Aligning ESIA and AMDAL for Geothermal Projects

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ABSTRACT

The preparation of environmental documents is a fundamental requirement for development projects in Indonesia. However, projects financed by international financial institutions are also obligated to meet environmental and social standards by preparing an Environmental and Social Impact Assessment (ESIA). Despite similar objectives, the misalignment between Indonesia's AMDAL and ESIA often presents challenges due to differences in conceptual, institutional, procedural, and substantive aspects. This study aims to identify strategies for aligning AMDAL and ESIA in geothermal projects in Indonesia using a descriptive qualitative approach. Data was collected through a review of AMDAL regulatory frameworks, international standards (i.e., International Finance Corporation (IFC) Performance Standards (PS) and World Bank (WB) Environmental and Social Standards (ESS)), literature review, and in-depth interviews with ESIA and AMDAL consultants. The analysis reveals that AMDAL and ESIA differ conceptually, with AMDAL serving as a legal compliance tool and ESIA functioning as a strategic risk management tool for lenders. Institutionally, the processes involve different development teams, appraisal parties, and monitoring agencies, often requiring proponents to hire separate teams and lead coordination efforts. Procedural differences include AMDAL's rigid, fixed timeline versus ESIA's flexible, risk-based approach. The AMDAL framework also has substantive gaps, such as the lack of requirements for multi-season baseline surveys, detailed analyses of vulnerable groups, cumulative impact assessments, or a standalone grievance redress mechanism. The findings conclude that alignment between AMDAL and ESIA is feasible and can satisfy both regulatory and lender requirements, provided that the depth and scope of analysis meet the comprehensiveness standards of each system. It is still essential to emphasize significant issues to ensure substantive quality. Recommended strategies include building internal capacity so relevant divisions understand both AMDAL and ESIA, developing a dedicated Stakeholder Engagement Plan, adopting integrated screening approaches, applying strategic scoping to identify material impacts, conducting joint and comprehensive baseline assessments, integrating public consultations, ensuring coherent and cross-referenced document development, streamlining monitoring systems, synchronizing regulatory and financing timelines, and producing complementary impact assessments supported by harmonized technical documentation. These findings have clear implications for geothermal projects in Indonesia, which, in addition to being required to prepare environmental documents, are often financed by international lenders mandating ESIA compliance with their standards. Effective alignment not only prevents project delays and ensure efficiency, but also ensures legal compliance, maintains lender and investor confidence, and strengthens environmental and social governance, thereby improving the overall quality of decision-making in the sector.

1 INTRODUCTION

A global shift toward more sustainable energy systems is increasingly gaining momentum, as highlighted by the recent appeal to transition away from fossil fuel-based energy (IEA, 2024). Responding to its international climate obligations and national energy transition agenda, Indonesia has been intensifying its investment in renewable energy, with geothermal emerging as one of the most promising sectors. Indonesia hold around 40% of the world's geothermal potential, mapped at 23,741.35 MWe (Lintas EBTKE, 2023; MEMR, 2024). This push toward renewable energy development has placed additional pressure on Indonesia's environmental and social assessment systems (Zahroh & Najicha, 2022). Discussions around energy transition often center predominantly on technological solutions, while critical social, environmental, and economic dimensions tend to be overlooked (Wijayani & Alifa, 2022; Wüstenhagen, Wolsink, & Bürer, 2007; Horbaty & Ellis, 2012). This narrow focus underscores the importance of robust planning tools to ensure that development initiatives align with broader sustainability goals.

One of the key tools for sustainable development planning is the Environmental Impact Assessment (EIA), which plays a crucial role in guiding decisions (Sukananda & Nugraha, 2020). EIA serves as a document to identify, predict, evaluate, and mitigate environmental and social impacts (IAIA, 2009). The scope of what constitutes the "environment" in impact assessments is not only biophysical aspects, but also chemical, ecological, cultural, visual, and socio-economic components, reflecting a more integrated understanding of development impacts (IAIA, 2009; Zahroh & Najicha, 2022). From multiple stakeholder perspectives, EIAs offer value, including for decision making process for the proponents, overseeing environmental management practices for government bodies, and encouraging public participation (Hasyim, 2022; Situmorang, 2022; Sukananda & Nugraha, 2020; O'Faircheallaigh, 2010).

Globally, EIA regulations vary widely, and many countries have recently taken steps to strengthen their regulatory frameworks (UNEP, 2018). In Indonesia, based on Law No. 32 of 2009 on Environmental Protection and Management, project proponents are required to obtain environmental approval before proceeding with development. This process involves preparing environmental documents such as the Environmental Impact Assessment (AMDAL), Environmental Management and Monitoring Efforts (UKL-UPL), or a Statement of Environmental Management and Monitoring Capability (SPPL). Geothermal exploration activities require UKL-UPL, while exploitation stages must be supported by AMDAL, as stated in Ministry of Environment and Forestry (MoEF) Regulation No. 4 of 2021 on the List of Businesses and/or Activities Required to Prepare AMDAL, UKL-UPL, or SPPL.

In Indonesia, many geothermal projects are financed by multilateral development banks or international financial institutions (IFIs), which require the preparation of an Environmental and Social Impact Assessment (ESIA). ESIAs refer to compliance with lender-specific environmental and social standards for projects financed by IFIs. It serves as a tool to recognize and evaluate the potential environmental and social effects of a proposed project, explore alternative options, and develop suitable strategies for mitigation, management, and monitoring (World Bank, 2017). Although an EIA and the required environmental permits may have already been

approved under the national scheme, donors or international investors often require the project sponsor to undertake a separate ESIA (Romianingsih *et al.*, 2023). As a result, companies frequently need to prepare two separate documents.

The core challenge lies in the need for better integration and alignment. In Indonesia, one of the biggest challenges in conducting ESIA is accommodating the local regulatory landscape. Often, there are strict legal and procedural requirements that must be followed. For example, EIA documents must adhere to a prescribed national format (ISEP, 2025). While this ensures procedural consistency within the national system, it can create difficulties when aligning with the more flexible, risk-based approach of international ESIA standards. As a result, inconsistencies may arise in terms of substance, scope, and methodology when both assessments are prepared concurrently. In addition, typically, the AMDAL/UKL-UPL and ESIA for geothermal power plant projects are prepared by different teams. There is also the risk of producing a "two-tier" study, where one document—typically the national EIA—is treated as a formality just to initiate project approval processes (Dias *et al.*, 2022). Furthermore, the timelines for AMDAL and ESIA processes are sometimes not aligned. When the two processes are not conducted simultaneously or close in time, challenges are amplified by evolving project designs and the introduction of new or innovative technologies, which make alignment even more difficult (Romianingsih *et al*., 2023). If the ESIA is conducted long after the AMDAL, changes in environmental and social conditions at the project site may have occurred. If the project scope has evolved, much of the groundwork must be repeated, effectively doubling the cost and effort. This duplication also impacts communities. Repeated stakeholder engagement sessions for both AMDAL and ESIA can lead to fatigue and disengagement among local communities (Reed, 2008). Over time, community members may begin to feel skeptical about the effectiveness of the engagement process (Adeyemi, 2024). As a result, they may be reluctant to participate in further consultations or provide the necessary data, which can hinder both processes.

