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Policy and Regulatory Readiness of Industrial Carbon Capture and Storage (CCS) in Indonesia

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ABSTRACT

Carbon Capture and Storage (CCS) is increasingly discussed as a policy option for decarbonizing hard-to-abate industries and supporting Environmental, Social, and Governance (ESG) implementation. In Indonesia, recent regulatory progress—especially Presidential Regulation No. 14 of 2024—has created an initial legal basis for CCS, but industrial deployment still depends on the coherence of policy, regulatory, and licensing arrangements across multiple sectors. This study examines the policy and regulatory readiness of industrial CCS in Indonesia through a qualitative, document-based analysis of laws, regulations, policy documents, peer-reviewed literature, and stakeholder consultations. The assessment is operationalized through eight readiness indicators: policy alignment, regulatory clarity, institutional coordination, licensing integration, environmental integrity, social safeguards, governance accountability, and Monitoring, Reporting, and Verification (MRV) readiness. The findings show that Indonesia has made important progress in establishing a legal foundation for CCS, yet readiness remains partial. The authority is fragmented across energy, environment, industry, licensing, transport, and sustainable-finance domains; long-term liability and post-closure stewardship remain insufficiently specified; and the integration of social safeguards and ESG-linked governance requirements is still limited. The article argues that industrial CCS can support the pillar of ESG, but only if Indonesia strengthens coordination, clarifies liability, streamlines licensing, and aligns CCS governance with ESG-oriented policy and reporting expectations.

Keywords: Carbon Capture and Storage; ESG; Industrial Decarbonization

ABSTRAK

Carbon Capture and Storage (CCS) semakin dipandang sebagai opsi kebijakan untuk mendekarbonisasi industri yang sulit diturunkan emisinya sekaligus mendukung implementasi *Environmental, Social, and Governance* (ESG). Di Indonesia, kemajuan regulasi—terutama melalui Peraturan Presiden No. 14 Tahun 2024—telah memberikan landasan awal bagi CCS, namun penerapan CCS industri masih bergantung pada koherensi pengaturan kebijakan, regulasi, dan perizinan lintas sektor. Penelitian ini menelaah kesiapan kebijakan dan regulasi CCS industri di Indonesia melalui analisis kualitatif berbasis dokumen atas peraturan perundang-undangan, dokumen kebijakan, literatur ilmiah, dan konsultasi dengan pemangku kepentingan. Penilaian dioperasionalisasi melalui delapan indikator: keselarasan kebijakan, kejelasan regulasi, koordinasi kelembagaan, integrasi perizinan, integritas lingkungan, perlindungan sosial, akuntabilitas tata kelola, serta kesiapan *Monitoring, Reporting, and Verification* (MRV). Hasil analisis menunjukkan bahwa Indonesia telah membuat kemajuan penting dalam membangun landasan hukum CCS, namun tingkat kesiapan masih parsial. Kewenangan masih terfragmentasi di ranah energi, lingkungan, industri, perizinan, transportasi, dan keuangan berkelanjutan; pengaturan mengenai tanggung jawab jangka panjang dan pascatutup belum cukup jelas; serta integrasi perlindungan sosial dan persyaratan tata kelola berbasis ESG masih terbatas. Artikel ini menunjukkan bahwa CCS industri dapat mendukung pilar lingkungan dalam ESG, tetapi hanya bila Indonesia memperkuat koordinasi, memperjelas tanggung jawab, menyederhanakan perizinan, dan menyelaraskan tata kelola CCS dengan ekspektasi kebijakan serta pelaporan berbasis ESG.

Kata Kunci: Dekarbonisasi Industri; ESG; Penangkapan dan Penyimpanan Karbon

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INTRODUCTION

Industrial decarbonization has become a central policy challenge because a large share of emissions from cement, steel, refining, petrochemicals, and other hard-to-abate sectors cannot be eliminated through energy efficiency and electrification alone. In this context, Carbon Capture and Storage (CCS) is increasingly treated not merely as a technical add-on, but as part of an industrial governance strategy that can help manage residual emissions when integrated into credible policy, regulatory, and investment frameworks (Mathur et al., 2022; McLaughlin et al., 2023; Global CCS Institute, 2023). The significance of CCS, therefore, depends not only on capture technology or storage potential, but also on whether a country can allocate responsibility, manage long-term risks, and build confidence among affected communities, investors, and regulators (Alizadeh et al., 2024; Aslam, 2024; Osazuwa-Peters & Hurlbert, 2020).

