BACKGROUND PAPER

Navigating the Transition

A Country Study on Industrial Decarbonisation in Indonesia

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GERMANWATCH

Executive Summary

Indonesia, as a developing country and one of the world's leading manufacturing economies, faces the critical challenge of aligning industrial growth with climate targets. The industrial sector, which employs nearly 20% of the workforce and contributes almost a quarter of the nation's GDP, has set a goal to achieve Net-Zero Emissions (NZE) by 2050, a decade ahead of the national target.

This paper presents a comprehensive study of Indonesia's industrial decarbonisation pathway. It analyses the economic context, the current policy and regulatory landscape, and the significant implementation gaps that persist. It examines key challenges, including access to finance, mandatory emissions reporting, and policy coherence. It also investigates the roles of civil society and international partners, with a particular focus on the potential contribution of the Climate Club.

Key findings indicate that while a foundational 'Green Industry' framework exists, its success depends on closing the gap between policy ambition and practical implementation. This study identifies three critical entry points for international collaboration: (1) providing technical assistance to develop a robust emissions inventory system, (2) fostering technology co-development for Carbon Capture and Utilisation (CCU), and (3) channelling innovative finance through mechanisms such as the proposed Green Industry Service Companies (GISCO) to de-risk private investment.

The paper concludes that a just transition for Indonesia's industrial sector requires concerted efforts to enhance data transparency, secure targeted financial support, and ensure inclusive policy development.

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Contents

Abbreviations

AFOLU	Agriculture, Forestry and Land Use
ASEAN	Association of Southeast Asian Nations
ASI	Asosiasi Semen Indonesia or Indonesia Cement Association
CCU	Carbon Capture and Utilization
CSO	Civil Society Organization
COP	Conference of the Parties to the UNFCCC
ENDC	Enhanced Nationally Determined Contribution
ETS	Emissions Trading System
GCCA	Global Cement and Concrete Association
GDP	Gross Domestic Product
GEIPP	Global Eco-Industrial Parks Programme
GHG	Greenhouse Gas
GISCO	Green Industry Service Company
IDCTF	Industrial Decarbonisation Competitiveness Facility
IISIA	Indonesian Iron and Steel Industry Association
IPPU	Industrial Processes and Product Use
JCM	Joint Crediting Mechanism
MEMR	Ministry of Energy and Mineral Resources
MoE	Ministry of Environment
MoI	Ministry of Industry

NDC	Nationally Determined Contribution
NZE	Net Zero Emission
OECD	Organisation for Economic Co-operation and Development
PLTS	Pembangkit Listrik Tenaga Surya or Solar Power Generation Unit
RIA	Regulatory Impact Assessment
SIINas	Sistem Informasi Industri Nasional or the National Industry Information System
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
WBCSD	World Business Council on Sustainable Development

1 Setting the Scene: Industry in Indonesia

1.1 Economic Structure and Industrial Emissions

The global effort to mitigate climate change has placed industrial emissions at the forefront of climate policy discourse, especially in manufacturing and heavy industry, which are major contributors to greenhouse gas (GHG) emissions. Decarbonising these industries is therefore a prerequisite for achieving the goals of the Paris Agreement. In this global context, emerging economies such as Indonesia, with large manufacturing sectors, must balance sustaining economic growth and development with transforming their industries to be low-carbon and sustainable.

In 2024, Indonesia's manufacturing sector was projected to grow at around 4.4%. As one of the world's leading manufacturing economies, the sector plays a significant role in Indonesia's labour market and economic output, employing almost 20% of the working-age population and contributing close to a quarter of the nation's GDP (Siahaan, 2025). The country's economy is expected to grow by about 5.7% annually from 2016 to 2045 (Lu *et al.*, 2024). Manufacturing industries collectively continue to outperform other economic sectors, demonstrating their resilience and status as an economic powerhouse.

Based on presentations by the Head of Green Industry Centre of the Ministry of Industry (MoI), 34% of the industrial sector's environmental impact is GHG emissions. Almost half of these emissions originate from the pulp and paper, cement, textile, food and beverages, and iron and steel subsectors, which together are responsible for 70% or higher of industrial GHG emissions (Kementerian Perindustrian, 2018), even without accounting for emissions from agriculture, forest and land-use change (AFOLU) related to wood sources.

The Indonesian industrial sector has set a target to reach Net Zero Emissions by 2050, ten years ahead of the national target of 2060. This goal signals a strong political will but requires a profound and rapid transformation. This paper aims to provide a comprehensive analysis of the current landscape of industrial decarbonisation in Indonesia.

1.2 Political and Regulatory Frameworks

The foundational regulation of the industrial sector in Indonesia is Law No. 3/2014 on Industry, which is currently undergoing revision to encourage faster industrial growth (Vedro Imanuel Girsang, 2024). The revised law is expected to include a key provision that promotes zero emissions by 2050 for industry players.

This chapter systematically analyses Indonesia's policy approach to industrial decarbonisation using a multi-level framework similar to that proposed by the OECD (OECD, 2024). This framework supports a clear assessment of the alignment between high-level objectives and the specific on-the-ground policies designed to achieve them. The analysis reveals a comprehensive vision but it also highlights critical gaps in the policy architecture, particularly at the implementation level.