This study explores how the alignment between AMDAL and ESIA preparation processes can be strengthened, with a particular focus on geothermal energy projects in Indonesia. By examining these gaps, the research seeks to identify practical strategies that could streamline the preparation phase, reduce duplication, and ultimately support geothermal proponents in meeting both national regulatory requirements and international financing standards more effectively. Several previous studies have addressed similar themes. For instance, Romianingsih *et al.* (2023) examined the differences between ESIA and AMDAL in the context of a single LNG-to-power project in Karawang Regency. Another study by Romianingsih (2023) focused on integrating AMDAL and ESIA content within electricity generation projects in Indonesia. Siregar and Utomo (2019) compared AMDAL with the Equator Principles in terms of how each addresses environmental risks in project development. However, studies specifically aimed at aligning AMDAL and ESIA are still limited. Most research instead compares EIA systems across countries (Swangjang, 2018; Makmor, 2014).

What distinguishes this study is its broader descriptive review of the AMDAL and ESIA implementation practices from geothermal projects. This allows for more comprehensive insights that go beyond a single project. Furthermore, the study is designed to generate practical recommendations targeted at project proponents, rather than focusing solely on regulatory or policy reform. The main standard used for international benchmarking is the IFC Performance Standards (IFC PS), widely recognized as the leading environmental and social safeguard system, with over 86% of development banks aligning their safeguards with it (Romianingsih *et al.,* 2023). IFC standards are particularly relevant for private sector projects, especially in the renewable energy sector (Invest Islands, 2018). In addition, this study includes a review of the World Bank (WB) Environmental and Social Standards (ESS), which are widely applied in public sector and state-owned enterprise (SOE) projects. This is particularly relevant given that SOEs account for approximately 94% of Indonesia's total installed geothermal capacity (Richter, 2020; Cariaga, 2022). The significance of the WB's involvement is further demonstrated by the Geothermal Resource Risk Mitigation (GREM) project in Indonesia (World Bank Group, 2018).

2 METHODS

The primary objective of the study is to identify and describe the key similarities and differences between AMDAL and ESIA in the context of geothermal development in Indonesia. This study adopts a qualitative descriptive approach, which is particularly suited for exploring the complex nature of AMDAL and ESIA in geothermal projects. Unlike quantitative methods, a qualitative approach enables a more nuanced understanding of differences, overlaps, and implementation challenges that may not be easily captured through numerical data. The scope of the study is limited to geothermal projects in Indonesia, with data collection conducted in June-August 2025. Data were gathered through document reviews, which provided factual and administrative insights from AMDAL and ESIA documents of relevant geothermal projects. In addition, literature studies were carried out to build a theoretical and regulatory foundation, drawing from journal articles, news sources, regulations, and standards. Primary data were obtained through semi-structured interviews using purposive sampling to capture insights from 4 ESIA and AMDAL consultants. The researcher also draws on personal experience as a practitioner involved in both AMDAL and ESIA processes, which provides reflective insight into real-world practices. To ensure credibility and dependability, the study employed triangulation and peer debriefing as validation techniques.

The analysis involves thematic content analysis. These themes are categorized to identify gaps in a descriptive manner across the following dimensions:

1. Conceptual Gaps
   This analysis relates to the underlying principles, purpose, and scope of each assessment framework.
2. Institutional Gaps
   This gap analysis focuses on the roles, mandates, and coordination among institutions involved in AMDAL versus ESIA processes.
3. Procedural Gaps
   This analysis covers the steps, timing, and consultation mechanisms involved in each process.
4. Substantial Gaps
   The gap analysis refers to the substantive content of AMDAL based on Law No. 32 of 2009, Government Regulation (GR) No. 22 of 2021 on the Implementation of the Environmental Protection and Management, MoEF Regulation No. 16 of 2012 on Guidelines for the Preparation of Environmental Documents, and selected AMDAL documents, compared to ESIA content synthesized by the researcher based on IFC PS, WB ESS, World Business Council for Sustainable Development (WBCSD) guidance.

These thematic gaps were mainly based on document reviews, further validated through interviews and authors' reflection. Based on this, the study formulates an alignment strategy and offers recommendations, particularly aimed at helping geothermal companies in Indonesia navigate and harmonize both AMDAL and ESIA processes more efficiently.

3 RESULTS AND DISCUSSIONS

3.1 Conceptual Difference Between AMDAL and ESIA

Despite sharing overarching goals, AMDAL and ESIA are built on different conceptual frameworks. AMDAL, grounded in Indonesian Environmental Legislation Law No. 32 of 2009 and GR No. 22 of 2021. The process is designed to fulfill environmental permitting requirements as part of the broader business licensing framework. As stipulated in Article 4 of GR 22/2021, "*Every business and/or activity plan that has the potential to impact the environment must obtain an AMDAL, UKL-UPL, or SPPL,"* with geothermal projects requiring a UKL-UPL for exploration and AMDAL for exploitation and operation. Furthermore, MoEF No 4 of 2021 explicitly identifies environmental documents (such as AMDAL) as a prerequisite for obtaining Environmental Approval (*Persetujuan Lingkungan*). Thus, AMDAL and UKL-UPL primarily serves as a legal compliance document, to ensure that competent authorities, when deciding whether to issue permits for a project with potentially significant environmental impacts, do so with full awareness of the possible consequences (Hasyim, 2022).

In contrast, ESIA emphasizes the identification and management of environmental and social (E&S) risks in line with international standards set by financial institutions or development lenders. ESIA is a technical and managerial tool that supports a project's bankability, sustainability, and long-term performance. IFC Performance Standard 1 (PS1) outlines that the objectives of ESIA are to manage E&S risks, improve performance, and facilitate informed financing decisions. WB ESS1 further states that ESIA aims to identify, assess, and manage E&S risks and impacts associated with a project, and to support sustainable decision-making for financing. Within the IFC and WB frameworks, ESIA documents function as dynamic tools for risk management, reputation protection, and long-term sustainability assurance. In terms of scope, ESIA can be tailored to the specific activities being financed by international lenders. For example, if the financing is only intended for the exploration phase, the ESIA will focus solely on exploration—particularly in Indonesia, where transitioning from exploration to exploitation requires additional regulatory steps.

In summary, while both AMDAL and ESIA aim to anticipate and mitigate the potential impacts of development projects, they diverge significantly in their underlying purpose**. Alignment between the two is not required, as they serve different functions.** AMDAL is an instrument of legal compliance designed to fulfill regulatory permitting obligations, while ESIA is a strategic risk management tool designed to meet international lender requirements and ensure E&S sustainability throughout the project lifecycle. This conceptual divergence creates potential friction for projects—particularly those in the geothermal sector—that must navigate both frameworks simultaneously. Failure to reconcile these frameworks early in the project cycle can result in regulatory delays, duplication of effort, underestimation of material risks, and ultimately, jeopardized access to financing or reputational risks for project proponents.

3.2 Institutional Barriers to AMDAL and ESIA Integration

AMDAL and ESIA are developed under different regulatory and institutional frameworks, where AMDAL being governed by Indonesian national regulations and ESIA generally guided by international standards. As a result, significant differences exist in their implementation, including the composition of development teams, appraisal mechanisms, monitoring practices, and stakeholder coordination requirements (Table 1).