Indonesia has become an important case in this debate. The country has substantial storage potential and a strategic interest in developing decarbonization pathways for energy-intensive sectors, while also seeking to maintain industrial competitiveness and align its climate agenda with broader sustainable development objectives (Hidayat et al., 2025). Presidential Regulation No. 14 of 2024 has provided an important umbrella framework for CCS activities, especially by clarifying the possibility of storage development and cross-border arrangements. Yet, the existence of an umbrella regulation does not, in itself, mean that implementation is institutionally ready. The practical readiness of CCS depends on whether capture, transport, storage, environmental approval, shipping, investment governance, and long-term stewardship can be governed coherently across the Indonesian legal system.

This question is especially important when CCS is viewed through an Environmental, Social, and Governance (ESG) lens. In ESG terms, the relevance of CCS cannot be reduced to emission reduction alone (Haryani & Anjani, 2023). The environmental pillar requires credible Monitoring, Reporting, and Verification (MRV), robust safeguards against leakage, and clarity on permanence (Keating et al., 2017). The social pillar requires consultation, risk communication, community protection, and accessible grievance mechanisms. The governance pillar requires institutional clarity, accountability, licensing predictability, and credible rules on liability and post-closure responsibility (Costa et al., 2021; Setiawan & Cuppen, 2013; Swennenhuis et al., 2024). A country may, therefore, have technical storage potential but still face low ESG readiness if governance arrangements are still fragmented.

The Indonesian debate has so far focused strongly on storage potential, oil and gas applications, and the strategic opportunities created by new regulation. This literature is valuable, but it leaves a more specific policy gap: whether Indonesia's current regulatory architecture is aligned, coordinated, and operational to support industrial CCS as an ESG-relevant infrastructure strategy.

This article addresses the aforementioned gap by examining readiness at the level of policy design, regulation, licensing, safeguards, and institutional coordination. The central argument is that Indonesia has moved from policy signaling to an initial legal foundation, but readiness remains partial because implementation still relies on multiple sectoral regimes with different mandates, procedures, and accountability logics.

For terminological consistency, this article uses CCS as the main term throughout the analysis. References to CCUS are retained only when they appear in official Indonesian regulatory language or in the wording of a cited source. This choice is deliberate. The main focus of the article is long-term storage governance and its implications for ESG implementation, rather than the full range of carbon utilization pathways. By using CCS consistently, the article avoids conceptual slippage between storage-focused regulation and broader decarbonization narratives.

The contribution of this article is threefold. *First,* it links CCS, ESG, and policy readiness within a single analytical lens for Indonesia. *Second,* it translates the broad notion of policy and regulatory readiness into operational indicators that can be applied systematically. *Third,* it shows that the key readiness problem in Indonesia is not the complete absence of law, but the mismatch between an emerging umbrella framework and the sectoral rules that still govern licensing, environmental approval, transport, monitoring, and long-term accountability (Ikeda & Tsuji, 2017). This approach makes it possible to move beyond descriptive regulatory mapping toward a more policy-relevant assessment of implementation risk.

THEORETICAL FRAMEWORK

CCS, ESG, and Policy Readiness

The literature on CCS governance shows that deployment succeeds when legal systems do more than authorize projects in principle. They must also define rights and obligations across the project life cycle, specify how environmental and safety risks will be managed, and allocate responsibility over long time horizons (Frattini et al., 2024; Romasheva & Ilinova, 2019; Aslam, 2024). In practice, readiness is a multidimensional condition, which includes whether policy objectives are aligned, regulatory requirements are clear, institutions can coordinate, and the licensing pathway is coherent to make implementation predictable for both regulators and project developers.

