation strategies (taking into account existing PLN risk matrix).
- Monitoring and evaluation framework including key performance indicators (KPIs)

Indicative Phase duration of phase 3: 3 months – 50-70 person-days

ARTICLE 5. Deliverables

Phase 1:

- Inception Report and Workplan
- Diagnostic Report (Phase 1 deliverables – see article 4)

Phase 2:

- PLN adaptation strategy document
- Strategic Summary for Executive and Board-Level Review
- Institutional alignment and capacity building plan (taking into account PLN's existing and under-development capacity building material).

Phase 3:

- Adaptation Action Plan
- Adaptation action plan (detailed and Costed Adaptation Action Plan)
- Implementation roadmap with milestones detailing responsible units and required resources including timelines, milestones, and others.
- Risk matrix and mitigation strategies (taking into account existing PLN risk matrix).
- Monitoring and evaluation framework including key performance indicators (KPIs)
- Final Presentation and Validation Workshop Materials

ARTICLE 6. Stakeholder engagement

The consultant will ensure broad engagement with internal PLN departments (strategy, finance, operations, HR, legal, sustainability, as well as other relevant internal stakeholders) and external stakeholders including line ministries, local governments, regulators, international donors, international organisations, and community representatives where applicable.

The Consultant should propose in its technical proposal the number, timing and objectives of field missions to Indonesia required to ensure effective implementation of the assignment and engagement with PLN and relevant stakeholders. While the exact approach may vary depending on the Consultant's team structure, including the presence of experts based in Indonesia or in the region, in-country engagement is expected during each phase of the assignment.

Therefore, the Consultant is expected to carry out a limited number of international missions to Indonesia, indicatively 3 to 4 missions over the duration of the assignment. Proposals should optimize the use of international travel, group workshops where possible, and rely on local expertise and remote coordination to ensure cost-efficiency. The proposal should include at least one mission dedicated to the presentation and discussion of the main results and recommendations with PLN and key stakeholders.

ARTICLE 7. Duration and timeline

The assignment is expected to start in July 2026, for a duration of 8 months minimum. The Consultant will propose the best organization to optimize this duration.

The estimated number of person days for this assignment is 160-200 person-days. Several field missions are expected (see article 6). The consultant shall propose a detailed workplan and timeline in the technical proposal.

ARTICLE 8. Consultant profile

The selected firm should demonstrate:

- Expertise in the energy or infrastructure sectors.
- Proven experience in climate adaptation and disaster risk management.
- Proven experience in climate risk assessment and adaptation planning for infrastructure systems, such as power, transport, water, or other large-scale infrastructure networks.
- Experience in developing corporate or sectoral climate adaptation strategies and implementation roadmaps, including governance frameworks, institutional arrangements, and operational action plans.
- Familiarity with ACT, ISO 14090/91, sustainability reporting and risk rating standards, or similar frameworks.
- Demonstrated experience working with power utilities or electricity sector institutions, particularly on climate resilience, risk assessment, infrastructure planning, or strategic transformation of electricity systems.
- Capacity to conduct risk assessments and develop operational roadmaps.
- Strong facilitation and stakeholder engagement skills.
- Proven experience in Indonesia or Southeast Asia, with a strong understanding of the institutional and regulatory context of infrastructure development in developing countries.
- **Local presence or partnership:** The Consultant is expected to demonstrate a strong local presence in Indonesia or to form a partnership (e.g. joint-venture or consortium) with a local consulting firm or institution. This will ensure effective day-to-day coordination with PLN and stakeholders, facilitate access to local data and expertise, and strengthen the understanding of the institutional, regulatory and operational context of the Indonesian power sector.

ARTICLE 9. Presentation of the bids

Technical proposals should not exceed about 15 pages (excluding attached CVs and any other supporting documents).

Proposals must be submitted in English.

Bids must contain:

- **A Working Methodology Note (WMN):**
 - A chapter showing good understanding of the Service and its context, scope, objectives and challenges
 - A chapter of comments on the above terms of reference. The technical proposal does not need to restate what is stated in the above terms of reference, which are supposed to apply and will have contractual value, but to highlight potential improvements, scope clarifications or limitations with reference to the above terms of reference.
 - The organization the consultant will adopt (sequenced and/or iterative activities, etc.) for successfully developing the Tasks of the Service as described above. It is expected that the Consultant review documents, identify benchmarks based on international best practices, and set up interviews with key stakeholders to complete its mission. It is also expected that the consultant will organize a kick-off meeting at the beginning of the mission, present the results of the draft report and the final report to PLN and AFD.
 - The organization envisaged, with a description of the allocation of tasks and responsibilities among its members, the modalities of coordination of experts; material and human resources to support key personnel.
 - A timetable of activities and tasks to be carried out by the Consultant indicating the dates of delivery of the Deliverables, as well as the holding of potential workshop(s) and presentations.
 - A timetable for the mobilization of the Consultant's staff, detailing the working hours of key personnel, with a clear distinction between the time spent at the Consultant's headquarters and the time spent in Indonesia.
- **CVs (Resumes) and Experience in similar services of the experts of the Consultant's Key Expert Team (KET) (CVEX)**, highlighting for each one qualification, experience and skills, more specifically in relation to the tasks and responsibilities that will be requested from him/her in the framework of the Service.
- **The detailed budget, based on the Price and Quantities Breakdown (PQB) Excel Table as attached to this document to be filled in by the applicants:**

The Consultant is responsible for including in its financial proposal all costs related to the mobilization of its staff: international, national and local travel, insurance, accommodation, food, communications and similar. The same applies for all materials required, including: training materials, technologies, data collection equipment, etc. The budget shall be detailed.

Potential subcontracted costs will be specified.

Based upon a French legislation dated 1986, this assignment is exempt from French tax "TVA" (VAT).