Table 1 Institutional Distinguishments Between AMDAL and ESIA Process

No.	Aspect	AMDAL	ESIA	Gap
1	Development Team	Certified personnel (SKA) registered by the Ministry.	Does not require certification. Emphasis is placed on experience, technical competence, and independence from the project proponent.	Different capability requirements.
2	Appraisal Party	Feasibility Assessment Team (TUK) under the Ministry/Local Environmental Agency (KLH/DLH) and sectoral experts.	Independent E&S consultant appointed by the Lender, based on project risk level and specific sector.	Different institutional affiliation and independence. AMDAL is appraised by a government-affiliated team, while ESIA is reviewed by an independent consultant.
3	Monitoring Agency	Relevant local or national government agencies, including Environment, Transportation, and Energy and Mineral Resources.	Lender and its independent consultant.	Different institutional affiliation and independence.
4	Coordination Among Stakeholders	Stakeholder engagement is required but limited to Project-Affected People (PAP), without specific provisions for engagement with Indigenous Peoples.	Involvement of all key stakeholders is required from the beginning by the project proponent.	AMDAL relies on voluntary stakeholder coordination, while ESIA mandates early and inclusive stakeholder engagement.

AMDAL and ESIA are developed under different standards and mechanisms, which often results in the need for different development teams. Preparing an ESIA requires experience in engaging with international lenders, while AMDAL preparation involves extensive coordination with the KLH or DLH, often across various divisions or directorates. In Indonesia, it is still uncommon to find professionals who are competent in both AMDAL and ESIA, as most tend to specialize in one or the other. As a result, project proponents frequently appoint two separate teams. In such cases, strong coordination between the teams is crucial to avoid inconsistencies and duplicated efforts. At a minimum, project proponents should conduct internal capacity building for the

relevant division or personnel so they have a working understanding of both AMDAL and ESIA. This enables them to effectively coordinate the work of different teams, even if the teams preparing each document are separate.

Beyond the preparation of the documents, both AMDAL and ESIA processes involve various stakeholders. Geothermal projects must simultaneously comply with environmental, forestry, spatial planning, and energy-sector regulations. A dedicated Stakeholder Engagement Plan (SEP) should be developed to guide both the AMDAL and ESIA processes. This plan must ensure alignment between the two systems, particularly in terms of communication strategies and messaging. The engagement narratives used in both AMDAL and ESIA should be consistent, coordinated, and mutually reinforcing to prevent confusion and manage expectations.

3.3 Procedural Differences Between AMDAL and ESIA

The implementation of EIA process is shaped by each country's unique legal and political context (Swangjang, 2018). In most countries, the fundamental legal provisions governing EIA processes are embedded within overarching environmental framework laws. However, in many jurisdictions, including Indonesia, core elements of internationally recognized EIA and Strategic Environmental Assessment (SEA) frameworks are often only generally referenced in national legislation (UNEP, 2018). In contrast, ESIA is typically guided by international standards through their respective guidelines or standards documents. Fundamentally, AMDAL and ESIA share procedural similarities. However, they also exhibit key differences in objectives, scope, methodology, and institutional requirements. These differences are summarized in the following Table 2.

Table 2 Procedural Differences Between AMDAL and ESIA

AMDAL	ESIA IFC PS / WB ESS	Gap
Screening		
Screening (*Penapisan*) is carried out by government institutions through the OSS (Online Single Submission) system and AMDALnet platform based on fixed project categories outlined in Annexes I, II, and III of GR 22/2021. It results in the Direction Letter that determines the type of environmental document required. The approach is predominantly administrative and rigid, with no requirement for public involvement. Timeframes are regulated by the OSS system, ensuring uniformity but potentially lacking context-specific environmental and social risk considerations.	Screening is a lender-driven process led by E&S specialists or independent consultants. It is adaptive and based on the level of risk and potential impacts, rather than a fixed list of categories. The output of screening is typically a Terms of Reference (ToR) or a Scoping Document, which guides further assessment. While public involvement is not mandatory at this stage, early stakeholder engagement is often recommended. The timelines are usually aligned with financing milestones (early in the project lifecycle).	The primary gaps between AMDAL/UKL-UPL and ESIA screening lie in their underlying frameworks, responsible institutions, decision criteria, and outputs. The differences can lead to inconsistent assessment outputs. Additionally, the lack of early stakeholder involvement in AMDAL/UKL-UPL screening contrasts with the expectations of international lenders.
Scoping		
Scoping (*Pelingkupan*) is mandatory as per GR 22/2021, with detailed procedures outlined in MoEF Regulation 8/2013. Scoping is often based on document review without site verification. Indonesian AMDAL does not require field surveys for scoping, except to conduct public consultation or socialization. The scoping process produces Terms of Reference (KA-ANDAL) that is assessed and approved through a formal review process involving the appraisal team, including technical experts, NGOs, and the community representatives.	IFC PS1 and Guidance Note 2, as well as WB, emphasize a flexible and iterative scoping process, especially in complex or data-poor environments, led by independent consultants. It should incorporate site visits, stakeholder input, and early engagement with PAP. Under ESS1 and ESS10, scoping must be impact-driven and inclusive of vulnerable groups. Stakeholder engagement is required from the earliest stages. Site visits and early feedback loops are highly encouraged. The output is a Scoping Report as the ESIA ToR.	There is no explicit requirement for stakeholder feedback in defining the scope of AMDAL. In contrast, IFC and WB require participatory, field-verified scoping to avoid missing critical impacts or stakeholder issues. The lack of flexibility and iterative adjustment in AMDAL may lead to gaps in impact identification.
Baseline Study		
AMDAL baseline studies are guided by GR 22/2021 and MoEF Regulation 4/2021. The baseline data for UKL-UPL does not have to be as comprehensive as which of in AMDAL. Physical, biological, socio-economic, and health components are assessed using a combination of field surveys (e.g., lab sampling, field measurements), secondary data (e.g., BPS, BMKG), and community interviews. The frequency is typically single-season, and there is no strict requirement for multi-season data. Social and biodiversity aspects are often less emphasized.	IFC PS1 and WB ESS1/7 requires scientifically sound, multi-season baseline data for both biophysical and social environments. Data collection includes detailed household surveys, key informant interviews, participatory mapping, gender-disaggregated data, and site visits spanning full seasonal cycles.	The AMDAL system, while comprehensive in regulatory structure, generally lacks requirements for multi-season baseline surveys, something mandated under IFC PS and WB ESS. Social baseline assessments in AMDAL also tend to rely heavily on secondary data and do not mandate detailed analyses of vulnerable groups or Indigenous Peoples (IP). Furthermore, AMDAL baselines are often static and not designed to evolve with stakeholder feedback or dynamic environmental-social conditions, unlike the iterative approaches promoted by IFC/WB.
Public Consultation/Stakeholder Engagement		
Public consultation is formally required at least once. It must be publicly announced through multiple media and documented. Project announcements are typically made by displaying a banner at the DLH office, uploading the notice to the DLH website, publishing it in newspapers, and/or conducting public consultation whose participants include Project-Affected People (PAP), environmental NGOs, local leaders, and authorities. However, public consultation in Indonesia is often characterized as pseudo-participation and a procedural	IFC PS and WB ESS7 requires structured, repeated, and inclusive consultation. Non-Technical Summary (NTS) must be shared beforehand. It must be culturally appropriate, documented, and transparent. It requires engagement of vulnerable groups, including IP (require FPIC), women, and the poor. It usually uses focused group discussions (FGD), workshops, interviews, and participatory mapping.	While AMDAL mandates public consultation, the process is often procedural, one-time, and may not reach vulnerable or IP effectively. In contrast, IFC and WB ESS require recurring, inclusive, and adaptive consultations, with verifiable impacts on project decisions. Lack of ongoing engagement or missing FPIC evidence creates credibility and compliance gaps.

