Strengthening Social Risk Mitigation and Stakeholder Engagement Frameworks for Sustainable Geothermal Energy Development in Indonesia

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ABSTRACT

As Indonesia accelerates its transition toward clean energy, geothermal development emerges as a strategic national priority. Despite possessing the world's second-largest geothermal potential, project implementation often encounters persistent social challenges, including land acquisition disputes, community resistance, and environmental concerns. This paper introduces the Social and Stakeholder Risk Assessment (SSRA) framework as a structured, anticipatory approach to identify, assess, and mitigate social risks throughout the project lifecycle.

SSRA comprises four core pillars—issue identification, perception analysis, stakeholder mapping, and engagement strategies—enabling early conflict detection and proactive response planning. Drawing on comparative case studies from the Muara Laboh, Rantau Dedap, and Geureudong geothermal sites, this paper demonstrates that early and meaningful engagement is critical to project legitimacy and success. While Muara Laboh achieved trust through participatory processes, Geureudong's limited communication led to prolonged tensions.

The framework is aligned with Indonesia's Geothermal Law No. 21/2014 and Ministerial Regulation No. 7/2017, and integrates international safeguards such as the World Bank's Environmental and Social Framework (WB ESF) and the ADB Safeguard Policy Statement (ADB SPS). Adoption of GRI (Global Reporting Initiative) standards further enhances transparency and accountability in stakeholder engagement.

Findings underscore the necessity of embedding social performance within the core of project planning. Transparent information sharing, local capacity development, and robust grievance redress mechanisms (GRM) are essential for building long-term social acceptance. This paper concludes that sustainable geothermal development in Indonesia hinges on the early institutionalization of social risk management—transforming social performance from a compliance obligation into a strategic asset.

1. INTRODUCTION

Indonesia's geothermal build-out is ultimately a social execution challenge as much as a subsurface and grid-integration one. In practice, project trajectories hinge on whether developers can surface *who cares about what, why, and with what influence*—early enough to act proportionately and transparently (Coyoga et al., 2022). Recent Indonesian project documents across energy infrastructure underscore this point: rigorous, routine stakeholder engagement (with clear objectives, owners, budgets, and evidence trails) outperforms ad-hoc outreach and reduces the drift toward politicised conflict, delay, and re-work (EBTKE, 2022).

From a policy perspective, the national energy transition agenda (e.g., Presidential Regulation No. 112/2022) and priority-program framing increase the *speed* imperative but also raise the bar for *social diligence* (MEMR, 2022). Materials from the Singkarak screening illustrate this double bind well: national clean-energy urgency and National Strategic Projects (PSN) framing sit alongside conservation, customary tenure, and local livelihood protection—none of which can be shortcut without legitimacy costs (ACWA, 2024). Such contexts make it essential to explicitly align early project design with international safeguards—especially IFC PS1 (ESMS), PS7 (Indigenous Peoples), and PS8 (Cultural Heritage)—as a shared reference point for lenders, authorities, and communities (IFC, 2012).

At the same time, Indonesian cases show why trust is fragile and *path dependent* (Anggreta, 2022). The Singkarak screening documents residual grievances from legacy hydropower, complex ulayat (customary) tenure, and narrative vacuums that are quickly filled by misinformation—classic precursors to opposition if not addressed with mindful, verifiable engagement (ACWA, 2024). Overlapping regulations and weak cross-sector coordination can compound these dynamics, producing ambiguity that communities experience as risk—again arguing for early, structured social analysis and disclosure.

1.1 Problem statemen and practical gap

Conventional E&S processes often generate *documents* rather than an *operating system* for social performance. What is missing in many geothermal efforts is a routine, risk-based mechanism that: (i) converts raw issues and perceptions into traceable risk statements; (ii) maps actor power, interests, and influence pathways; (iii) sets explicit means of engagement matched to intent; and (iv) closes the loop with ownership, timelines, budget, and learning. The Stakeholder Engagement Plan for EDC Indonesia makes this logic explicit

by formalising Social Safeguard Risk Assessment (SSRA) variables—*issues, stakeholders, perceptions, means*—and rating each risk by likelihood × consequence using a structured scoring system (AMF, 2023).

