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PERCEPTION GAPS AND IMPLEMENTATION BARRIERS OF THE GREEN ECONOMY IN INDONESIA'S RESOURCE DOWNSTREAMING POLICY: MULTI-STAKEHOLDER SURVEY EVIDENCE AND A "4G" INTERVENTION FRAMEWORK

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2. ABSTRACT

Indonesia's resource downstreaming (*hilirisasi*) strategy seeks to capture higher value added domestically, yet its rapid expansion has coincided with growing environmental and social pressure in extractive regions. This article examines why green economy commitments are not translating into practice and how stakeholders perceive the barriers. We analyse a survey of 247 respondents from central government (n = 12), local government (n = 154), industry (n = 54), and civil society/academia (n = 27), concentrated in Kalimantan, interpreting cross-group comparisons through policy implementation theory and recent empirical evidence. Three findings emerge. First, perception gaps widen with distance from policy-making: 67% of central government respondents report that green incentives exist, versus 19% of community respondents. Second, dominant barriers depend on position: regulation and implementer capacity for the centre, funding for local governments, and green skills for industry, while technology readiness ranks among the top three barriers for all groups. Third, permitting problems, overlapping authority, and unequal involvement weaken policy transmission, even though all industry and community respondents support participation in planning and oversight. We propose a "4G" framework (Green Economy Clinic, Green Skills Voucher, Green Technology Access, Green Financing Matching Fund), conditional on three governance enablers: policy synchronisation, transparent permitting, and meaningful participation. Drawing on recent evidence on captive coal power, nickel-related health and

forest impacts, and voucher and matching-grant effectiveness, the article links survey findings to intervention design.

3. KEYWORDS: Green Economy; Downstreaming; Policy Implementation; Perception Gap; Green Skills; Green Finance; Indonesia

4. INTRODUCTION

Downstreaming has become the organising principle of Indonesian industrial policy. The 2020 ban on nickel ore exports marked a shift from exporting raw commodities toward processing them domestically (CELIOS & CREA, 2024), and the government has since prepared 18 priority downstreaming projects worth about IDR 618.13 trillion, with a target of 276,636 jobs (Purnomo, 2025). The projects span minerals and coal, agriculture, marine and fisheries, energy transition, and energy security. Realised downstreaming investment in January–December 2025 was concentrated in extractive sectors: IDR 373.1 trillion in minerals and coal, compared with IDR 144.5 trillion in plantations and forestry, IDR 60 trillion in oil and gas, and IDR 6.4 trillion in fisheries and marine (Databoks, 2026).

The environmental footprint of this expansion is increasingly documented. Nickel processing in Sulawesi and North Maluku relies heavily on captive coal-fired power, that is, plants built by industrial users and not connected to the public grid. Joint analysis by the Centre for Research on Energy and Clean Air (CREA) and Global Energy Monitor (GEM) reports that operational captive coal capacity reached 19.3 GW in 2025, that 4.49 GW was added between July 2024 and July 2025 (about 80% of all coal capacity added in that period), and that operational, under-construction, and planned capacity together reach about 31 GW (CREA & GEM, 2026). Ember (2026) estimates that captive power accounted for 48% of Indonesia's power-sector emissions in 2024 and that more than 94% of the roughly 81 TWh of captive electricity used in nickel processing by the end of 2025 came from coal. RMI estimates that nickel-related activities emitted 170.2 $MtCO_2$ in 2023, equivalent to 22% of emissions from the energy sector and industrial processes and product use (Fauzianto et al., 2025). Presidential Regulation No. 112/2022 requires captive coal units to cut emissions intensity by 35%, but exemptions for national strategic projects and the absence of a public monitoring framework leave compliance unverifiable (CREA & GEM, 2026, as reported by Eco-Business).