This article treats policy and regulatory readiness as the extent to which a jurisdiction can govern industrial CCS in a way that is legally coherent, administratively workable, environmentally credible, and socially accountable. This definition is important because a purely descriptive inventory of laws cannot answer the more critical question of whether the regulatory architecture is capable of supporting real projects. In a fragmented setting, multiple rules may exist while responsibility remains blurred at the interfaces between sectors.

An ESG perspective sharpens this point. If CCS is promoted as part of a sustainable industrial transition, policy readiness must be assessed against the practical requirements of each ESG pillar. Environmental integrity

depends on MRV, storage stewardship, and enforceable standards for permanence. Social legitimacy depends on meaningful consultation, public communication, health and safety protections, and grievance pathways. Governance credibility depends on clear mandates, transparent decision-making, stable liability allocation, and regulatory consistency across agencies. In other words, CCS readiness is also ESG readiness when the technology is positioned as part of sustainable finance, industrial transition, or responsible infrastructure development (Costa et al., 2021).

Indicators of Industrial CCS Readiness

To operationalize the assessment of industrial CCS readiness, this study uses eight indicators. Policy alignment examines whether CCS is linked coherently to industrial decarbonization, climate commitments, and sustainable development policy. Regulatory clarity assesses whether the main obligations, approvals, and responsibilities are defined in a sufficiently explicit manner. Institutional coordination looks at whether lead and supporting roles are clearly arranged across ministries and agencies. Licensing integration considers whether the sequence of permits and approvals is understandable and manageable. Environmental integrity evaluates whether MRV, site stewardship, and environmental safeguards are credible. Social safeguards assess consultation, benefit-risk communication, and community protection. Governance accountability examines long-term liability, transparency, and responsibility. MRV readiness evaluates the strength of monitoring and reporting architecture across the project life cycle.

Table 1. Operational indicators for assessing industrial CCS readiness

Indicator	Question	Main ESG Relevance
Policy alignment	Is CCS clearly linked to decarbonization and industrial policy?	Improves strategic consistency and reduces policy uncertainty
Regulatory clarity	Are duties, approvals, and responsibilities explicitly defined?	Supports compliance and accountability
Institutional coordination	Are lead and supporting agencies clearly arranged?	Strengthens governance credibility
Licensing integration	Is the permit sequence transparent and manageable?	Reduces transaction costs and delay risk
Environmental integrity	Are MRV, permanence, and stewardship safeguards credible?	Supports the environmental pillar
Social safeguards	Are consultation, risk communication, and grievance channels provided?	Supports legitimacy and the social pillar
Governance accountability	Is long-term responsibility clearly allocated?	Determines who bears risk over time
MRV readiness	Can monitoring and reporting function across the full project life cycle?	Links performance to disclosure and assurance

These indicators are used qualitatively rather than numerically. The aim of the indicators is not to construct a rigid index, but to provide a transparent basis for determining whether Indonesia's readiness is adequate, partial, or absent in each dimension. This approach allows the analysis to identify where legal provisions exist but remain incomplete, where mandates overlap, and where ESG implications arise, even when the underlying issue appears at first glance to be merely regulatory or administrative. This distinction

is important in the Indonesian context, where implementation challenges are concentrated at institutional boundaries rather than in a single missing law.

METHODOLOGY

This study uses a qualitative, document-based policy and regulatory analysis. The unit of analysis is the governance architecture shaping industrial CCS in Indonesia, rather than an individual project. A qualitative design is appropriate because the research is related to analyzing legal coherence, institutional mandates, permitting arrangements, and ESG-related governance expectations that cannot be understood through technical or financial metrics alone. The analysis is descriptive-analytical as it describes the relevant policy and legal architecture while also evaluating whether that architecture is operationally ready to support industrial CCS.

The evidence base consists primarily of secondary materials. These include binding legal instruments, implementing regulations, official government publications, policy statements, comparative reports on CCS governance, and peer-reviewed academic literature on CCS, infrastructure governance, and ESG. Documents were selected using four criteria: direct relevance to industrial CCS or ESG governance; legal or policy authority; continuing applicability; and usefulness for tracing how responsibilities are distributed across capture, transport, storage, monitoring, licensing, and long-term stewardship. This selection logic was designed to avoid treating all documentary sources as equally probative and to keep the analysis focused on operational governance questions.