1.2 Why SSRA for geothermal

Geothermal's risk profile (front-loaded CAPEX, long lead times, land and water interfaces, traffic and access roads, biodiversity/cultural overlays) makes early social clarity economically decisive (Luthfi, 2021). SSRA provides the backbone to do that work systematically: it begins with issue and perception intelligence, translates findings into risk statements, and links each priority to proportionate engagement and grievance pathways. Indonesian project artefacts already use many of these pieces—IAP2 spectra to set intent; social network analysis (SNA) to find agenda-setters; risk registers and action plans to drive follow-through.

1.3 Alignment with standards and local governance

The proposed SSRA approach is deliberately compatible with lender expectations and Indonesian governance realities. On standards, SSRA nests neatly under IFC PS1/7/8 (screening, ESMS, FPIC, cultural heritage), which Indonesian screening work (e.g., Singkarak) already uses as an early anchor. On engagement, SEPs from SERD explicitly adopt IAP2 and codify practical steps—stakeholder identification, issue categorisation, communication/consultation planning, and GRM design—so field teams can execute. And because legitimacy depends on cadence and transparency, external-relations reporting demonstrates a PMEALIE rhythm linking feed-forward, concurrent, and feedback controls to monthly and annual disclosures.

1.4 Evidence base and contributions

This paper synthesises *practice-proximate* evidence from:

- EDCI (Graho Nyabu)—an SEP that operationalises SSRA variables and scoring into an actionable plan (AMF, 2023);
- SERD (Rantau Dedap)—a 2024 Social Mapping update (16 villages) commissioned after ADB expert inputs to strengthen gender/education/effectiveness data, and the SAVA SEP that complements the PCDP with IAP2/SNA-based targeting (AMF, 2024);
- SLTR Annual External Relations Report—a live example of IAP2-linked planning and PMEALIE controls suitable for adaptation to geothermal (Mirekel, 2025b);
- Singkarak SSRA screening—comparative lessons on trust, customary tenure, FPIC capacity, and narrative strategy in a high-visibility renewables project (Mirekel, 2025a).

What this paper adds is a coherent, geothermal-ready SSRA method (and visual workflows) that connects those ingredients end-to-end—from early intel and perception analysis to risk rating, engagement design, GRM operations, and learning rhythms.

1.5 Research question and objectives

We ask three practical questions that matter for Indonesian geothermal delivery:

1. *How* can developers structure early social intelligence so it becomes decision-useful (not just descriptive)?
2. *Which* engagement means (and at what IAP2 level) are proportionate for issues where high-power/high-interest actors cluster?
3. *What* governance cadence (PMEAL-style) keeps the system adaptive and credible over multi-year buildouts?

Accordingly, the paper's objectives are to (i) articulate an SSRA framework tailored to geothermal; (ii) show alignment with IFC PS and Indonesian practice; and (iii) demonstrate, qualitatively, how SSRA improves schedule reliability, reduces non-productive time (NPT), and strengthens bankability.

1.6 Scope, methodology, and structure

The scope is limited to the social dimension of risk and stakeholder engagement (not technical subsurface or power-market modelling). Methodologically, we synthesise and cross-reference current Indonesian project artefacts (Stakeholder Engagement Plan, Social Mapping, external-relations reporting, SSRA screening) to extract transferable patterns and tools. The remainder of the paper proceeds as follows: Section 2 details the SSRA framework; Section 3 situates it within standards and governance; Section 4 presents case vignettes; Section 5 translates analysis into engagement and GRM design; Section 6 synthesises efficiency and business benefits; Sections 7–8 provide an implementation roadmap, KPIs, and conclusions.

2. THE SSRA FRAMEWORK

The SSRA framework is designed to transform qualitative social information into risk-based outputs that can directly inform decision-making. In practical application, the framework addresses four key questions: *What issues are live? How are they perceived? Who can move them? And what engagement "means" fit the intent?*

2.1 Inputs and working method

SSRA should start early and draw from multiple inputs: site reconnaissance, desk review, Key Informant Interviews (KIIs)/Focus Group Discussions (FGDs), and rapid perception scans. In EDCI's case, fieldwork spanned villages, districts, and provinces to feed

the SEP's analysis and mapping. The SERD Social Mapping likewise clarifies objectives, data domains (incl. education, gender, perceptions), and actor-network scope, providing a strong substrate for SSRA coding.