Local consequences are equally visible. A modelling study of three nickel-producing provinces estimated that, if left unregulated, smelter and captive-power emissions would

cause more than 3,800 deaths in 2025, with an annual economic burden of USD 2.63 billion, and that economic gains would begin to erode around the eighth year of development (CELIOS & CREA, 2024). A counterfactual analysis of 7,721 Sulawesi villages found that villages near nickel mines lost forest at nearly twice the rate of comparable non-mining villages during 2011–2018, while well-being outcomes were mixed and varied by region (Lo et al., 2024). Greenpeace Indonesia and CELIOS (2024) report that mining-dependent villages face poorer access to education, clean water, and health services, greater vulnerability to disasters, and higher potential for water and soil pollution. Ramadhani and Paksi (2025) characterise the overall pattern as "refined dependency": higher investment and export values coexist with continued positioning in low-value segments of global supply chains and with domestic accumulation of environmental and social costs.

The green economy is the policy framework intended to reconcile growth with sustainability. According to Indonesia's National Development Planning Agency (Bappenas), the green economy balances national welfare and environmental sustainability through investment, capital, infrastructure, employment, and skills development, and its progress is tracked through the Green Economy Index (GEI), which has economic, social, and environmental pillars (Kementerian PPN/Bappenas, 2024). The national GEI rose from 46.91 in 2011 to 61.46 in 2024, but the pillars diverge: in 2024 the social pillar stood at 68.80, the economic pillar at 61.50, and the environmental pillar at only 55.53, down from 56.40 in 2023 (Kementerian PPN/Bappenas, 2024). The weakest and recently declining dimension is the one most exposed to downstreaming.

What remains under-examined is *why* commitments are not translating into practice and *how* stakeholders located at different points of the policy chain perceive the problem. Existing work on Indonesia is predominantly legal, sectoral, or review-based, and cross-group survey evidence that places central government, local government, industry, and communities side

By side is scarce. This article addresses three research questions:

a) Research Question 1. How do stakeholders perceive the integration of green economy principles into downstreaming policy, and how large are the perception gaps between them?

b) Research Question 2. What do different stakeholder groups identify as the main barriers to implementation?

c) Research Question 3. Which policy interventions are consistent with these findings and supported by recent empirical evidence?

The contribution is twofold. Empirically, we document a systematic pattern in which confidence declines with distance from policy-making while barriers are framed differently by position. Practically, we derive an intervention package whose components map onto the barriers each group reports and are assessed against evidence on comparable instruments.

4.1 Literature Review and Conceptual Framework

4.1.1 Green economy, ecological modernisation, and their critics

UNEP (2011) defines a green economy as one that improves human well-being and social equity while significantly reducing environmental risks and ecological scarcities. Ecological modernisation theory holds that growth and environmental protection can be reconciled when institutions, technology, and economic incentives are designed accordingly (Hajer, 1995). Recent Indonesian applications of this lens find that the gap between policy objectives and outcomes persists because of institutional fragmentation, inconsistent enforcement, competing land-use interests, and limited governance capacity (Journal of Government and Politics, 2026). Critical political-economy work cautions that, without such institutional conditions, "green" industrialisation may reproduce extractive dependency and ecologically unequal exchange (Ramadhani & Paksi, 2025). The two perspectives are complementary here: the first specifies the conditions under which reconciliation is possible, the second warns what happens when they are absent.

4.1.2 Policy implementation theory

The implementation literature explains why well-designed policies fail to produce intended results. Pressman and Wildavsky (1973) showed that long decision chains and many clearance points distort policy objectives. Van Meter and Van Horn (1975) identified standards and objectives, resources, inter-organisational communication, characteristics of implementing agencies, and implementers' dispositions as determinants of performance. Edwards III (1980) emphasised communication, resources, disposition, and bureaucratic structure. Mazmanian and Sabatier (1983) added that implementation succeeds more often when objectives are clear, the causal theory is sound, and target groups are involved. Lipsky (1980) highlighted that frontline implementers exercise discretion that can diverge from policy intent. Taken together, these frameworks imply specific observable signatures: weak communication appears as gaps in understanding and perceived availability of instruments; resource problems appear as funding, technology, and skills barriers; structural problems

appear as overlapping authority and slow permitting; and differences in disposition appear as divergent priorities across groups.