The multi-level framework consists of five levels. It begins with the general objective in Level 1, followed by strategies in Level 2, which are the main approaches to achieve the objective. These strategies form the foundation for Level 3, which identifies five critical operational routes necessary for implementation. The lower section of the framework describes the implementation mechanism,

bridging technical requirements with the regulatory framework. Level 4 outlines essential prerequisites conditions for implementing the routes, while Level 5 anchors these requirements in concrete policy actions and regulations.

Industrial emissions in Indonesia cover a broader scope than the industrial processes and product use (IPPU) sector as defined in the Indonesian NDC. Emission sources in the industrial sector include energy consumption, IPPU processes, and industrial waste. The assessment of Indonesia's industrial decarbonisation policies is shown in Fig.1.

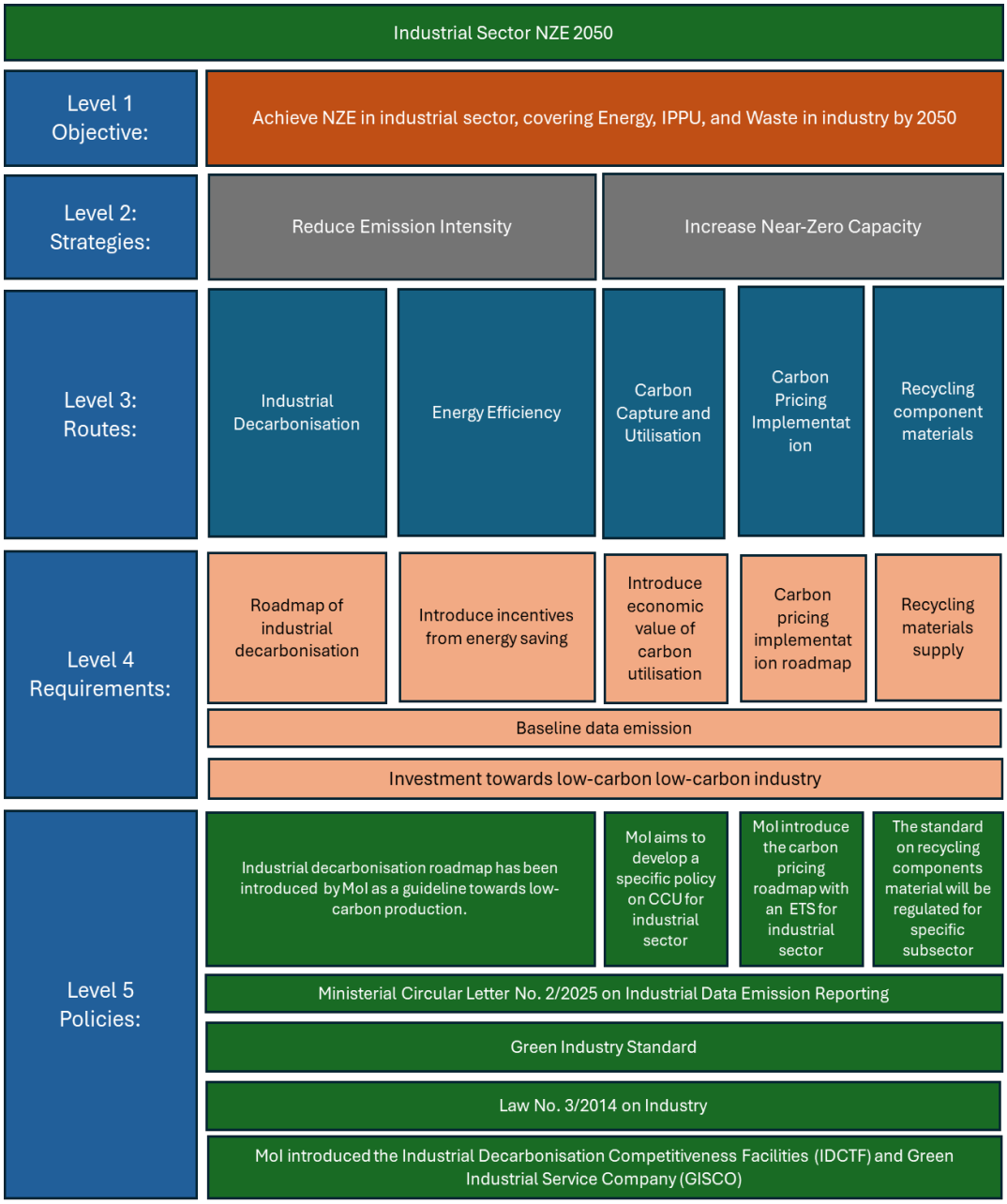

Figure 1: Adopted from the "Framework for Supply-Side Pledges and Implementation Actions on Industrial Emission Reductions from The Carbon Capacity Nexus," (OECD, 2025)

The Overarching Industrial Decarbonisation Regulatory Framework

Level 1: High-Level Objectives

At the highest level, Indonesia has established clear and ambitious targets. The cornerstone of its ambition is the industry-specific goal of achieving Net-Zero Emissions (NZE) by 2050. These objectives provide the overarching direction for all subsequent strategies and policies.