2.2 The four pillars (what to collect and how to use it)

Pillar 1 — Issue identification
Describe *what the issue is*, *where it sits*, and *how intense it is*. EDCI's scoring matrix provides concrete sub-variables—location, area of impact, intensity—with ordinal scales to normalize evidence across topics.
Why it matters: this prevents "listy" risk logs and forces comparable statements across land, biodiversity, water, labor, traffic, etc.

Pillar 2 — Perception analysis
Capture how people interpret risks/benefits (not just the technical "facts"). SERD's Social Mapping explicitly tracks community perceptions of programs and participation—useful proxies for trust and acceptance.
Why it matters: unaddressed perception gaps often escalate into stoppages; SSRA makes those gaps visible early.

Pillar 3 — Stakeholder mapping
Go beyond listings to power–interest and network attributes (who influences whom, via what channels). EDCI's schema enumerates position, power, capacity to mobilize, legitimacy, and networks with practical scales (village→national; intellectual/cultural/economic/structural/traditional).
Field teams can then validate network structure via SNA—an approach shown in SERD's and SLTR's materials (methods, figures, and actor-involvement tables).

Pillar 4 — Means of engagement
Make intent explicit using the IAP2 Spectrum (inform→consult→involve/engage→collaborate→empower), then choose tactics accordingly (PCDP, workshops, co-creation forums, joint monitoring). Both SAVA and SLTR include the IAP2 table as the organizing spine for tactics.
Why it matters: intent-clarity avoids mismatches (e.g., "inform" tools used where "collaborate" is required by power/interest realities).

2.3 From pillars to risk statements and significance

SSRA compiles a one-line risk statement per issue (rooted in the four pillars) and then scores likelihood ("probability/frequency") and consequence ("intensity of impact") to prioritize action. The intensity rubric for issues (very rare→very intensive; within one group→across groups) helps separate noise from real escalations.

Tip: set internal thresholds (e.g., *High* = act now; *Medium* = monitor with triggers; *Low* = watch) and link each *High* to an accountable owner, budget, and timeline.

2.4 Turning scores into strategy (IAP2-aligned action design)

1. Set objectives per high-priority risk (what success looks like).
2. Select the IAP2 level that matches actor power/interest revealed by mapping/SNA.
3. Pick channels (PCDP disclosure, thematic FGDs, co-creation with Quadrant-I actors, joint biodiversity/community road-safety workstreams).
4. Publish the plan with roles, budget, schedule, and monitoring—see SAVA's stakeholder plan and workplan tables

2.5 Anchoring to safeguards and local governance

Early SSRA screening should align with IFC PS1/7/8—the Singkarak study does this explicitly—and diagnose gaps (e.g., FPIC depth, cultural-heritage capacity, narrative strategy). It should also respect customary decision systems (e.g., Minangkabau's *musyawarah* via Ninik Mamak/Pangulu), and track where collective forums (e.g., 13 Nagari around Singkarak) concentrate opposition or support.

2.6 Embedding SSRA in the project rhythm (PMEAL)

The Social and Stakeholder Risk Assessment (SSRA) framework offers a structured, forward-looking method for managing social risks, operating as a living system that adapts seamlessly to each phase of the project lifecycle. A PMEAL/PMEALIE setup provides:

- Feed-forward controls (strategic planning; PCDP preparation) to anticipate issues.
- Concurrent controls (field officers; daily/weekly/biweekly reviews) to adjust in real time.
- Feedback controls (monthly/annual reports) to learn and reset. SLTR's report shows this cadence in practice and even lists the IAP2 table, SNA figures, and an engagement/management plan template teams can adapt.