4.1.3 Evidence on implementation barriers in Indonesia

A systematic review of 2020–2025 literature finds persistent inconsistencies between regulatory goals and implementation outcomes in Indonesia's green economy agenda, together with structural, institutional, and socio-technical barriers (Ikhwan, 2025). In the energy sector, green growth programmes, special economic zones, and climate funds are reported to face substantial challenges in execution (Keumala et al., 2025). Legal analysis of renewable energy highlights fragmented legal frameworks and limited enforcement, and points to a normative gap between Indonesia's green economy orientation and the UNEP framework (Anggriawan, 2025). The common thread is that the binding constraint lies in implementation rather than in the absence of policy.

4.1.4 Participation and distribution of costs

Community participation is both a procedural right and an implementation condition. In the context of nickel downstreaming and the resource-curse literature, Daryanti (2025) finds limited community involvement in environmental impact assessment and other decisions affecting livelihoods, and argues that participation is necessary to balance growth and environmental protection. This aligns with Mazmanian and Sabatier's (1983) point that target-group involvement conditions implementation success, and with evidence that the local impacts of nickel mining are heterogeneous, with the poorest villages bearing the heaviest environmental and health burdens while also gaining some infrastructure benefits (Lo et al., 2024).

4.1.5 Green skills and training vouchers

A review of vocational education and training (VET) in industrial green transitions concludes that the role of training institutions develops gradually alongside industry transition and relies on work-based learning and co-created skill-formation ecosystems linking training providers, industry, and government (Thunqvist et al., 2023). A policy brief for low- and middle-income countries identifies six challenges in preparing the workforce for the green transition and recommends a national green skills taxonomy within workforce planning (Climate Compatible Growth, 2025). In Indonesia, sector studies of the cement industry identified gaps between available skills and those required for green technologies and called for stronger public–private collaboration (ILO, 2014). Voucher design matters for effectiveness. In a

randomised experiment, EUR 1,000 vouchers raised training participation among low-skilled workers by almost 20 percentage points over two years, but with a deadweight loss of almost 60% and a shift toward more general training (Hidalgo et al., 2014). A randomised field experiment in Switzerland found no effect of voucher-financed adult education on earnings or employment (Schwerdt et al., 2012). These findings suggest that vouchers expand participation but do not guarantee relevance, so eligibility rules, provider accreditation, and links to employer-defined needs are important design features.

4.1.6 Green technology and green finance

Financial barriers are consistently found to constrain the adoption of green practices by small and medium-sized firms. A fuzzy-AHP study with expert input ranks financial investment levels among the most significant obstacles (Chien et al., 2021), and a recent report on public support for SME sustainability identifies limited access to external finance, insufficient internal capacity, and perceived investment risk as persistent barriers, concluding that public financing combined with non-financial support can enable green investment (SME Finance Forum, 2026). On additionality, the central concern about matching schemes, a randomised trial of a matching-grant programme for firms in Yemen found that grants led to more product innovation, capital investment, and upgrading of management systems in the first year (McKenzie et al., 2017). For nickel processing, technology choices are decisive: power source determines emissions, which is why clean-energy requirements for smelters and stronger emissions standards and disclosure feature prominently in recommendations (CELIOS & CREA, 2024; Fauzianto et al., 2025).

4.1.7 Analytical propositions

The frameworks above generate three propositions that guide the empirical analysis.

a) Proposition 1 (communication). Perceived availability of instruments (incentives, assistance) and understanding of policy decline with distance from policy-making.

b) Proposition 2 (resources and position). The dominant barrier differs by position in the policy chain: regulators emphasise regulation and capacity, sub-national governments emphasise funding, and implementers emphasise skills and technology.

c) Proposition 3 (structure and participation). Overlapping authority and slow permitting, together with narrow involvement mechanisms, weaken transmission even when target groups are willing to participate.