AMDAL	ESIA IFC PS / WB ESS	Gap
exercise with selective involvement of stakeholders (Marzuki, 2009; Nadeem & Fischer, 2011).		
Document Development: Impact Identification and Assessment		
Impact assessment is governed by GR No. 22/2021 and its Annex III. It primarily focuses on direct environmental and social impacts, without detailed cumulative or induced impacts.	IFC emphasizes a risk-based approach that includes direct, indirect, and cumulative impacts. The WB ESS framework applies a risk and impact-based approach, requiring analysis under ESS1 and across other thematic ESS. Emphasis is placed on uncertainty and sensitive areas.	The AMDAL framework does not require a formal cumulative impact assessment or induced seismicity analysis, both of which are key concerns in geothermal and gas projects.
Development of Environmental Monitoring and Management Plan		
The development of an environmental monitoring and management plan is represented by the RKL-RPL (Environmental Management and Monitoring Plan) document, as mandated by GR 22/2021. For geothermal exploration, the environmental document is only in the form of UKL-UPL in which the main component is similar to RKL-RPL matrix. KLH provides a standardized RKL-RPL format for certain types of projects, which is typically used as a reference in preparing the documents.	The document is the Environmental and Social Management Plan (ESMP). It includes detailed information on budget, timeline, roles and responsibilities, and adaptive monitoring mechanisms. The ESMP is often supplemented with an Environmental and Social Action Plan (ESAP) that may be contractually binding for lenders.	RKL-RPL is often generic and not integrated with cost, roles, and timelines. Conversely, the ESIA process under IFC and WB requires the preparation of a comprehensive ESMP which is dynamic and budgeted. This results in a gap where the RKL-RPL may meet legal compliance but falls short of meeting lender expectations for detailed planning.
Development of Supporting Documents/Parallel Studies		
The supporting documents include the Wastewater Technical Approval (*Pertek* BMAL), Emission *Pertek*, Hazardous Waste Technical Details (Rintek LB3), Technical Details Document (DRT) and Traffic Impact Analysis (Andalalin), and the Spatial Suitability Approval (PKKPR). Each document is governed by separate sectoral regulations, such as MoEF Regulation 5/2021 or Ministry of Transportation Regulation 75/2015, and follows distinct processing procedures. For example, the Andalalin process is managed by the Directorate of Road Transport, Ministry of Transportation, which involves a formal Andalalin Committee review and approval meeting. The PKKPR is handled through the Online Single Submission (OSS) system under the Ministry of Agrarian and Spatial Planning/National Land Agency (ATR/BPN), requiring conformity with spatial planning (RTRW) and technical verification. The *Pertek* BMAL, Emission *Pertek*, Rintek LB3, and DRT are coordinated with different divisions of the environmental agencies.	IFC PS and World Bank ESS, supporting documents are risk-based, interdisciplinary, and project-context driven. Required documents may include a Cultural Heritage Assessment (IFC PS8/WB ESS8), Stakeholder Engagement Plan (SEP), or specialized studies such as Gender Assessment, Human Rights Screening, or a Biodiversity Management Plan. Often, international lenders require these studies as part of their due diligence process before project financing decisions are made.	AMDAL/UKL-UPL requires multiple technical approvals and supporting studies, tend to focus narrowly on technical compliance. In contrast, ESIA emphasizes broader thematic studies.
Document Evaluation		
The evaluation is carried out by the Technical Team (*Tim Uji Kelayakan*) appointed by the government, which validates the environmental documents. There is no requirement for independent or third-party evaluation, and the same authority both assesses and approves the documents. The process typically includes a formal review meeting (*sidang AMDAL* or *sidang UKL-UPL*), where the proponent presents the study results, receives feedback from the evaluation team, and addresses any required revisions before approval.	IFC places the responsibility of document evaluation through internal due diligence mechanisms and supervision. The WB ESS framework mandates independent due diligence under ESS1 and ESS10. It also requires transparent decision-making and clear accountability mechanisms, ensuring that environmental and social considerations are fully integrated into project approvals. Technical or environmental due diligence is carried out by lenders or third-party consultants, not a formal government commission.	AMDAL lacks independent, third-party validation processes, relying instead on government reviewers who both assess and approve the documents. This dual role may limit objectivity and the rigor expected by international financiers or sustainability frameworks and may lead to manipulation of the process (Enríquez-de-Salamanca, 2018).
Monitoring by Evaluator		
Monitoring is implemented based on the RKL-RPL and UKL-UPL matrices, requiring proponents to submit environmental performance reports every 6 months to local or national environmental agencies (DLH/KLH) and other relevant agencies (based on the impacts), either directly or via the SIMPEL system. Additionally, sudden inspections or audits may be conducted. Non-compliance may result in administrative sanctions imposed by the authorities.	IFC requires ESAP-based monitoring, which often includes third-party independent audits. While no strict frequency is imposed, monitoring is generally conducted quarterly or at critical project milestones. Non-compliance can lead to suspension of loan disbursement. WB ESS emphasizes adaptive management and continuous feedback mechanisms. Third-party monitoring may be required, and monitoring schedules are adapted to project phases. Emphasis is placed on learning and adjusting based on findings, not just compliance.	AMDAL focuses heavily on compliance reporting and formal inspections, with limited emphasis on adaptive monitoring or stakeholder involvement. There is also a lack of third-party verification or structured learning mechanisms, which are standard under international ESIA practices

AMDAL	ESIA IFC PS / WB ESS	Gap
Grievance Redress Mechanism (GRM) for the EIA		
While Law No. 32 of 2009 technically grants every individual the right to file environmental complaints and obliges the government to respond, the law's substance falls short. It fails to establish a concrete, stand-alone mechanism for this process. Instead on the AMDAL document, this issue is addressed as a part of various socio-economic approaches rather.	GRM acts as a system to address the concerns and grievances regarding the project's environmental and social performance. The process for resolving issues must be prompt, transparent, and easy to understand. It should also be culturally appropriate and accessible to everyone, at no cost and without fear of punishment. In addition, a separate process is needed to handle grievances related to workers' rights.	The AMDAL framework lacks a concrete, standalone mechanism for handling grievances about E&S impacts. In contrast, the ESIA framework mandates a formal, transparent, and accessible grievance mechanism that a project proponent must establish to promptly resolve concerns from both PAP and workers.
Timeline		
The AMDAL process in Indonesia is strictly regulated under MoEF Regulation No. 4/2021, which stipulates a fixed timeframe of 60–180 calendar days depending on the project's risk category (A, B, or C). However, this timeframe applies strictly to the preparation of the documentation; the subsequent submission, administrative completeness checks (typically around 10 working days), and technical review (up to 50 working days) are additional and not bound by the initial deadline. Thus, while document drafting is time-bound, the overall approval timeline critical for projects such as geothermal development, remains variable and subject to procedural and administrative factors. While this creates regulatory predictability, it also enforces tight deadlines that may limit data collection and the depth of analysis, especially for complex projects such as geothermal development, where seasonal variation and multidisciplinary data are critical.	Under IFC PS1 and WB ESS1, there is no formal timeline mandated for the preparation of the ESIA. The duration is flexible and depends largely on the project proponent's preparedness, the complexity of the project, and the lender's due diligence process. The IFC emphasizes quality, stakeholder engagement, and iterative analysis rather than speed. ESIA typically requires 12–18 months of preparation to ensure comprehensive baseline data collection and robust risk assessment.	AMDAL process has a fixed legal timeframe. In contrast, both IFC and WB do not enforce formal timelines, allowing more flexibility and depth in baseline studies. This results in a gap where AMDAL is often completed quickly with limited data, while ESIA—particularly those funded by lenders—requires a longer, more comprehensive, and iterative process.