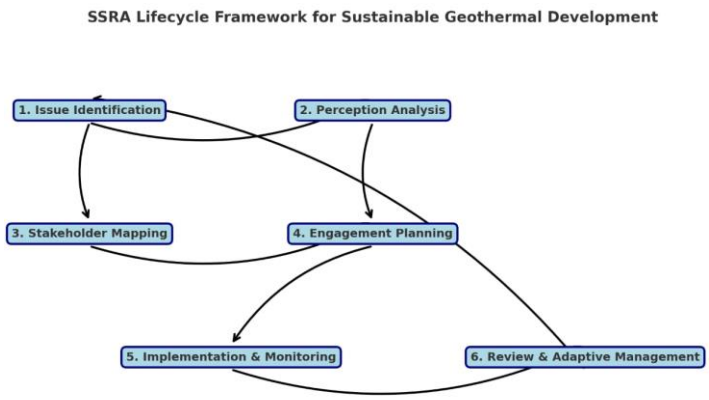

Figure 1: Flow chart illustrating the integration of the Social and Stakeholder Risk Assessment (SSRA) framework across the entire project lifecycle

2.7 Typical geothermal "fit" (what SSRA is good at)

- Corridor/access road trade-offs → early actor mapping shows where to collaborate (not merely "inform") and what co-benefits matter. (Use EDCI-style power/legitimacy/network variables.)
- Biodiversity/cultural overlays → flag PS7/PS8 triggers and escalate to co-design with customary leaders before siting/works windows are fixed.
- Water, dust/noise, traffic safety → convert perception data into proportionate mitigations and monitoring with public feedback loops (PCDP + GRM).

2.8 What "good" looks like (minimum viable SSRA kit)

- A register with the four pillars + L×C score and owner/budget/timeline for every *High*.
- A map + SNA view of high-power/high-interest actors, refreshed quarterly.
- An IAP2-based engagement plan with concrete channels and schedules.
- A PMEAL cadence (daily/weekly/biweekly/monthly/annual) with clear artifacts: minutes, GRM logs, disclosure records.

Bottom line: SSRA is not another report; it is the operating spine that connects early intelligence to proportionate engagement and continuous learning—exactly what geothermal projects need to keep schedules predictable and risks priced in.

Main idea: SSRA isn't an extra report; it's the *operating spine* that ties social analysis to decisions, actions, and evidence.

3. GOVERNANCE, STANDARDS, AND LEARNING RHYTHMS

3.1 Governance architecture and accountability

A credible social-performance system starts with who reports to whom and what they are accountable for. In the SLTR annual external-relations report, the external team works under the direct instruction of the Construction Manager and Corporate Project Admin Manager, and is explicitly responsible for planning, data collection, analysis, mapping, and stakeholder-engagement plans—a clear, auditable chain of command for day-to-day engagement. The same report hard-codes commitments that should appear in geothermal projects: run fieldwork safely and in compliance with regulations; respect local values and customs; and learn from experience via routine evaluation of interactions and open feedback loops.

For issues that cross jurisdictions or values (e.g., forest access, biodiversity, customary authority), a collaborative-governance layer is needed. EDCI's SEP names the practical hurdles—asymmetric power/capacity among actors, complex company–government–NGO–customary–community dynamics, and an absence of facilitative leadership—and proposes a collaborative governance framework tied to a Biodiversity Action Plan (BAP) to minimize negative governance risks. Benefits include inclusive decision-making, conflict reduction, and more efficient resource use, with explicit duties on the project proponent to identify, categorize, and communicate with stakeholders and to build long-term relationships. The same section points to multi-stakeholder forums for habitat protection in protected/buffer forests—useful escalation venues when single-agency coordination stalls.

What to implement: define reporting lines to the project's leadership; publish team roles; codify safety and cultural-respect commitments; and stand up a collaborative forum with clear rules of procedure for high-stakes themes (access roads, biodiversity, cultural heritage).

3.2 Standards and regulatory alignment

National framework. A geothermal-ready engagement system should map to Indonesian law and implementing rules. The SLTR report's regulatory chapter lists core anchors frequently relevant to field practice: Law 32/2009 (environment), GR 22/2021 (environmental management), Bapedal Decree 08/2000 (public involvement and disclosure), and sectoral ESDM instruments, among others.