5. MATERIALS AND METHODS

5.1 Proposition

We use a cross-sectional, quantitative-descriptive design based on primary survey data collected by the Centre for Learning and Public Service Policy Strategy, National Institute of Public Administration of Indonesia (Pusjar SKPP LAN, 2026). The instrument covers perceived integration of green economy principles into downstreaming policy; understanding of green economy policy; involvement of industry and communities in planning and oversight; availability of incentives and assistance; permitting quality; inter-agency coordination; barriers to implementation; and support needs.

The sample comprises 247 respondents in four groups: central government (n = 12; 4.9%), local government at provincial and district/city level (n = 154; 62.3%), industry including state- and regionally owned enterprises (n = 54; 21.9%), and civil society and academia (n = 27; 10.9%). The largest regional shares are Central Kalimantan (138 respondents), East Kalimantan (34), South Kalimantan (15), Bangka Belitung (10), and Bali (10). About 78% of respondents therefore come from the three Kalimantan provinces, regions directly exposed to mining and downstreaming. Secondary data used for context are the Green Economy Index (Kementerian PPN/Bappenas, 2024), downstreaming investment figures (Purnomo, 2025; Databoks, 2026), and the impact studies cited in Section 1. Monetary values are reported in rupiah as in the sources.

5.2 Analytical strategy

We report percentages by stakeholder group and compare groups using percentage-point differences, which serve as our indicator of perception gaps. Findings are then interpreted against propositions P1–P3. Because group sizes are very unequal, we also report approximate 95% Wilson confidence intervals for selected indicators. These are back-calculated from reported percentages and group sizes (for example, 67% of 12 central respondents corresponds to 8 respondents) and should be recomputed from the raw data before publication. We do not claim statistical generalisation to the national population.

6. RESULTS AND DISCUSSION

6.1 Results

Table 1 summarises the sample. There are 144 men (58.3%) and 103 women (41.7%). Education is concentrated at the bachelor's level (50.6%), followed by master's/doctoral (34.4%), senior secondary (14.6%), and junior secondary (0.4%).

Table 1. Respondent characteristics. (Source: Pusjar SKPP LAN,2026)

Group	n	Share	Men	Women
Central government	12	4.9%	9	3
Local government	154	62.3%	92	62
Industry (incl. SOEs/regional enterprises)	54	21.9%	29	25
Civil society/academia	27	10.9%	14	13
Total	**247**	**100%**	**144**	**103**

Perceived Policy Integration and Understanding (RQ1)

Central government respondents are divided on whether national downstreaming policy integrates green economy principles: 42% say it does, 17% say partially, and 41% say it does not. Local government respondents are strongly positive: 97% say the central government supports the green economy in downstreaming, and 89% say their government has translated it into local regulation. This confidence at the government level is not matched by understanding outside government. Among one non-government group, 63% both know and understand green economy policy (35% know only; 2% do not know), whereas in the other only 37% understand it, 41% know only, and 22% do not know.

Barriers by Stakeholder Group (RQ2)

Table 2 shows that the dominant barrier varies by position, while technology readiness enters the top three for every group.

Table 2. Top Three Barriers to Green Economy Implementation in Downstreaming (Source: Pusjar SKPP LAN, 2026).

Group	Barrier 1	Barrier 2	Barrier 3
Central government	Inadequate regulation (23%)	Limited implementer capacity (23%)	Technology readiness (19%)
Local government	Funding constraints (24%)	Technology readiness (20%)	Limited local capacity (19%)
Industry	Lack of green skills (22%)	Technology readiness (20%)	Funding constraints (17%)
Civil society/academia	Technology readiness (27%)	Funding constraints (22%)	Inadequate regulation (21%)

The central government frames the problem on the supply side of policy (regulation and administrative capacity), local governments on resources (funding), and industry on capability (skills and technology). Green skills are not a leading barrier for government respondents but are the top barrier for industry.