AMDAL and ESIA have key procedural differences that affect implementation, especially for capital-intensive and high-risk sectors such as geothermal energy development. For geothermal projects, where both environmental compliance and international financing are critical, alignment between AMDAL and ESIA processes has significant implications for permitting efficiency and project timelines.

1. Integrated Screening Approaches

   The AMDAL screening process is governed by regulatory thresholds outlined in PP No. 22/2021, while the ESIA approach relies on a risk-based categorization system that considers context-specific E&S sensitivities. For geothermal projects, particularly those in forest areas, conservation zones, or areas with Indigenous Peoples, a risk-based approach provides more comprehensive early warnings of potential red flags. Integration of ESIA-style risk categorization into AMDAL screening could help geothermal proponents proactively manage potential showstoppers and reduce the risk of project delays due to re-screening or re-evaluation during financing processes. As an added value, engaging stakeholders can be carried out—not only to align with best practices under international standards, but also to obtain validation and input from key stakeholders. This input can serve as justification during the preparation of national environmental documents.

2. Strategic Scoping for Material Impact Identification

   Scoping in the AMDAL process (KA ANDAL) tends to be document and regulation-driven, with limited stakeholder engagement. In contrast, ESIA scoping includes consultations with PAP and authorities to refine the scope and identify material impacts early. In geothermal projects, where land use, water availability, and community health are recurring concerns, meaningful scoping determines the depth and relevance of the assessment. Limited scoping under AMDAL may result in underestimation of significant impacts such as induced seismicity, groundwater depletion, or livelihood displacement, which can become critical issues during lender due diligence. Integrating ESIA-informed scoping into the KA ANDAL stage enhances the robustness of the analysis and reduces the need for costly rework or supplementary assessments.

3. Joint Baseline Data Collection

   The integrity of both AMDAL and ESIA assessments depends on robust baseline data. However, asynchronous timelines between the two processes may result in duplicated data collection efforts or inconsistent datasets. For geothermal projects, where baseline data collection may take weeks, lack of integration increases time and cost burdens. To avoid those risks, geothermal project proponents should conduct a joint baseline data collection process that fulfills the requirements of both AMDAL and ESIA. It not only optimize costs but also ensure methodological consistency across both assessments.

   In addition to joint baseline data collection for environmental documents and ESIAs that have not yet been prepared at all, there are also cases where an exploitation-phase geothermal ESIA refers to baseline data from the UKL-UPL implementation reports of the exploration phase. For example, PT Supreme Energy Rantau Dedap used this approach for their ESIA of the 250 MW Rantau Dedap Plant in 2017. In that case, the ESIA also took into account the completed ANDAL. This was because financing was allocated solely for exploitation activities. During the exploration stage, the company had implemented environmental and social impact management and monitoring effectively, resulting in environmental datasets with observable trends that could be utilized for the baseline data of the exploitation ESIA, especially if the environmental quality monitoring results were still valid at the time (as in this case, the ESIA was prepared within a relatively short time after the exploration phase).

4. Integrated Public Consultation

Rather than conducting separate public consultations for AMDAL and ESIA, project developers are encouraged to implement a single, integrated public consultation process that satisfies the procedural requirements of both systems. This approach prevents redundancy, reduces consultation fatigue among local communities, and ensures broader stakeholder coverage. Even if the ESIA process has not yet started, the company's internal divisions responsible for E&S quality should understand that public consultations for national environmental documents must already be designed to meet ESIA standards, especially if an ESIA is planned in the future (e.g., when financing from International Financial Institutions is anticipated). While AMDAL focuses on direct project-affected people (PAP), ESIA demands broader engagement—including with vulnerable groups, women, Indigenous Peoples, and civil society. This way, a single public consultation—although conducted for a national environmental document—can also serve ESIA purposes, provided there have been no significant changes in E&S conditions (e.g., post-disaster, major new infrastructure development, or acomplete change in village leadership and officers).

5. Coherent Document Development

While the structure of the AMDAL (comprising the ANDAL, RKL-RPL) differs from the ESIA (including ESMP) document, both aim to present a comprehensive assessment of impacts and mitigation strategies. Procedural alignment can be facilitated through the concurrent drafting of AMDAL and ESIA documents, starting with a joint kick-off and using a shared digital repository for content that needs to be harmonized. In fact, expectations for alignment between AMDAL/UKL-UPL and ESIA can be established as early as the planning stage for their preparation. This approach was taken by PT Ormat Geothermal Indonesia for their UKL-UPL and ESIA in the Wapsalit area. It ensures consistency in project descriptions, analytical frameworks, and mitigation commitments, thereby reducing ambiguity in implementation.

6. Integrated Monitoring for Streamlined Oversight

In principle, the monitoring processes for AMDAL and ESIA are similar in nature. However, they are typically carried out by different parties. Monitoring is usually conducted on a quarterly or semi-annual basis, and in some cases, unexpected inspections may also occur. Given this, the project proponent does not need to create separate monitoring systems. Instead, they must ensure that their environmental and social management efforts comprehensively cover the requirements of both: the UKL-UPL or RKL-RPL and the ESMP.

This integrated approach has been implemented by PT SMI for the Waesano Geothermal Exploration Project in Wae Sano, Flores Island, East Nusa Tenggara. In their ESMP, they explicitly included both the management and monitoring requirements for the UKL-UPL and the ESIA. By designing an integrated monitoring and management framework that satisfies both sets of obligations, proponents can reduce redundancy, improve efficiency, and maintain regulatory and lender compliance simultaneously.

7. Synchronizing Regulatory and Financing Timelines

AMDAL and ESIA often follow different timelines, which may delay project implementation or create inconsistencies. In geothermal projects, where exploration-to-construction cycles are tightly scheduled, asynchronous approval processes can lead to sunk costs or permit expirations. Establishing a synchronized timeline for AMDAL and ESIA preparation and approval enables geothermal developers to align environmental licensing with procurement, financing, and construction schedules. A proposed alignment of AMDAL and ESIA steps and timeline is illustrated in the following figure.