International safeguards. Lenders and many developers use the IFC Performance Standards to structure engagement as an ongoing process with four recurring elements: stakeholder analysis and a SEP (with measures for disadvantaged groups); disclosure (objectives, scale, timing, risks/mitigations, engagement process, and the grievance mechanism); consultation that allows communities to shape mitigation; and ongoing responsiveness. Within that umbrella, geothermal teams most often interact with PS1 (ESMS), PS7 (Indigenous Peoples/FPIC), PS8 (Cultural Heritage), and—where biodiversity is at stake—PS6 (Biodiversity). The EDCI SEP explicitly explains the purposes and coverage of PS6, PS7 (including FPIC and culturally appropriate benefits), and PS8 (tangible/intangible heritage and benefit-sharing).

Diagnostic screening and gaps. The Singkarak SSRA screening uses PS1/PS7/PS8 as its early rulebook and flags what often goes wrong: FPIC not yet demonstrated, cultural-heritage depth insufficient for local context, GRM still a draft, and no KPIs to test complaint-handling effectiveness—each a governance gap that erodes trust. It also warns about overlapping mandates—here, lake conservation vs. accelerated energy development—creating policy conflict unless synchronized across agencies and levels of government.

What to implement: maintain a single standards register mapping project commitments to PS1/6/7/8 and national rules; demonstrate FPIC depth where PS7 triggers; operationalize a lender-ready GRM with KPIs; and pre-negotiate agency coordination for known overlaps (e.g., conservation estates, cultural sites).

3.3 Learning system: PMEAL/PMEALIE as the project rhythm

Learning is not a workshop—it is a cadence. The SLTR annual report operationalizes a PMEALIE system (Planning–Monitoring–Evaluation–Accountability–Learning–Impact Evaluation) with three control modes and concrete artifacts:

- Feed-forward controls (inputs): *strategic-planning coordination* and a Public Consultation and Disclosure Plan (PCDP), so engagement is designed up front rather than patched later.
- Concurrent controls (process): dedicated field officers, weekly/biweekly meetings, and daily/weekly reports to detect drift early and retune tactics in real time.
- Feedback controls (outputs): monthly and annual reports that synthesize progress, constraints, outcomes, and next steps—your institutional memory and audit trail.

Two additional enablers in the same report are worth copying into geothermal projects: (i) a published IAP2 Spectrum of Participation table (to keep intent clear across teams and months), and (ii) a Stakeholder Engagement & Management Plan table that links issues to actions, owners, and timing. The report also stresses structured data/logs and communication chronology—without these, teams cannot prove what was disclosed, to whom, and when.

What to implement: adopt the three-mode control scheme; publish a calendar for weekly/biweekly/monthly checkpoints; require standardized minutes, disclosure records, and GRM logs; and roll up results in a simple dashboard that tracks both engagement outputs and issue outcomes.

3.4 Putting it together: a geothermal-ready governance checklist

- Org & authority. Show the reporting line to construction/project leadership and list responsibilities (planning → field execution → documentation).
- Conduct & culture. Commit to safe operations and respect for local customs/values in the engagement code of conduct.
- Standards register. Map national rules and IFC PS1/6/7/8 to concrete project actions (SEP, PCDP, disclosure, FPIC, CH management).
- Collaborative forum. Convene a multi-stakeholder body for biodiversity/forest access/cultural heritage issues; link it to the BAP and publish rules of procedure.
- PMEALIE cadence. Lock in feed-forward (PCDP), concurrent (officers + weekly/biweekly + daily/weekly logs), and feedback (monthly/annual) controls from day one.
- GRM + KPIs. Avoid the common failure mode flagged at Singkarak (draft GRM/no KPIs) by publishing time-bound steps and effectiveness indicators (e.g., closure rate within target, appeal resolution time).

Net result: governance clarifies authority and conduct, standards align expectations, and PMEALIE turns learning into a repeatable operating rhythm—together, they keep geothermal engagement credible over multi-year build-outs while protecting schedule and lender confidence.

4. CASE VIGNETTES

4.1 SERD (Rantau Dedap): iterating baselines and livelihoods

SERD's SOCMAP refresh covers 16 villages across three districts, with ADB expert input to strengthen social indicators and effectiveness assessment. The study's purpose is to inform targeted community programs and improve relevance to local needs—i.e., move from generic CSR to issue-linked engagement.

In parallel, the SAVA Phase-1 SEP formalizes engagement structures, lists IAP2/SNA elements, and positions the plan as a complement to the PCDP to ensure adaptive risk management.