Incentives, enforcement, and involvement (RQ1, RQ2)

Perceived availability of green economy incentives falls steadily from the centre to communities: 67% among central government respondents (25% no, 8% unsure), 45% among local government, 33% among industry, and 19% among civil society. The 48-point gap between centre and community is the largest in the survey. Approximate 95% intervals are wide for the small groups (central: about 39–86%; community: about 8–37%), but the two intervals do not overlap, and a Fisher exact test on the back-calculated counts (8 of 12 versus 5 of 27) gives $p \approx 0.008$. On enforcement, 73% of local government respondents say firm action has been taken against downstreaming projects that are not pro-green economy, versus 56% of central respondents (44% disagree).

Involvement is uneven. Among central respondents, 58% say planning and oversight involve only industry stakeholders and 42% say they involve both industry and communities. Among local government respondents, 54% say both are involved, 25% say neither, 18% say only industry, and 3% only communities. Yet support for participation is universal in the groups concerned: 100% of industry owners and 100% of community respondents (52% strongly agree, 48% agree) support involving them in planning and oversight.

Permitting, coordination, and assistance (RQ2)

Permitting is a consistent pain point. The share rating downstreaming permitting as both transparent and efficient is 8% among central respondents, 26% among local government, 22% among communities, and 41% among industry. Central government is the most critical of its own system: 42% rate permitting as neither transparent nor efficient, and 42% name permitting as the service aspect most in need of improvement. For communities, speed and transparency of permitting is the top priority (41%). Industry prioritises infrastructure and oversight (31%) and permitting speed and transparency (30%).

On institutions, 67% of central and 61% of local government respondents agree that authority overlaps in downstreaming services. Inter-ministerial collaboration is rated effective by 85% of industry and 70% of community respondents.

Assistance for sustainable downstreaming actors is seen as available by 83% of central respondents, 83% of industry owners, 71% of local government, and 56% of communities. Support needs differ: industry most needs assistance and coaching (25%), then socialisation and education (18%) and supporting infrastructure (15%); communities most need supporting

infrastructure such as clean energy and waste management (21%), then assistance (17%) and socialisation (16%).

6.2 DISCUSSION

Perception gaps as a communication and structural problem (P1, P3)

The most consistent result is that confidence in policy is high within government and declines toward implementers and communities. Table 3 summarises three indicators with the same pattern.

Table 3. Perception Gaps Between Stakeholder Groups. (Source: authors' calculations, 2026).

Indicator	Central	Local	Industry	Community	Largest gap
Green incentives are available	67%	45%	33%	19%	48 pts
Assistance is available	83%	71%	83%	56%	27 pts
Permitting is transparent and efficient	8%	26%	41%	22%	33 pts

This supports P1 for incentives and assistance. In the terms of Van Meter and Van Horn (1975) and Edwards III (1980), inter-organisational communication is the weak link: instruments exist on paper but are not recognised or experienced by implementers and target groups. It is consistent with reviews finding that Indonesia's gap between regulatory goals and outcomes stems from structural and institutional barriers (Ikhwan, 2025) and with evidence that institutional fragmentation and limited governance capacity undermine green economy policy (Journal of Government and Politics, 2026).

Permitting is the exception to a monotonic pattern: the central government is the most pessimistic (8%) and industry the most optimistic (41%). Two readings are plausible. Policymakers may observe systemic problems, such as the overlapping authority acknowledged by two-thirds of central respondents, while firms that have already passed through the process judge it relatively favourably. Survivorship bias is also possible, since firms that were blocked or deterred are unlikely to be in the sample. This reinforces the need to read the permitting result as a system-level concern rather than as satisfaction among users.