Level 2: Core National Strategies

Indonesia's decarbonisation plan, steered by the Ministry of Industry, aligns core strategies for transitioning industrial capacity through two main approaches:

- **Strategy A: Reduce Emission-Intensity**

  The foundational concept of a Green Industry, as defined in Law no. 3/2014, prioritises efficiency and sustainable resource use in existing operations. In addition, the Green Industry Standard sets GHG emission intensity as one of the assessment criteria, indicating that reducing emission intensity is one of the core decarbonisation strategies (Kementerian Perindustrian, 2024). This strategy is supported by efforts to promote energy efficiency in industrial facilities.

- **Strategy B: Increase Near-Zero Capacity**

  Indonesia is also pursuing the creation of new, low-emission industrial capacity through process improvement and materials substitutions. The strategy includes fostering emerging technologies, as reflected in the industrial decarbonisation roadmap for the nine subsectors priorities (WRI Indonesia, 2025) Key routes to achieve this include promoting a circular economy through recycling component materials, deploying Carbon Capture and Utilisation (CCU), and implementing carbon pricing in industry.

While the objectives and strategies are clear, the effectiveness of the framework depends on the specific routes, requirements, and policies that are implemented. It is at this level that significant implementation challenges become apparent. The following sections analyse Routes, Requirements, and Specific Policies as well as the challenges of industrial decarbonisation within this framework.

Level 3: Routes

Level 3 describes five operational pathways designed to put the strategies into practice by reducing industrial emission intensity and increasing near-zero capacity. These routes are: (i) industrial decarbonisation, (ii) energy efficiency improvements, (iii) carbon capture and utilisation (CCU), (iv) carbon pricing implementation, and (v) recycling of component materials.

These routes reflect both technical and economic aspects and aim to balance direct emission reductions with emission cost internalisation. The direct emission reductions are sought through industrial decarbonisation, energy efficiency, and technological intervention such as CCU, while the carbon pricing roadmap provides a mechanism for internalising GHG emission costs. Recycling component materials integrates circular economy principles and reduces emissions upstream.

Level 4: Requirements

The Requirements specify essential prerequisites and enablers needed to unlock these routes. For industrial decarbonisation, a roadmap is essential to provide guidance and technology options for

low-carbon industrial processes. To encourage industry players to implement energy efficiency measures, incentives for energy savings need to be continuously introduced.

In line with the industrial decarbonisation routes, carbon pricing must be supported by a clear roadmap to help industries prepare their business models for the future. CCU deployment needs to be accompanied by recognition of the economic value of carbon utilisation. For the recycling route, the supply of recycled materials that meet specific quality standards must be secured.

A cross-cutting requirement for all routes is reliable baseline emissions data and access to investment for low-carbon industry. A robust emissions database is crucial for helping industry actors plan and implement decarbonisation measures. At the same time, substantial financial mobilisation is necessary for all five routes to succeed.

Level 5: Specific Policies

Specific Policies provide the governance anchor for the entire framework, translating high-level targets into a concrete regulatory infrastructure. The Ministry of Industry leads these efforts by establishing clear operational guidelines, such as sector-specific decarbonisation roadmaps and the Green Industry Standard, which together signal technical benchmarks for compliance.

Beyond regulation, the Ministry of Industry (MoI) has introduced enabling mechanisms to safeguard industrial competitiveness during the transition. Recognising the need for capital and investment in low-carbon technologies, the Ministry is developing the Industrial Decarbonisation Competitiveness Facility (IDCTF) and Green Industry Service Companies (GISCO).

Challenges

Despite the robust structure of the industrial decarbonisation framework, several critical challenges remain.

First, financial policies and mechanisms. Lack of finance is a key constraint. The MoI's most significant policy innovations include the planned creation of Green Industry Service Companies (GISCO) and the Industrial Decarbonisation Competitiveness Facility (IDCTF). These initiatives are designed to provide de-risked financing by acting as intermediaries that channel credit to industrial green projects. For market-based mechanisms, the government is developing a carbon pricing mechanism and exploring an Emissions Trading System (ETS).

Second, regulatory standards and data. At present, robust industrial emissions data are still lacking. The absence of continuous, reliable, and fit-for-purpose data is one of the most significant weaknesses in the policy structure.

Third, technology and infrastructure. The strategy relies heavily on technologies such as CCU. However, a key requirement has faced setbacks. Presidential Regulation No. 14/2024 on Carbon Capture and Storage focuses on the oil and gas sector rather than on the broader energy and industrial sectors that also use energy. As a result, it does not provide an adequate regulatory basis for CCU deployment in industry, illustrating a gap between strategic objectives and supporting regulations.

Subsector Specific Initiatives:

Beyond the MoI's efforts to achieve the NZE 2050 target, several industrial subsectors have begun adapting low-carbon practices driven by external pressures and global market trends.