Analytically, the study combines comparative legal reading with thematic coding. Each source was read against the eight readiness indicators introduced above. The coding was guided by three practical questions: what is regulated; which institution is responsible; and what implementation issues remain unresolved at the interface with another part of the governance system. The results were then interpreted qualitatively as indicating adequate readiness, partial readiness, or absent readiness. This method enables the researchers to distinguish industrial CCS readiness as mere legal presence or genuine implementation preparedness.

Limited stakeholder consultations with government and policy stakeholders working on industry, environment, energy, and climate governance were used only for contextual validation of the regulatory reading. These consultations were non-attributable and were not treated as stand-alone primary interview data. Their role was to check whether the document-based interpretation reasonably reflected implementation realities, particularly with respect to sequencing, coordination difficulties, and areas of uncertainty. Validation was therefore pursued through triangulation across legal texts, policy documents, academic literature, and contextual stakeholder inputs.

The study has two main limitations. *First,* it does not attempt to provide a project-level technical or economic assessment. *Second,* because the analysis focuses on governance readiness, it cannot resolve all engineering questions relevant to storage performance or commercial viability. Even so, this scope is appropriate for the article's objective: to evaluate whether Indonesia's current policy and regulatory architecture is sufficiently ready to support industrial CCS as an ESG-relevant infrastructure strategy.

FINDINGS

The analysis shows that Indonesia's readiness for industrial CCS is best understood as partial rather than absent. The country now has an important umbrella basis for CCS through Presidential Regulation No. 14 of 2024, and this matters because it signals that CCS is no longer treated as a purely speculative policy option. At the same time,

implementation authority remains distributed across older sectoral regimes. As a result, Indonesia has moved beyond policy signaling but has not yet reached a fully integrated governance model. The practical consequence is that most readiness gaps emerge not from a total lack of rules, but from the interfaces between legal instruments, institutions, and approval processes.

A central finding is that the legal architecture remains segmented across the CCS value chain. Subsurface issues and storage development are strongly connected to the oil and gas regime; environmental approval is governed through the environmental protection framework; business licensing is linked to the OSS risk-based architecture; maritime movement and port handling of carbon are tied to shipping law; and cross-border elements implicate international agreement procedures. This segmentation is understandable because CCS cuts across several administrative domains. However, it also means that no single institutional pathway yet governs industrial CCS from capture to post-closure stewardship. This is the most prominent problem concerning Indonesia's readiness.

Table 2. Regulatory mapping, readiness gaps, and ESG implications across the CCS value chain

Stage	Main instruments	Key institutions	Readiness gap	ESG implication
Capture and conditioning	Industrial rules, environmental approval, OSS licensing	Industry authority, KLHK, licensing authority	Cross-sector sequencing is not yet fully integrated	Environmental claims may outpace governance clarity
Domestic transport	Technical transport and infrastructure rules	Energy and technical regulators	Responsibility shifts across stages remain complex	Governance risk may arise from fragmented authority
Maritime transport and terminals	Shipping and port regulations plus sector permits	Transport and port authorities	No single CCS-specific pathway covers all interfaces	Safety and community communication may be uneven
Injection and storage	Presidential Regulation No. 14 of 2024 and subsurface sector rules	ESDM and technical authorities	Long-term liability and post-closure rules remain incomplete	Governance credibility and investor confidence are affected
MRV and long-term stewardship	Environmental monitoring and technical oversight rules	KLHK, technical regulators, and operators	Lifecycle MRV integration is still partial	Environmental integrity and ESG disclosure remain incomplete

The fragmentation becomes most visible at transition points in the value chain. A capture facility may satisfy industrial and environmental requirements, yet uncertainty can arise when the project moves into transport regulation, offshore or interregional shipment, or injection and long-term storage responsibilities. Similarly, an umbrella regulation may recognize storage development in principle, while implementation still depends on environmental approval, business licensing, transport permissions, and technical standards issued under separate legal regimes. In governance terms, this creates a coordination burden for project developers and regulators without a formally defined mechanism for resolving overlap quickly and consistently.