The involvement results support P3. If 58% of central respondents report that planning and oversight involve only industry, while industry and communities alike are willing to participate, the constraint is the design of mechanisms rather than the willingness of target

groups. This matters substantively: documented cases from Halmahera describe affected communities not being involved in environmental impact assessment (Kompas, 2024), and legal analysis finds limited community participation in nickel downstreaming despite its status as a right (Daryanti, 2025). Participation also has an instrumental logic, because target-group involvement is a condition of implementation success (Mazmanian & Sabatier, 1983).

The downstreaming paradox and the environmental pillar

The low and recently declining environmental pillar of the GEI (55.53 in 2024 versus 56.40 in 2023) should be read alongside the concentration of downstreaming investment in extractive sectors and the captive coal expansion described in Section 1. Evidence from several independent sources converges on a similar message: without strict environmental governance, investment growth does not automatically translate into better welfare or environmental quality (Ramadhani & Paksi, 2025; CELIOS & CREA, 2024; Greenpeace Indonesia & CELIOS, 2024; Lo et al., 2024). Our survey signals are consistent with this concern: only 19% of community respondents experience green incentives, and 44% of central respondents disagree that firm action has been taken against non-green projects. Put differently, the reward-and-sanction instruments that would make environmental performance economically rational are not yet felt at the point of delivery.

The captive power case illustrates the problem concretely. Because Presidential Regulation No. 112/2022 allows exemptions for national strategic projects and no public monitoring framework exists to verify the required 35% emissions-intensity reduction (CREA & GEM, 2026), the incentive environment for clean smelter power is weak, and the data needed to design performance-based incentives are incomplete. Ember (2026) notes that limited compliance in operational reporting creates data inconsistencies, including a 13-percentage-point discrepancy in the coal share of captive generation between its estimate and official statistics. This is a practical argument for linking any green incentive to verified, publicly reported performance indicators.

None of this implies rejecting downstreaming. The point is that sustainable value added depends on whether industry is steered toward lower emissions intensity and waste, for example through clean energy for smelters, stricter emissions standards, and disclosure (CELIOS & CREA, 2024). Ecological modernisation theory presupposes that incentives and institutional capacity make environmental improvement economically rational for firms (Hajer, 1995), and our results suggest this precondition is only partly met.

The 4G framework and the evidence behind it (RQ3, P2)

The barrier profiles in Table 2 support P2 and motivate four complementary instruments (Pusjar SKPP LAN, 2026). Each maps to the barrier most prominent for a specific group, and each is assessed against evidence on comparable instruments.

G1: Green Economy Clinic. An integrated consultation and education service, delivered in person or digitally with government, practitioners, universities, and industry, covering policy information, environmental standards, green technologies, incentive opportunities, and implementation steps. It targets the understanding gap (Section 4.2) and the demand for socialisation expressed by industry (18%) and communities (16%). It improves communication channels (Edwards III, 1980) and can double as a participation channel. Because industry's top support need is assistance (25%), the clinic should offer initial coaching, not only information.

G2: Green Skills Voucher. A voucher allowing firms to choose and finance training matched to their green competence needs in low-emission technology, resource efficiency, waste management, and environmental standards. It addresses industry's top barrier (22%). The literature supports demand-led, collaborative designs (Thunqvist et al., 2023; Climate Compatible Growth, 2025), but experimental evidence cautions that vouchers can carry high deadweight loss and shift training toward general content (Hidalgo et al., 2014) and may show no earnings or employment effect (Schwerdt et al., 2012). Design implications are therefore to condition eligibility on firms' verified skills gaps, accredit or curate providers, and evaluate outcomes in terms of adopted practices rather than course completions.

G3: Green Technology Access. A curated catalogue of green technologies with feasibility testing, selection assistance, and verification that technologies are actually used. It addresses the only barrier that appears in the top three for all four groups (and the top barrier for communities, at 27%). For nickel processing, technology choices such as the power source are the main determinant of emissions (Fauzianto et al., 2025; Ember, 2026), so the catalogue should prioritise clean captive power and emissions-control technologies and track realised performance.