- The cement industry in Indonesia is strengthened by the work of the Global Cement and Concrete Association (GCCA), an international body whose members are actively pursuing various decarbonisation pathways. In addition, the Indonesian Cement Association (ASI) incorporates the World Business Council for Sustainable Development (WCBSD) methodology in its reporting and carbon-related initiatives.
- The steel industry is currently prioritising innovations in green steel: steel produced with lower carbon emissions and more environmentally responsible processes. Leading companies, such as PT Gunung Raja Paksi Tbk (GRP) and PT Krakatau Posco (PTKP), are at the forefront of this transition through a range of sustainability initiatives. GRP has obtained both the Green Label Indonesia certification and an Environmental Product Declaration (EPD) and has commissioned a Rooftop Solar Power Plant (PLTS Atap) Project with a total capacity of 9.3 MWp as part of its pathway toward net-zero emissions. GRP also plans to transition from natural gas to green hydrogen. These initiatives are further accelerated by international trade policies, particularly the European Union's Carbon Border Adjustment Mechanism (CBAM) policy (Indonesian Iron & Steel Industry Association (IISIA), 2024).

1.3 Role of Civil Society

The transition toward a low-carbon industrial sector in Indonesia is not driven by government efforts alone. It requires a complex ecosystem of actors, including civil society organisations (CSOs), industry associations, and international partners, each playing a distinct and essential role.

CSOs, in particular, have become increasingly influential in shaping Indonesia's industrial decarbonisation agenda. Their contributions can be viewed through the lens of Start and Hovland's (2004) policy-influence framework, which identifies four key roles: researchers, advocates, conveners, and capacity builders.

As researchers, CSOs generate critical data and analysis needed for evidence-based policymaking. Organisations such as the Institute for Essential Services Reform (IESR) and World Resources Institute (WRI) Indonesia have developed industrial decarbonisation roadmaps using bottom-up modelling. These studies outline clear pathways and technology options to reduce emissions and reach net-zero by 2050.

As advocates, some CSOs push for targeted policy reforms, and highlight gaps in the current regulatory framework. Their work has helped identify major barriers, including high capital costs, limited regulatory incentives, and the lack of a market premium for low-carbon steel (Adhinegara *et al.*, 2025), CELIOS.

CSOs also serve as conveners, fostering dialogue and collaboration among government ministries, industry actors, academic institutions, and international organisations. A notable example is a green-steel workshop organised by Climate Catalyst, which brought together CSOs and universities to discuss shared challenges and opportunities. By creating platforms for discussion and knowledge exchange, CSOs help develop a more coherent understanding of the pathway toward decarbonisation.

Finally, in their role as capacity builders, CSOs work to strengthen the abilities of both industry and government to undertake meaningful climate action, supporting technical understanding, offering training, and helping stakeholders navigate the complexity of industrial transformation.

2 National Industry Decarbonisation in the Global Context: Opportunities and Challenges

2.1 National Context

According to Law No. 3/2014 on Industry, a green industry is defined as an industry that prioritises efforts to achieve efficiency and effectiveness in the sustainable use of resources, in order to align industrial development with the preservation of environmental functions and to provide benefits to society. This concept has therefore become the basis for industrial decarbonisation efforts in Indonesia.

The MoI has announced an industrial decarbonisation strategy consisting of industrial decarbonisation roadmaps, an industrial emission reduction policy, a carbon pricing mechanism, circular economy implementation, carbon capture and utilisation, and green industry standards. The ministry also announced nine prioritised industrial groups/subsectors: cement, fertiliser, metal, pulp and paper, textile, chemical, ceramic and glass, food and beverages, and the automotive industry. Four of these are the first priority until 2030: metal (including iron and steel), pulp and paper, cement, and fertiliser.

Iron and steel

There are various types of Indonesian iron and steel industries, differentiated not only by their products but also by the materials used in production. The Indonesian Iron & Steel Industry Association (IISIA) has around 200 members. Most iron and steel manufacturers in Indonesia produce their products from iron ore. Only a few, such as Gunung Raja Paksi (GRP), PT Master Steel Mfg. Co., PT Ispat Indo, and Inter World Steel Mill, use the Electric Arc Furnace (EAF) process with scrap as raw material. In the case of GRP, for example, approximately 70% of the raw materials used are scrap, resulting in average GHG emissions 42% below the global average, as estimated by the World Steel Association.

These companies do not fully use scrap materials due to several challenges, including difficulty in sourcing scrap of sufficient quality and quantity. Domestically, availability is limited, while importing scrap is not possible because Indonesian regulations classify scrap as waste and prohibit waste imports under Ministry of Environment (MoE) rules. Domestically, the biggest challenge in the scrap market is the difficulty of obtaining necessary permits and complying with frequently changing regulations, which hinders smooth operations and investment. Limited infrastructure for scrap collection, processing, and transportation, as well as competition between numerous small-scale players and established companies, contributes to price fluctuations and potential quality concerns. Navigating these challenges requires strategic approaches that consider regulatory compliance, infrastructure development, and market competitiveness. GHG emissions data in this sector exists but is limited to a few companies and only covers certain years.