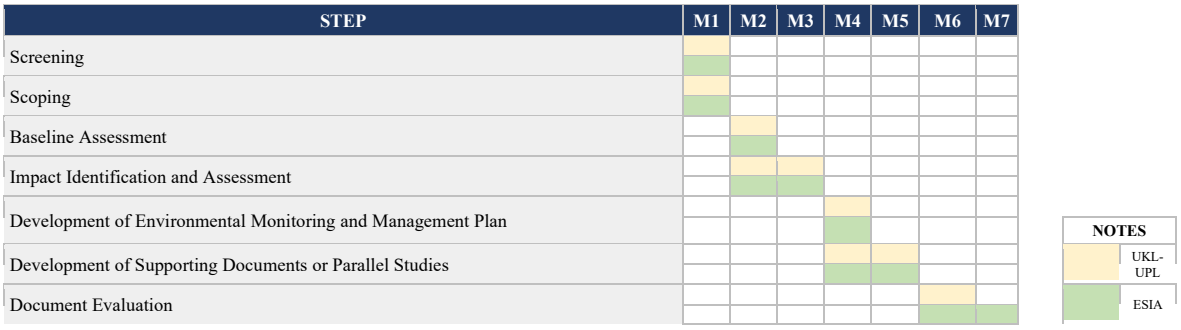

Figure 1 Synchronized Timeline of UKL-UPL and ESIA for Geothermal Exploration

In the context of geothermal projects, the timeline for ESIA preparation, both for exploration and exploitation phases tends to exceed that of national environmental permitting processes, namely the AMDAL and UKL-UPL. This disparity arises because the final ESIA approval, which serve as the basis for lender compliance and project financing, can only be issued once the national environmental approval has been granted, either in the form of the Environmental Feasibility Decree (*Surat Kelayakan Lingkungan Hidup*/SKKLH) or the Environmental Approval (*Pernyataan Kesanggupan Pengelolaan Lingkungan Hidup*/PKPLH).

For the exploration stage, the overall permitting process is generally shorter, as it requires fewer parallel technical documents. The PKKPR remains mandatory. Usually, only *Rintek LB3* is required, as hazardous waste will inevitably be generated and temporarily stored on site. Parallel studies such as emission and wastewater *Pertek* and *Andalalin*, are typically not applicable. This is primarily due to the limited scope of works—if the drilling area is relatively small, the need for such permits is not triggered. For example, generator use during exploration is usually limited in capacity and operating hours, allowing air emission monitoring to be incorporated into the RKL-RPL matrix without the need for a separate emission *Pertek*. Similarly, for wastewater management, exploration projects are required only to provide adequate domestic wastewater storage (generated

from worker accommodation) and cooperate with licensed transporters and treatment facilities. Drilling-related wastewater is also stored and handled by licensed third parties, eliminating the requirement for a wastewater *Pertek*. Furthermore, exploration ESIA does not necessitate a two-season baseline environmental assessment. Consequently, the permitting process for exploration can typically be completed within a maximum of seven months, in contrast to the longer timelines associated with the exploitation stage.

In contrast, the exploitation phase demands a more extensive scope of work, including multiple parallel technical studies, the completion of sector-specific permits, and the requirement for two-season baseline data collection to capture environmental variability. Consequently, the ESIA process for exploitation extends to approximately one year before all documentation and approvals are finalized.

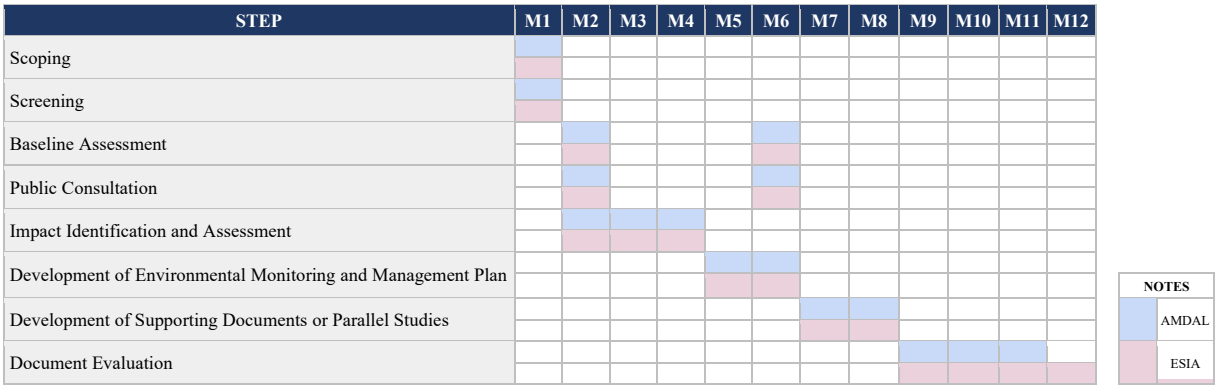

Figure 2 Synchronized Timeline of UKL-UPL and ESIA for Geothermal Exploitation

3.4 Substantial Gaps Between AMDAL and ESIA

The substance of an EIA would concentrate on whether EIA is having a direct impact on the quality of planning decisions and the nature of developments. In a wider approach, EIA is maintaining, restoring and enhancing environmental quality (Glasson & Therivel, 2019). Therefore, it is essential to consider the substance when analyzing the differences between AMDAL and ESIA:

Table 3 Substantial Gaps Between AMDAL and ESIA

AMDAL/UKL-UPL	ESIA	Gap
Screening		
The screening results are summarized in a Direction Letter, which states that for the business activity category of geothermal environmental services utilization in conservation areas and geothermal development at the exploration stage, an UKL-UPL is required. Meanwhile, at the exploitation stage and/or indirect utilization stage, an AMDAL is required (MoE Regulation No. 4/2021), with the following details: 1. Category A: Activities with the potential to cause disturbances to biodiversity and its ecosystems, as well as activities with the potential to trigger social conflicts. 2. Category B: Activities with the potential to cause impacts on climate, air quality, noise levels, hydrogeology, physiography and geology, spatial planning, land, and soil; biological components; as well as geothermal equipment and installations.	Screening stage is a initial assessment categorizes projects based on their type, location, sensitivity, scale, nature, and potential environmental impacts, determining whether they fall under Category A (significant adverse environmental impacts; sensitive, diverse, or unprecedented), B (adverse environmental impacts are less severe than cat A), C (minimal or no adverse environmental impacts), or FI (financial intermediaries). This categorization on screening stage stated on ESIA document.	In ESIA, there is an FI category. AMDAL considers the type of business activity and whether the location is within a conservation area, making it strictly based on these two main factors. In contrast, ESIA does not have such rigid provisions and must consider all these factors as a whole.
Scoping		
The equivalent of a scoping report is KA ANDAL. The KA ANDAL outlines the proposed geothermal exploitation and/or indirect utilization activities across all project phases and identifies potential impacts. These impacts are evaluated to determine their significance, resulting in classifications as hypothetical significant impacts (DPH) or hypothetical non-significant impacts (DTPH). Spatial boundaries for each DPH are defined based on project, ecological, social, and administrative limits, supported by maps, while temporal boundaries are set to assess environmental changes with and without the planned activities.	Scoping report of ESIA disclosed project description using literature study, outline the project ESIA process overview, implementation of stakeholder engagement, identify preliminary impacts based on scope activities, and proposed plan for ESIA study. Scoping activities were conducted in the potential area of influence that defined based on IFC PS 1: Assessment and Management of Environmental and Social Risks Impacts.	ESIA scoping process discloses the project description mainly through document review, outlines the ESIA process overview, implements stakeholder engagement, identifies preliminary impacts based on scope activities, and proposes a plan for the ESIA study. It does not use a formal DPH/DTPH classification or include temporal boundaries. In contrast, AMDAL used KA ANDAL for scoping process in Indonesia that focused on outlining proposed geothermal exploitation and/or indirect utilization across all project phases, identifying potential impacts, and evaluating their significance.
Baseline Assessment		
The aspects of baseline assessment in AMDAL:	The aspects of baseline assessment in ESIA:	ESIA baseline assessments tend to be broader and more detailed, especially in terms of