4.2 EDCI (Graho Nyabu): significance, actor power, and route choices

EDCI's SEP quantifies deforestation/habitat degradation as a *critical* risk (high likelihood and consequence) and shows—via power–interest analysis—that NGOs, customary institutions, and Taman Nasional Kerinsi-Seblat (TNKS) authorities cluster in Quadrant I (high power/high interest), signaling the need to move from consultation to collaboration/co-creation.

Access-road strategy is pivotal. The initial south access (≈46 km) gave way to a shorter north access (≈20 km) through Production/Conservation Forest, intensifying biodiversity concerns and actor scrutiny—again underlining why SSRA + IAP2 + SNA matter from the outset.

4.3 Singkarak (comparative): trust, culture, and cumulative impacts

The Singkarak screening surfaces historic grievances (legacy of PLTA Ombilin), customary (ulayat) tenure, and livelihood reliance on endemic bilih fish—hence the emphasis on PS1/7/8, FPIC capacity, and narrative strategy to counter misinformation. The takeaway is to build a new social contract grounded in cultural intelligence, not just technical compliance.

4.4 Muara Laboh (West Sumatra): disciplined engagement linked to bankability

Stage-2 expansion (adding ~83 MW net to nearly double plant capacity) embeds stakeholder engagement in the ADB Initial Environmental Examination (IEE), while multiple financiers—JBIC, ADB, and private Japanese banks—announced project-finance support in early 2024/2025 (sumitomocorp.com, 2025). The public materials show how routinized disclosure, monitoring, and corrective actions translate into smoother lender diligence and clearer credit processes (ADB, 2023).

Implication. Robust, documented engagement is an *efficiency lever*: fewer diligence loops, faster clarifications, and lower uncertainty premia in financing.

4.5 Geureudong (Aceh): perception gaps and the cost of late communication

A 2023 qualitative study around Mount Geureudong (Bener Meriah) reports low baseline knowledge of plans/impacts/benefits and clusters of concern around water, H_2S/blowout risk, land-use change, and cultural/ecological disruption—with low acceptance recorded in several areas (Coyoga et al., 2021). Broader Indonesian evidence from Fadhillah (2023) shows that when early questions on water, dust/noise, seismicity/landslides, and outsider labor remain unanswered, negative narratives become sticky and escalate to stoppages.

Implication. The SSRA loop (issues → perceptions → mapping → means) is designed to neutralize exactly these early-stage friction points.

5. DESIGNING SSRA-INFORMED ENGAGEMENT (FROM ANALYSIS TO ACTION)

5.1 Pillars → tactics

Begin with desk review + KIIs/FGDs → build risk statements and a likelihood × consequence matrix → set objectives and owners → choose IAP2-aligned tactics and channels (PCDP, co-creation forums, joint monitoring) → publish an implementation plan with budget/schedule/monitoring. (See Figure 2.)

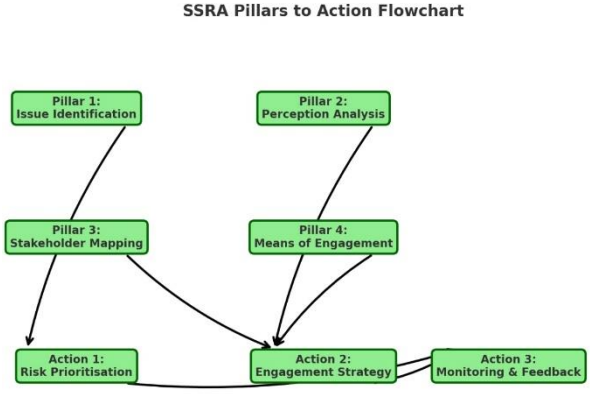

Figure 2: Transformation of SSRA pillars into actionable tactics for effective social risk management.

5.2 Grievance Redress Mechanism (GRM)

Operate a GRM that is legitimate, accessible, predictable, fair, transparent, rights-compatible, learning-oriented, and dialogue-based; accept complaints on contractor behavior; and enable third-party facilitation for complex cases. (See Figure 3.)