This condition weakens policy alignment. CCS is increasingly discussed as part of climate and industrial transition policy, but the policy signal has not yet been translated into a fully articulated cross-sector application pathway. As a result, industrial actors may understand the strategic direction of policy but still face uncertainty over which regulatory sequence applies to specific project configurations. Thus, policy readiness is stronger at the level of ambition than at the level of implementation. This gap matters because industrial investment decisions depend less on rhetorical support and more on whether regulatory obligations can be predicted in a legally defensible way.

Regulatory clarity is also partial. Presidential Regulation No. 14 of 2024 improves the legal basis for CCS and helps reduce earlier uncertainty over whether storage activities can be recognized within Indonesian policy. However, clarity remains incomplete with respect to long-term liability, monitoring duration, post-closure stewardship, and the allocation of responsibility between operators and the state. These issues are vital because, in the context of CCS governance, they determine who bears risk after injection, what financial safeguards are required, and how environmental credibility is maintained over time (Aslam, 2024; Romasheva & Ilinova, 2019). Without further specification, the system is still vulnerable to governance ambiguity.

Institutional coordination is one of the clearest readiness bottlenecks. The sectoral distribution of authority means that energy, environment, industry, licensing, transport, and potentially sustainable-finance authorities all have a stake in CCS implementation. Yet the current arrangement still depends heavily on ad hoc coordination rather than a formally defined inter-ministerial governance mechanism. This creates at least three risks. *First,* different agencies may interpret project boundaries and approval requirements differently. *Second,* project developers may face duplication in documentation and review. *Third,* regulators may lack a shared framework for linking technical compliance to ESG-relevant outcomes, such as community safeguards, monitoring transparency, and long-term accountability.

Licensing integration remains similarly incomplete. Indonesia has had an important risk-based business licensing framework, but CCS is unusual because it spans industrial operations, subsurface governance, transport infrastructure, environmental approval, and potentially maritime or cross-border movement. In that setting, a generic licensing architecture is not enough (Setiawan et al., 2025). It needs a clear pathway showing lead agencies, review sequences, documentary requirements, and decision points from capture through storage. In the absence of such integration, the burden of navigating the system shifts to project proponents, increasing transaction costs and implementation risks even where formal legal authority exists.

The ESG implications of these findings are direct. For the environmental pillar, an incomplete MRV architecture and unclear post-injection stewardship can weaken confidence that stored carbon will be monitored credibly and that environmental risks will remain controllable over time. For the social pillar, fragmented permitting and weakly articulated consultation expectations can lead to limited communication with affected communities, unclear grievance channels, and lower public trust. For the governance pillar, ambiguity over long-term liability and overlapping authority can undermine accountability, reduce bankability, and weaken the credibility of CCS as a sustainable transition instrument. The central point is that regulatory incompleteness is also an ESG problem, not merely a legal one.

These gaps affect stakeholder groups differently. Industrial actors face uncertainty over project sequencing, compliance costs, and future liability exposure. Investors face policy and governance risks because unclear responsibility and incomplete safeguards

reduce the predictability needed for long-lived infrastructure. Communities face the risk of insufficient consultation, limited transparency regarding storage risks, and unclear channels for recourse. Regulators face the burden of coordinating across fragmented mandates without always having explicit procedural tools to do so. This distribution of risk helps explain why readiness must be evaluated beyond a descriptive inventory of laws. What matters is how governance gaps translate into practical consequences for implementation.

The above findings indicate that Indonesia's readiness profile is mixed. Policy alignment is emerging but not yet fully institutionalized. Regulatory clarity has improved through recent reforms but remains incomplete on long-term issues. Institutional coordination and licensing integration remain the weakest dimensions. Environmental integrity, social safeguards, and governance accountability are partially supported but not yet embedded in a unified CCS implementation pathway. MRV readiness is recognized as necessary, yet it requires more explicit operationalization across the project life cycle. The overall conclusion of the findings section is therefore clear: Indonesia has an initial legal foundation for industrial CCS, but it does not yet have a fully operational governance system for ESG-aligned deployment.