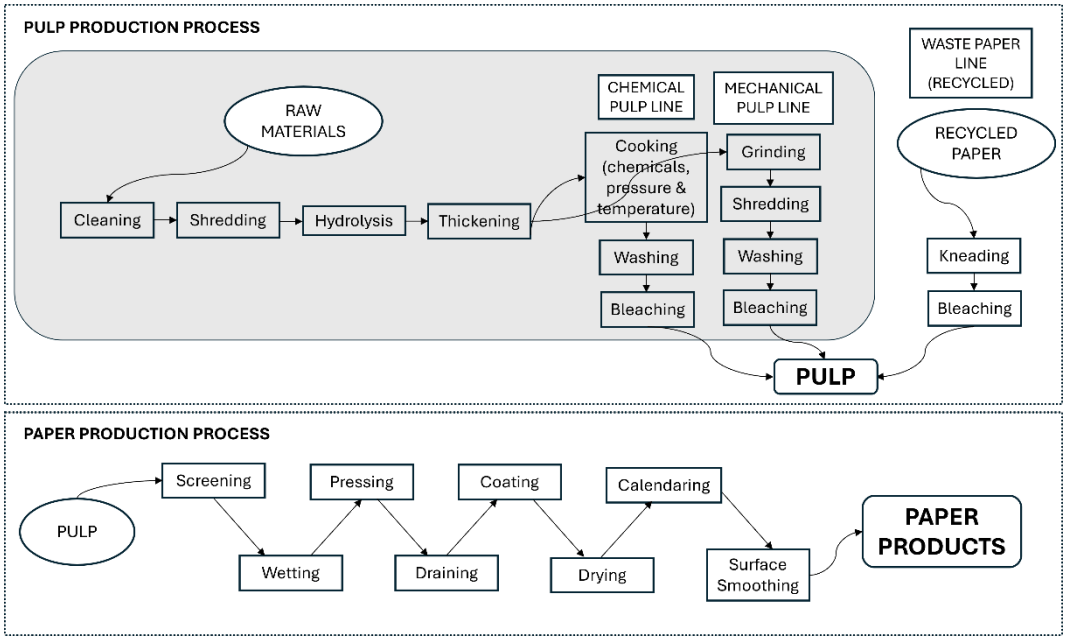

Figure 2: Pulp and paper production processes (based on Haile et al., 2021)

Pulp and paper

The pulp and paper sector consists of an upstream segment (pulp production) and a downstream segment (paper product manufacturing), as shown in Figure 2. Some companies operate integrated systems that span the entire value chain from pulp to final paper products. Therefore, some pulp and paper companies own forest resources or long-term fibre supply agreements, operate pulp mills, and also operate paper mills (and sometimes converting plants).

Under Indonesia's reporting system, GHG emissions from forests and plantations fall under the Ministry of Forestry, not the industrial reporting system. Some integrated companies operate captive power plants, such as PT Pakerin and Asia Pulp & Paper Group (APP). Emissions related to IPPU in this sector are linked to the use of sodium carbonate (Na_2CO_3), also known as soda ash, especially in pulp production. Some companies have reported GHG emissions in recent years as part of their sustainability reports.

Cement

The cement industry is relatively advanced and well-organised in reporting GHG emissions. From 2009 to the end of 2022, thirteen companies regularly reported their emissions. Some are involved in carbon projects under the Clean Development Mechanism (CDM), and one operates a carbon co-operative approach in heat waste recovery.

The industry experienced rapid growth from 2018 to 2023, but production volumes declined from 2022 due to reduced domestic consumption following the pandemic. The Indonesian Cement Association (ASI) reported that utilisation rates dropped significantly from around 65% before the pandemic to 56% in 2024. This decline was mainly due to the slowdown of domestic infrastructure projects in 2024, even though exports increased during the same period. However, regional competition is intensifying, especially from ASEAN countries, China, India, and Pakistan. The association has recommended a moratorium on new plants and increased cement exports to prevent further decline (Annisa Nurfitri, 2025).

Fertilisers

Almost all fertiliser companies in Indonesia are state-owned enterprises under PT Pupuk Indonesia (Persero), including PT Pupuk Kalimantan Timur (PKT), PT Petrokimia Gresik (Petrogres), PT Pupuk Sriwidjaja (PUSRI), PT Pupuk Kujang, and PT Pupuk Iskandar Muda (PIM). They dominate about 80%

of subsidised fertiliser supply (urea and NPK), while private companies dominate around 80% of the non-subsidised market. A carbon capture and utilisation (CCU) pilot project is currently being implemented at PT Petrokimia Gresik as part of decarbonisation efforts (Petrokimia Gresik, 2025b). Several companies, including those under PT Pupuk Indonesia (Persero), have reported their GHG emissions through sustainability reports.

Other subsectors

The other five priority subsectors: textile, chemical, ceramic and glass, food and beverages, and automotive industry, still lack a robust GHG emissions database. Some industries report emissions irregularly, while others are unsure what or how to report.

Regulatory developments

In February 2025, the Minister of Industry issued Circular Letter No. 2/2025 requiring industries to submit emission data (GHG and air pollutants) through the National Industry Information System (SIINas). However, as a circular letter, it is not legally binding and serves only as encouragement.