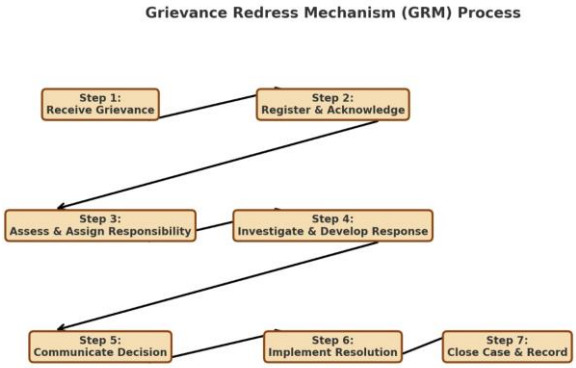

Figure 3: Process flow of the project-level grievance redress mechanism to ensure timely and transparent resolution of stakeholder concerns.

5.3 Governance & PMEAL

Institutionalize weekly/biweekly reviews, logbooks, and public reporting rhythms; link feed-forward, concurrent, and feedback controls so engagement data flow into monthly/annual learning.

6. QUALITATIVE EFFICIENCY & BUSINESS BENEFITS (WHY SSRA PAYS FOR ITSELF)

1. Faster permitting with fewer loops. Issue-specific evidence packages reduce regulator clarifications and resubmissions; "diligence-ready" IEE/SEP files compress review time (ADB, 2023) (JBIC, 2025).

2. Lower land-access friction and cost. Mapping formal/informal authority and publishing transparent offers—backed by a trusted GRM—reduces last-minute premia and litigation, especially on corridor/road issues (EDCI).

3. Less non-productive time (NPT). Anticipating stoppage triggers (dust/noise, water draw, traffic safety) avoids rig/EPC idle days and standby claims; Indonesian cases tie unchecked perceptions to stoppages (Fadhillah, 2023).

4. Fewer variation orders/claims. With Quadrant-I actors (high power/high interest) at the table, mitigations are co-designed early, limiting late scope churn (EDCI).

5. Better workforce productivity & safety. Early local hiring pipelines, cultural induction, and camp-conduct protocols reduce local/non-local friction captured in perception studies (Fadhillah, 2023).

6. Smoother lender due diligence (bankability). Standardized SSRA artefacts (risk registers, GRM logs, minutes, monitoring) shrink Q&A cycles; Stage-2 financing at Muara Laboh signals alignment with project-finance expectations. (JBIC, 2025)

7. License-to-operate resilience. A credible, time-bound GRM and routine disclosure dampen rumor cascades and escalations; when issues flare, documented pathways enable timely closure and protect operating days.

Bottom line: SSRA improves schedule reliability, lowers working-capital drag, and strengthens bankability—crucial in front-loaded geothermal CAPEX.

7. IMPLEMENTATION ROADMAP (CONCISE)

- Institutionalize SSRA from screening. Maintain a living register of issues, perceptions, actor map, means, each with risk rating, owner, budget, timeline.

- Match intent to power/interest. Where actors cluster in Quadrant-I (e.g., TNKS, WARSI, PERAK, universities, customary leaders), move from consult to collaborate/empower.

- Operate a trust-worthy GRM. Multi-channel intake, time-bound steps, progress feedback, mediation options, public periodic reporting.

- PMEAL cadence. Weekly/biweekly ops reviews; monthly/annual synthesis; publish plain-language updates on issues, actions, outcomes.

8. MONITORING SIGNALS AND PRACTICAL KPIS

- First-pass approval rate and permitting loops avoided (%).
- Avg. days to resolve grievances; % within target window.
- NPT days avoided and standby/claims avoided (USD).
- Share of Quadrant-I actors in co-created actions.
- Local hires/suppliers and incident rate trends (workforce/community).
- Lender diligence Q&A cycle time; spread/participation at financial close.
- Public disclosure cadence (updates, attendance, minutes).

9. CONCLUSION

Sustainable geothermal in Indonesia will be secured as much in social performance as in the subsurface. SSRA provides the bridge from analysis to decision and action; IAP2, SNA, and a credible GRM make that bridge usable every day. The cases across SERD, EDCI, Singkarak, Muara Laboh, and Geureudong point to the same operating truth: start early, make intent explicit, co-create where power concentrates, and learn visibly. The reward is not just fewer conflicts—it's steadier schedules, stronger bankability, and durable social acceptance.

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