G4: Green Financing Matching Fund. Matching co-funding of industry investments that meet green criteria, combinable with interest subsidies, guarantees, blended finance, or support for initial investment costs, and disbursed selectively against measurable

environmental performance. It addresses funding constraints, the top barrier for local governments (24%) and third for industry (17%). Evidence indicates that financial barriers deter green adoption (Chien et al., 2021) and that public finance works best when paired with non-financial support (SME Finance Forum, 2026). The Yemen trial suggests matching grants can induce additional investment and innovation (McKenzie et al., 2017), but additionality must be tested in each setting. Performance conditions reduce the risk of subsidising investments that would have occurred anyway and the risk of non-additional environmental claims.

Governance enablers and sequencing

The four instruments are tools; their effectiveness depends on three governance enablers highlighted by the survey. First, *policy synchronisation*: with 67% of central and 61% of local respondents acknowledging overlapping authority, and regulation and capacity as central government's top barriers, a cross-ministerial and central–local coordination forum, a roles-and-authority matrix, and integration of green economy criteria into project planning are needed. Second, *fast and transparent permitting*: service standards, open process status, integrated inter-agency systems, and complaint channels respond to the top-ranked service priorities of central government (42%), communities (41%), industry (30%), and local government (28%). Third, *meaningful participation*: involvement of communities in planning and oversight, open disclosure of impacts and benefits, and functioning grievance channels draw on the readiness already expressed by target groups.

Sequencing follows cost and dependency. G1 and the communication enablers can start first because they are relatively inexpensive and improve data on needs; G2 and G3 can follow as a capacity package; G4 should come after green criteria and performance indicators are agreed, so that finance is targeted. Incentives should be tied to measurable indicators (energy efficiency, emissions reduction, waste management), and evaluation should extend beyond counting programmes or recipients to workforce competence, technology adoption, resource efficiency, and environmental performance.

Three risks require attention. Incentives may attract free-riding or greenwashing when verification is weak, so results-based payment and open data are needed. Limited implementer capacity (23% of central and 19% of local respondents) means new programmes can add burden without institutional strengthening. And limited local funding calls for a clear division of fiscal responsibility between central and regional governments.

7. CONCLUSION

This article finds that barriers to implementing the green economy in Indonesia's downstreaming policy relate not only to policy substance but also to perception gaps and the fit between implementers' needs and policymakers' perspectives. Confidence within government is not matched by understanding, experience of incentives, or access to assistance among industry and communities; the dominant barrier differs by position, with technology readiness shared across groups; and permitting, overlapping authority, and narrow involvement mechanisms weaken policy transmission despite broad willingness to participate. Against the backdrop of captive coal expansion, documented health and forest impacts, and a low and declining environmental pillar in the national index, the findings point to the need to strengthen the environmental dimension of downstreaming.

Policy implications. (1) Implement the four 4G instruments together, with incentives tied to transparent, verifiable environmental performance indicators. (2) Underpin them with central–local synchronisation, transparent permitting, and meaningful participation. (3) Shift evaluation from outputs to environmental and capability outcomes. (4) Repeat perception surveys periodically as an early-warning indicator of implementation gaps.

Limitations and future research. First, respondents are concentrated in Kalimantan (about 78%) and in local government (62.3%), limiting generalisation. Second, the central government group is very small (n = 12), so percentages are sensitive to single responses and confidence intervals are wide. Third, the analysis is descriptive; we report only an illustrative test for one contrast and no multivariate models. Fourth, the instrument measures perceptions, not observed environmental performance. Fifth, the effectiveness of the four instruments has not been tested; future work could use case studies, quasi-experimental designs, or pilots in selected industrial clusters, and could link survey perceptions to regional environmental indicators.

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