Ministerial Regulation No. 13/2025 outlines the procedures for submitting industrial data through SIINas. Required data include total annual production, total consumption of water, electricity and energy, and raw materials. Waste management reporting is mandatory for medium and large industries, but GHG emissions reporting remains voluntary. The MoI is preparing a new regulation to make GHG reporting mandatory to better understand sectoral emissions and plan the pathway toward net-zero by 2050.

Technology and decarbonisation challenges

The first four priority subsectors exhibit varying levels of technological advancement. Cement companies generally use advanced technologies and continue to improve due to market competition and government initiatives. In iron and steel, around 32% of Indonesia's 2023 steel production used the scrap–EAF pathway, while 68% relied on BF–BOF technology. Since blast furnaces can operate for over 40 years, new unabated BF capacity risks locking in emissions for decades, posing a challenge to achieving net-zero steel sector emissions by 2050 or even 2060 (GEI ASEAN, 2025).

In pulp and paper, even with modern technologies, the sector remains carbon intensive due to energy needs, fuel types, and raw material sources. Large quantities of electricity and steam are required, often relying on fossil-fuel-based grids. Despite efforts to improve efficiency and expand renewable energy, fossil fuel dependence remains significant.

The fertiliser industry is energy-intensive throughout the production chain. PT Pupuk Indonesia (Persero), the largest producer, reported shifts in energy intensity in 2024 due to limited gas, CO_2, steam, or electricity supplies, as well as technical constraints causing plant shutdowns or suboptimal operations. PTPI aims to support the low-carbon transition through renewable energy, alternative fuels, and technology innovation (Pupuk Indonesia, 2025).

Access to advanced and low-carbon technology remains a major challenge due to heavy import dependence and high capital requirements. Financing gaps also persist: many companies cannot access suitable financing for cleaner technologies, while international lenders often prefer to lend amounts far exceeding industry needs. The issue is not scarcity of funds but mismatches between available financing and actual needs.

To address this, the MoI is developing the Green Industry Service Companies (GISCO) mechanism, intended to facilitate financing, technology deployment, and project management for industrial decarbonisation. GISCO is expected to serve as an intermediary between lenders and eligible industrial decarbonisation projects.

Multi-stakeholder collaboration

Industrial decarbonisation requires collaboration among multiple stakeholders. While the MoI is responsible for industrial regulation and standards, civil society organisations, think tanks, and universities play essential roles in supporting research, data development, and policy formulation. Universities often focus on foundational research supporting green and low-carbon standards, while think tanks contribute to practical tools such as databases and policy analyses. Industry research centres also explore sector-specific technologies to reduce emissions.

At the Second Annual Indonesia Green Industry Summit (AIGIS) in August 2025, the MoI soft-launched decarbonisation roadmaps for the nine priority subsectors. These roadmaps are initial versions and not yet fully comprehensive, but they signal strong commitment and collaboration between government, industry, and research institutions. Further work will expand and deepen these roadmaps. The summit adopted the tagline *Ini Tanggung Jawab Kita* (It Is Our Responsibility), emphasising shared responsibility for industrial decarbonisation.

2.2 International Context

Indonesia is an active participant in several international initiatives that support industrial decarbonisation. One of the most relevant is the Global Eco-Industrial Parks Programme (GEIPP), supported by the United Nations Industrial Development Organization (UNIDO) and the Government of Switzerland. The first phase ran from 2020–2023, and the second phase (2024–2028) seeks to demonstrate the feasibility and benefits of greening industrial parks by improving resource efficiency and the environmental and social performance of industries (GEIPP Indonesia, no date). These efforts contribute to Indonesia's broader goals of inclusive and sustainable industrial development.

GEIPP emphasises alignment with the National Circular Economy Strategy, which is based on the 5R principles: Reduce, Reuse, Recycle, Recovery, and Repair. Two industrial parks have been selected: the MM2100 Industrial Park in Java and the Batamindo Industrial Park in Batam. MM2100 has scored highly under the International EIP Framework and demonstrates strong potential for further improvement with targeted support. The programme in this park focuses on the provision of specialised advisory services and the development of industrial symbiosis both within and across parks. Batamindo Industrial Park, with its readiness for mainstreaming Industry 4.0 solutions, has also shown considerable potential for enhanced performance. Capacity building and technical cooperation have been key components of GEIPP's engagement with both parks.

Beyond GEIPP, Indonesia participates in the Global Matchmaking Platform under the Climate Club. Together with Argentina, Kenya, Morocco, and Egypt, Indonesia is part of the Partnership for Net Zero Industry: Sustainable National Transformation Pathways to Climate Neutral Industry by 2050, supported by Germany's International Climate Initiative. This partnership promotes low-carbon production, particularly in high-emitting industries such as steel, cement, and concrete (IKI, 2025).

The initiative aims to ensure that industrialisation and economic growth can progress without increasing emissions. It facilitates collaboration among governments, financiers, industries, technology providers, and research institutions to strengthen policy environments, encourage investment in decarbonisation technologies, and promote knowledge exchange. To date, the partnership has convened workshops in Indonesia to support the transition to low-carbon steel, indicating practical engagement beyond high-level commitments.