AMDAL/UKL-UPL	ESIA	Gap
1. Geophysical-Chemical Components: climate, air quality, noise, geology, physiography, geomorphology, volcanic stratigraphy, geotechnics and seismicity, geochemistry, soil, hydrology, surface water quality, hydrogeology, shallow groundwater quality. 2. Biological Components: ecosystem types, terrestrial flora and fauna, aquatic biota. 3. Socio-Economic, Cultural, and Public Health Components: socio-economic conditions, socio-cultural aspects, public health, community perceptions. 4. Transportation Components: road and transportation facilities, traffic volume.	1. Abiotic/Physical environment: seasonal climate variations (rainfall, temperature, humidity), wind speed/direction, air quality, geology and soil, hydrology and hydrogeology, surface and groundwater quality, noise, vibration, odor levels, quality and quantity of surface water, physiography, land use/status, and watershed information. 2. Biotic environment: vegetation and flora, wildlife and aquatic fauna, ecosystem services, terrestrial biodiversity, marine biota. 3. Socio-economic: social data (demographics, indigenous community surveys, identification of populations potentially affected by land acquisition, and mapping of sensitive receptors near project sites), economic data (local income, employment, livelihoods, and land ownership), socio-cultural data (social structure, community perceptions, cultural heritage, indigenous peoples, customs, norms, cultural values, heritage sites, and human rights), and community health.	seasonal and climatic variability, social data granularity, and ecosystem services. ESIA includes explicit consideration of indigenous peoples, human rights, and land acquisition impacts in more detail. AMDAL baseline focuses more on certain geophysical aspects specific to Indonesian geology. Transportation is explicitly required in AMDAL but less clearly separated in ESIA baseline.
Public Consultation/Stakeholder Engagement		
AMDAL public consultation is often limited in scope and depth. Consultations were conducted using a "Project Socialization" approach. Public consultation may also be conducted through announcements in mass media and the installation of pamphlets and banners. In KA ANDAL and ANDAL, the substance of the section about public involvement includes: • The public consultations and socializations implementation; • Concerns about potential environmental changes, such as runoff that may occur due to land clearing during the exploitation stage; • Expectations for environmental improvement or community welfare resulting from the proposed activity; • Other relevant suggestions, opinions, and feedback regarding the proposed activity.	ESIA document outlines stakeholder engagement and consultation activities conducted in multiple stages, including: • Consultation during ESIA development phase • ESIA disclosure and consultation • Stakeholder engagement plan for the future and grievance management, with a particular focus on land acquisition, Corporate Social Responsibility (CSR), and community development.	Both the AMDAL and ESIA documents present the implementation and results of public consultations conducted. However, the ESIA is more pragmatic as it also includes a SEP and a GRM that follow up on community engagement throughout the project cycle.
Impact Assessment		
AMDAL assesses significant impacts using a matrix based on environmental components and project components. It also identifies hypothetical significant impacts, which may be either negative or positive, as well as derivative impacts (primary, secondary, and tertiary). The significance of an impact is determined using seven criteria (MoE Regulation No. 5/2012, although no longer in force, is still applied in the ANDAL document): 1. the number of people affected, 2. the geographic extent of the impact, 3. the duration and the intensity of the impact, 4. the number of other environmental components affected, 5. the cumulative nature of the impact, and 6. the reversibility or irreversibility of the impact.	The impact assessment phase aims to determine the significance of the identified environmental and social impacts. This process considers the magnitude of each impact by taking into account factors such as predicted scale, duration, geographic extent, impact nature, and impact reversibility. In addition, it also considers the sensitivity of affected receptors. Key activities include evaluating the significance of individual impacts and examining potential cumulative impacts using Cumulative Impact Assessment (CIA). After the significance is assessed, the mitigation plan is outlined, and then the significance of the residual impact can be determined.	In ESIA, there is a "residual impact" component, whereas in AMDAL, this component is not included. The presentation of cumulative impacts also differs, with the ESIA being more comprehensive as it has its own dedicated methodology. However, AMDAL includes hypothetical significant impacts, the number of environmental components affected, and derivative impacts, which are not mentioned in the ESIA.
Management and Monitoring Plan		
The RKL-RPL covers pre-construction, construction, operational, and decommissioning. The RKL-RPL is presented in a detailed matrix format. For each potential impact identified, the matrix details the source, type, and magnitude of the impact. The plan covers:	ESMP is built based on ESMS (Management System), a system that adheres to international standards and composed of seven key elements: Policy, Identification of Risks and Impacts, Management Programs, Organizational	RKL-RPL is a stand-alone plan, not like ESMP which is built within ESMS framework. While the AMDAL framework outlines a RKL-RPL in a matrix format, the ESIA details a more holistic ESMP.

AMDAL/UKL-UPL	ESIA	Gap
1. Form of Activity: The exact measures that will be taken to manage or mitigate the impact. 2. Location: The specific geographic area where these management and monitoring activities will take place (even the coordinate point). 3. Timeframe: The frequency and duration of these activities. 4. Responsible institution for each management and monitoring task.	Capacity and Competency, Emergency Preparedness and Response, Stakeholder Engagement, and Monitoring and Review. The ESMP is the specific action plan, contains the procedures and steps, presented in a summary table format that acts as a matrix. It covers different project phases: preparation, construction, and operation, and decommissioning. The ESMP is usually accompanied by its own detailed management plans and typically specifies a system for assessing the effectiveness of its management and monitoring measures.	ESMP is a more comprehensive system. The ESIA framework also details specific procedures for internal and external audits, budget responsibility, and a more structured approach.
Grievance Redress Mechanism (GRM)		
There is no GRM document for the AMDAL process.	In an ESIA, GRM is a key part of stakeholder engagement. A good GRM needs clear objectives, assigned responsibilities, a timeline, and a budget. It also requires oversight from senior management and regular reporting. For any project, a third party can be involved in the GRM. The GRM should use various communication methods and procedures, depending on the situation and available resources and integrated into the broader E&S management system, acting as an indicator of that system's effectiveness.	
Stakeholder Engagement Plan (SEP)		
The engagement of directly impacted stakeholders is only regulated during the announcement of a business plan and public consultations. There is no mandatory requirement for the development of an SEP document.	In SEP, the proponent must identify all stakeholders, especially the PAP. They will then create an SEP scaled to the project's risks. The plan must include different measures to ensure effective participation from vulnerable groups. It should be driven by a well-defined strategy and have a clear set of objectives, timetable, budget, and allocation of responsibilities. All staff should be made aware of the program and understand why it's being undertaken and what implications it might have for project outcomes. Crucially, stakeholder mapping based on whose "interest" and impacted by the project is a key part that distinguishes SEP as a document to be reckoned with.	AMDAL does not mandate designated SEP. In contrast, ESIA uses the SEP as a foundational document to manage stakeholder engagement in a continuous, structured, and inclusive manner.
Derivative Document		
When preparing an AMDAL or RKL–RPL document, it must be accompanied by several supporting technical approvals, such as Wastewater *Pertek*, Emission *Pertek*, Rintek LB3, and Traffic Impact Analysis (Andalalin). These approvals must, at a minimum, outline the applicable technical standards for meeting quality requirements and related analyses, the competency standards for the human resources involved, and the environmental management system to be implemented. Once *Pertek*s and Rintek approved by the relevant authorities, the proponent is required to obtain a Certificate of Operational Feasibility (SLO). For Andalalin, Andalalin Approval Decree is also required. These documents are either referenced in specific sections or attached as annexes to the AMDAL document.	ESIA derivative document are limitless which based on the expected outcomes and action that need to be addressed from the risks and impacts identification process. These plans can take on many forms and are highly dependent on the project's specific risks and impacts. Examples of such documents may include a Stakeholder Engagement Plan, Resettlement Action Plan, Biodiversity Action Plan, Hazardous Materials Management Plan, Emergency Preparedness and Response Plan, Community Health and Safety Plan, and Indigenous Peoples Management Plan.	The key difference lies in the scope and flexibility of supporting documents. AMDAL uses a structured, compliance-based approach, requiring a fixed set of documents. In contrast, ESIA utilizes a more adaptive and comprehensive framework. Its action plans are not limited to a prescribed list but are instead directly derived from the specific risks and impacts identified during the assessment process. This means the number and type of action plans will vary from one project to another, ensuring a tailored response to every unique impact that deems necessary for further action.
Evaluation Results Documentation		
The formal hearing will result in the issuance of the SKKLH/PKPLH after the revisions are completed and approved. It is established based on the recommendations of the environmental feasibility assessment. It contains general information about the activity and the obligations of the proponent regarding E&S impacts. These obligations include adhering to the provisions in the RKL-RPL and the *Pertek*s. The responsible	Procedurally, a due diligence process is conducted, resulting in an Environmental & Social Review Summary (ESRS) and an Environmental & Social Action Plan (ESAP), both of which are reviewed and approved by the client. The ESRS provides a public summary of the lender's E&S assessment, explaining the risk category, key impacts, main mitigation	In AMDAL, the resulting document is only the SKKLH/PKPLH, which is essentially a decree. Even if there are actions to be taken, they are generally surface-level and broad in nature. In contrast, ESIA produces two follow-up documents: the ESRS, which summarizes the assessment results and is disclosed to the public, and the ESAP, which provides a detailed "to-do list" for environmental and