A useful way to interpret this result is to distinguish between formal readiness and operational readiness. Indonesia is moving toward formal readiness because key legal recognition now exists and CCS is no longer outside the policy conversation. Operational readiness, however, remains weaker because the chain of approvals, obligations, and accountabilities has not yet been translated into a single implementation logic that can be applied consistently across project types. This distinction helps explain why the current framework may appear more advanced when examined from the perspective of policy announcement than when examined from the perspective of project execution.

The same distinction is relevant to regulators. Where legal recognition arrives before procedural integration, regulators may have authority in principle but lack a shared operating protocol for complex cases that span multiple agencies. This can generate conservative decision-making, repeated requests for clarification, and uneven interpretation across sectors or project stages. For industrial actors, these governance frictions are not minor procedural issues; they directly affect project timing, costs, and perceived risks. For this reason, the maturity of Indonesia's CCS framework should be judged not only by the presence of legal instruments, but also by the degree to which institutions can apply them in a coordinated, transparent, and predictable way.

DISCUSSION

The Indonesian case shows why readiness cannot be inferred from the existence of a new regulation alone. Presidential Regulation No. 14 of 2024 is significant because it establishes legal recognition and policy direction, but the more difficult governance work lies in aligning sectoral regimes that were not originally designed around the full CCS life cycle. This is why the principal challenge is structural rather than technical. Indonesia's regulatory arrangement currently combines an umbrella policy logic with sector-specific implementation rules. Unless these layers are connected more explicitly, CCS will continue to face uncertainty at the precise points where projects must move from policy aspiration to legal execution.

This finding also helps explain why the article moves beyond description. A descriptive reading might conclude that Indonesia already possesses enough legal instruments to begin implementation. An analytical reading, however, leads to a more qualified conclusion: the system is ready in principle, but only partially ready in operation. The difference matters because ESG-oriented infrastructure requires a governance architecture capable of delivering

accountability, not merely authorization. Incomplete coordination can become a governance risk. Incomplete MRV can become an environmental integrity risk. Incomplete consultation can become a social legitimacy risk. Readiness gaps therefore cut across all three ESG pillars.

The analytical value of this approach lies in making regulatory sequencing visible as an ESG issue. In many infrastructure debates, ESG is discussed after legal design has already been settled, as if it were a separate layer of reporting or investor communication. The Indonesian CCS case suggests the opposite. If the legal sequence itself is fragmented, ESG performance will also be fragmented as environmental monitoring, social safeguards, and governance accountability are embedded in different agencies and procedures. A readiness analysis therefore provides a bridge between regulatory design and ESG performance rather than treating them as separate fields.

This point is particularly relevant for industrial transition policy. Industries considering CCS need evidence that climate alignment, regulatory compliance, and ESG expectations can be met through one coherent governance pathway. If each pillar is handled separately—environment in one process, licensing in another, consultation in another, and long-term liability in yet another—the result is not only administrative inefficiency but also a weaker transition narrative. Integrated readiness matters because it helps transform CCS from a narrowly technical compliance option into a credible component of responsible industrial strategy.

The implications for industrial actors and investors are especially important. CCS projects are long-lived and capital-intensive. They require confidence not only in technical feasibility, but also in future responsibility, compliance burdens, regulatory sequencing, and disclosure expectations (Pasha et al., 2025). Where long-term liability remains insufficiently specified, capital providers may price additional governance risk into projects or delay participation altogether. Where licensing remains fragmented, developers may face sequencing delays and higher transaction costs. This means that regulatory quality is part of project bankability, not a separate administrative concern (Osazuwa-Peters & Hurlbert, 2020; Costa et al., 2021).