Several international collaborations are also taking place at the project level, particularly in the cement and fertiliser industries. One example is the current pilot project to decarbonise the fertiliser sector through a partnership between the MoI, PT Petrokimia Gresik, and Uwin Resource Regeneration Inc. from Taiwan. The project aims to reduce emissions from industrial processes by capturing CO_2 and converting it into valuable industrial raw materials such as soda ash and baking soda. During the 2nd AIGIS session, the President Director of PT Petrokimia Gresik stated that the pilot project

is expected to capture 20,000 tons of CO_2 annually, corresponding to a production capacity of 50,000 tons of soda ash per year (Petrokimia Gresik, 2025a). By adopting this technology, PT Petrokimia Gresik can reduce carbon emissions while generating additional revenue from the sale of by-products to the glass and detergent industries.

Under the Joint Crediting Mechanism (JCM) between Japan and Indonesia, a Waste-Heat Recovery Power Generation system has been implemented at the PT Semen Indonesia (Persero) Tbk plant in Tuban, East Java. Based on verification results, a total of 46,938 credits, which is equal to 46,938 tCO_2e, to be issued. Of this amount, 50% was issued by the Japanese government on 4 February 2025, while the remaining credits are still pending issuance by Indonesia.

To prepare for the implementation of the EU Carbon Border Adjustment Mechanism (CBAM), the MoI is currently assessing the feasibility of establishing an Emissions Trading System (ETS) that is compatible with the EU ETS. The aim is to minimise additional tariffs for Indonesian exports entering the EU market. Collaboration with EU counterparts on both ETS and CBAM development is ongoing.

3 Looking Forward

3.1 Perception on the Role of the Climate Club

Indonesia is currently facing a major challenge in meeting its Enhanced Nationally Determined Contribution (ENDC) targets. These targets aim for a national emission reduction of 32%, or 912 million tons of CO_2, by 2030. However, this goal is increasingly at risk due to rising industrial emissions. As explained in Chapter 1, the rapid growth of industrial processes requiring high heat energy over the past two decades has been the primary driver of the significant increase in GHG emissions from the industrial sector. This urgency calls for the Indonesian government to prioritise decarbonisation in four key industrial sectors: cement, iron and steel, pulp and paper, and fertiliser.

The MoI is currently promoting several key drivers of industrial decarbonisation, including the development of an industrial decarbonisation map, an industrial emission reduction policy, a carbon pricing mechanism, circular economy implementation, CCU, and a green industry standard. To deliver these measures effectively, MoI must have the capacity and capability to produce accurate and up-to-date industrial emission profiles, ensure access to relevant technologies to support CCU deployment, and secure financial and funding mechanisms for the successful implementation of GISCO. This section examines perspectives from multiple stakeholders on the role of the Climate Club in Indonesia's industrial decarbonisation.

The Climate Club is a voluntary international partnership led by the G7 that brings countries together to accelerate industrial decarbonisation through shared standards, coordinated policies, and support for technology and capacity building.

On the positive side, the Climate Club could significantly support MoI's needs by providing access to finance, technology transfer and development, capacity building, policy coordination, and global matchmaking. At COP29 in Baku, the Climate Club, together with UNIDO, formally launched the Global Matchmaking Platform for Industrial Decarbonization to accelerate the transition in heavy-emitting industries, with participation from key donor and partner organisations. The strength of this initiative lies in its commitment to tailoring support to the specific circumstances of each participating country. Nevertheless, some non-state actors remain doubtful that the Climate Club can fully realise its ambition or effectively support MoI in ensuring a just and inclusive industrial transition in developing countries, including Indonesia. Their concerns stem from the perceived vagueness and lack of legitimacy of the Climate Club's intergovernmental arrangements. On the one hand, the Climate Club aims to support the effective implementation of the Paris Agreement and related decisions on industrial decarbonisation. To achieve this, Nordhaus and Victor (Nordhaus, 2015) ar-

gue that members should have binding emission-reduction commitments, sanctions for non-members, and the legal authority to convert decisions into binding obligations. Similarly, Martini et al. suggest that the Climate Club could adapt robust, treaty based, and legally binding membership frameworks, formal decision-making processes embedded in domestic regulations, and procedures to address non-compliance (Martini and Görlach, 2022) or resolve disputes (von Luepke, Neuhoff and Marchewitz, 2024). On the other hand, the Climate Club is currently structured as an intergovernmental forum for discussion (Climate Club, 2022), operating through UN-style consensus decision-making without any mechanisms for dealing with non-compliance. This arrangement could allow certain states to use procedural tactics to delay or obstruct decision-making. The ambiguity also raises questions regarding the financing of Climate Club activities and work programmes. Although one of its pillars is to mobilise private-sector financing, its governance framework states that all activities depend entirely on voluntary contributions from member states (Climate Club, 2022).