AMDAL/UKL-UPL	ESIA	Gap
party is also required to submit reports on the fulfillment of these requirements every 6 months, apply for changes if there are plans to modify the activity, and conduct an environmental audit after operations end. The decree also includes other important provisions, such as the threat of administrative sanctions for violations, the obligation to provide access for supervision, and the validity period of the decree, which remains effective as long as the business does not undergo significant changes.	measures, and the agreed action plan, and is typically published on the lender's website as part of the disclosure process. The ESAP outlines the actions required to address gaps identified during the due diligence, specifying responsibilities, timelines, levels of importance, and implementation schedules, serving primarily as a technical and internal document.	social management. In ESIA, ESAP commitments become part of a binding agreement with lenders.

It is evident that, in terms of substance, a significant gap still exists. ESIA often includes a broader range of aspects that are not sufficiently addressed within Indonesia's national AMDAL framework. As highlighted by Georgoulias & Arrasate (2016), international safeguard policies are often designed to fill the gaps left by local regulatory systems and help ensure the sustainability of projects—particularly in developing countries where EIA requirements tend to be less comprehensive. In a similar vein, another research emphasizes that the adoption of international E&S safeguard policies serves to improve the overall quality of project selection and design (Faubert, Bouchard, & Curtis, 2010). Given these substantive differences, it becomes essential to explore how the AMDAL and ESIA processes can be better aligned in practice.

1. Comprehensive Baseline Assessment

   ESIA places greater emphasis on the depth and breadth of baseline data. This is also supported by research conducted by Romianingsih *et al.* (2023). To ensure a more robust understanding of project impacts, geothermal project proponents are encouraged to design a comprehensive baseline study that integrates the substantive data needs of both frameworks. The data can be collected by conducting joint baseline data collection as mentioned previously.

2. Complementary Impact Assessment

   There are aspects where ESIA tends to provide deeper analysis (e.g., cumulative impacts, gender impacts, climate risk), while AMDAL is stronger in regulatory compliance (e.g., emissions, noise thresholds). In the geothermal industry, impact assessments often include seismic risk analysis to evaluate potential induced seismicity resulting from drilling and fluid injection activities. The project team should map out the requirements of both systems in the early scoping phase and structure the impact assessment through a crosswalk to map the substance so that findings can be used interchangeably or combined. This integration helps not only with licensing and financing but also provides a comprehensive evidence base for internal project decision-making and risk mitigation planning.

3. Cross-Referenced Supporting Documents

   AMDAL is often processed alongside various technical approvals, while ESIA is typically supported by thematic studies. To enhance integration and avoid duplication, the supporting documents of each process can be cross-referenced. For example, ESIA's thematic documents, such as the SEP, Grievance Redness Mechanism (GRM), Biodiversity Action Plan, can be referenced within the RKL-RPL as complementary implementation tools. Conversely, AMDAL's technical approvals, such as emission limits and hazardous waste management plans, can be cited in ESIA's ESMP to demonstrate regulatory compliance.

Substantive alignment between AMDAL and ESIA is essential for improving the overall quality and coherence of E&S assessments in geothermal development. Project proponents can reduce gaps, avoid conflicting recommendations, and enhance the credibility of their impact assessments. IFIs, such as the WB and IFC, increasingly serve a quasi-regulatory role by promoting the application of universal E&S standards across countries and sectors (Feichtner & Wörsdörfer, 2014). Rather than treating AMDAL and ESIA as separate or redundant processes, viewing them as complementary frameworks allows for more efficient resource use and a more robust foundation for regulatory compliance and international financing readiness.

4 CONCLUSIONS

This study highlights the importance of aligning AMDAL and ESIA processes, particularly in the context of geothermal energy development in Indonesia, by examining their conceptual foundations and key differences across institutional, procedural, and substantive dimensions. While these two systems originate from distinct regulatory frameworks and serve different compliance needs, their alignment, especially in terms of procedures and substance, has the potential to significantly strengthen the quality of decision-making and support more robust E&S governance for project developers. Importantly, such alignment does not necessitate full integration; rather, it requires intentional coordination to avoid duplication, fill critical gaps, and improve the overall coherence of E&S management.

From a practical standpoint, project proponents are encouraged to take a proactive role in designing and implementing impact assessments that satisfy both national regulations and international safeguard standards, even in the absence of formal regulatory or policy-level integration. Proponents who adopt such strategies can benefit from more efficient resource use, enhanced stakeholder credibility, and better readiness for international financing.

Future research could expand on these findings by examining comparative case studies, specifically, one project that intentionally integrates AMDAL and ESIA processes and one that does not, to evaluate differences in efficiency (e.g., cost savings) and effectiveness (e.g., time to approval, quality of documents). Additionally, further inquiry could explore how alignment can be institutionalized through policy and regulatory reforms, offering a clearer roadmap for both developers and government agencies to work in tandem toward more integrated and sustainable infrastructure development.

5 LIMITATIONS

This study is subject to certain limitations. First, the majority of the data used are derived from secondary sources, which may not fully capture project-specific nuances. The study does not focus on a single case study; instead, it draws from multiple cases to identify general patterns and insights. While this approach allows for broader applicability, it may limit the depth of contextual analysis for any one specific project. In addition, while the analysis includes reflective insights from the authors' professional experience as practitioners in the field, such reflections may carry inherent subjectivity. Nonetheless, these practice-based perspectives are intended to enrich the discussion and bridge the gap between theory and real-world implementation.

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