The social dimension is equally significant. CCS often encounters public concern not because communities reject decarbonization as such, but because long-term storage, local safety, transparency, and accountability are difficult to understand and assess from outside expert communities. Thus, Indonesian policy needs to treat consultation as more than a procedural formality. Effective social safeguards require timely disclosure, understandable risk communication, and pathways for affected stakeholders to raise concerns before, during, and after project approval. Without these safeguards, CCS may be perceived as a technocratic project that serves industrial and policy interests while externalizing uncertainty to communities (Setiawan & Cuppen, 2013; Abdullah et al., 2021).

Several actionable implications follow from this analysis. *First,* Indonesia should establish an inter-ministerial CCS coordination body with a clear legal basis involving ESDM, KLHK, the Ministry of Industry, the Ministry of Finance, OJK, and the relevant licensing or investment authority. The purpose of such a body would not be to replace sectoral mandates, but to coordinate sequencing, resolve overlap, align MRV and ESG expectations, and provide a focal point for implementation decisions that cross ministerial boundaries. This measure directly addresses the current coordination gap that makes fragmented authority difficult to manage in practice.

Second, the government should develop a cross-ministerial CCS-ESG roadmap. Such a roadmap should explain when and under what conditions industrial CCS can be

recognized as an ESG-supporting activity, what constitutes acceptable environmental integrity, what social safeguards are required, and how governance accountability should be demonstrated. A shared roadmap would provide a common policy signal for project developers, regulators, financiers, and affected stakeholders. It would also reduce the current disconnect between climate policy ambition, industrial policy, and the governance expectations associated with sustainable finance and ESG-oriented investment.

Third, Indonesia should issue more detailed implementing rules on long-term liability, monitoring duration, post-closure transfer of responsibility, and financial security mechanisms for storage sites. These issues are central to governance credibility because they determine how risk is allocated over time and whether operators can demonstrate that they are not shifting unresolved stewardship burdens to the public. Clearer rules on closure plans, guarantee instruments, and monitoring obligations would improve both regulatory predictability and ESG credibility. They would also help define what constitutes responsible CCS deployment rather than mere legal permissibility.

Fourth, licensing reform should focus on transparency and integration. A practical near-term measure would be a joint guidance document or integrated permitting map that sets out required approvals, lead agencies, review sequences, documentary standards, and decision points for industrial CCS projects. Such a tool would not eliminate sectoral regulation, but it would reduce uncertainty for both developers and regulators by making the process visible and manageable. This is especially important in a risk-based licensing environment, where clarity of pathway is often as important as the formal existence of authority.

Finally, social safeguards should be treated as part of readiness rather than as a late-stage add-on. Consultation requirements, public information standards, and grievance mechanisms should be articulated more clearly in the governance framework for CCS projects. Doing so would strengthen the social pillar of ESG while also improving governance credibility. For Indonesia, this is not only a matter of public acceptance. It is also a matter of whether industrial CCS can be presented credibly as part of a just and accountable decarbonization strategy.

CONCLUSION

This article argues that Indonesia's policy and regulatory readiness for industrial CCS is partial: stronger than before, but not yet fully operational. The country has an important umbrella basis for CCS, yet implementation still depends on multiple sectoral regimes governing subsurface activity, environmental approval, licensing, transport, and long-term stewardship. The readiness challenge lies in fragmentation at the interfaces between these regimes, not in the total absence of law.

Viewed through an ESG lens, these readiness gaps matter because they affect all three pillars simultaneously. Incomplete MRV and stewardship rules weaken environmental integrity. Weakly articulated consultation and grievance pathways reduce social legitimacy. Unclear liability and overlapping authority undermine governance credibility. Industrial CCS can be a meaningful support instrument for ESG implementation in Indonesia, but only if the country moves from basic legal recognition toward a more coordinated and accountable governance architecture.

The practical priorities are clear: establish an inter-ministerial coordination mechanism, adopt a cross-ministerial CCS-ESG roadmap, clarify long-term liability and post-closure responsibility, integrate licensing pathways transparently, and strengthen consultation and safeguard requirements. If these steps are taken, Indonesia will be better positioned to convert its emerging CCS framework into a credible system for ESG-aligned industrial transition. Othewise, CCS may be strategically attractive but operationally underprepared.

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