A key concern among MoI officials and non-state actors relates to the lack of regulatory impact assessment and insufficient public consultation underpinning the legal basis for implementing just and inclusive industrial decarbonisation in Indonesia. As outlined in Chapter 1, MoI's industrial decarbonisation strategy places strong emphasis on CCU development. From a legal and governance standpoint, this requires a clear regulatory foundation to enable implementation within industrial activities. The most suitable opportunity to establish this foundation arose in 2024, when the President enacted Presidential Regulation No. 14 of 2024 on Carbon Capture and Storage. Unfortunately, this regulation does not address the governance or adoption of CCU in the industrial sector. According to internal MoI sources familiar with the process, the Ministry of Energy and Mineral Resources (MEMR), which led the drafting, circulated the draft regulation to relevant ministries without providing any accompanying technical documents that would have enabled MoI to propose the inclusion of CCU-related provisions for the industrial sector.

The omission of CCU governance from Presidential Regulation No. 14 of 2024 illustrates why proper regulatory impact assessment (RIA) and meaningful public consultation are essential. Had MEMR conducted an RIA covering carbon capture deployment across all relevant sectors, not only energy and mineral resources, or held public consultations that allowed industrial stakeholders to review the draft, the importance of CCU for industrial decarbonisation would likely have been recognised and reflected in the regulation.

As stated in Chapter 1, this reflects a broader disconnection between strategic goals and regulatory implementation. Under Indonesian law, the obligation for ministries to conduct RIAs and public consultations derives solely from Presidential Instruction No. 7 of 2017, which applies internally within government. Meanwhile, Law No. 12 of 2011 and its amendments, the legal framework governing law-making processes in Indonesia, do not require RIA or broad public consultation for regulatory instruments below the level of an Act, including Presidential Regulations. In practice, this results in inconsistent application: some ministries conduct RIAs and consultations when drafting Presidential Regulations, while others do not. The absence of a legal mandate under Law No. 12 of 2011 for RIA and sufficient public consultation in drafting subordinate regulations appears to be the root cause of this inconsistency.

3.2 Indonesian Outlook on Industrial Decarbonisation

Several studies propose key strategies for achieving a just industrial decarbonisation, which could be applied in Indonesia by considering the social and economic impacts of transitioning to a low-carbon economy while ensuring equitable access to opportunities and resources for all. This approach requires a combination of technological innovation, policy intervention, and social adjustment (Wang *et al.*, 2025). There are two differing perspectives on technological innovation. The first, supported by some research institutes and international organisations, advocates for deploying technologies such as CCU, green hydrogen, green ammonia, and relevant renewable energy

sources. The second perspective argues that the adoption of a circular economy within green industry should be prioritised over investment in new technologies that remain unproven at scale (OECD, 2024).

The current conflicting mindsets between the MoI and the MoE on the legality of metal scrap imports for Indonesia's metal industry highlight the importance of inclusive policy development, particularly regarding circular economy practices in the metal sector. The MoI views scrap metal as an essential raw material for domestic metal production. In contrast, the MoE, holding the authority to restrict imports for environmental protection, classifies imported scrap metal as waste that may pose environmental risks. As a result, national metal producers face significant difficulties in securing adequate scrap due to the stringent import requirements imposed by the MoE.

There are several entry points for international collaboration and learning to strengthen just industrial decarbonisation in Indonesia. First is the development and regular maintenance of the industrial sector's emission inventory. As noted in Chapter 2, the MoI is preparing a regulation to make GHG emissions reporting mandatory. This policy initiative must be supported by proper technical assistance and regulatory impact assessments to ensure a comprehensive understanding of the sector's emissions profile and enable more effective decarbonisation strategies toward achieving net-zero emissions by 2050.

Second, international cooperation is needed to provide technological access and foster CCU deployment within Indonesia's industrial sector. Finally, the Climate Club could play an important role by providing financial and funding support to ensure the successful implementation of GISCO.

Challenge/Barrier/ Opportunity	Entry Point	Recommendation
[Barrier] Overlapping and disharmonised regulations	Industry Associations and CSOs	Overlapping and inconsistent regulations continue to hinder industrial decarbonisation. Industry associations together with CSOs, including think tanks and universities, need to advocate for regulatory harmonisation and propose specific regulatory changes where needed.
[Barrier] Heavy reliance on fossil fuel energy sources, especially in the national power grid	Ministry of Energy and Mineral Resources	A clear pathway is needed for phasing-out fossil fuels, including those used to supply industrial energy needs. This requires both development and implementation of a comprehensive transition plan.
[Barrier] High cost of low-carbon logistics and transport	Ministry of Transport	A low-carbon transport and logistics scheme for industrial purposes should be developed to help reduce emissions and operational costs.
[Challenge] Low investment in Research and Development (R&D)	Green Industry Centre, MoI	R&D for low-carbon technologies should be supported through the Industrial Decarbonisation Competitiveness Facilities (IDCTF) scheme to help reduce costs and accelerate innovation
[Challenge] Lack of investment certainty and absence of clear incentives for producing green steel	Agency for Government Goods/Services Procurement Policy (LKPP)	Demand for green steel should be stimulated through green public procurement supported by clear incentives.
[Opportunity] Strengthening civil society's participation in industrial decarbonisation	CSOs' shared platform on industrial decarbonisation	The existing shared platform can be further utilised to strengthen civil society's role in expanding public knowledge and disseminating information on industrial decarbonisation. Media engagement also needs to be enhanced to broaden outreach.

Table 2: Key challenges, barriers, and opportunities as well as potential entry points and recommendations

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