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EXECUTIVE SUMMARY

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ISTANBUL POLICY CENTER
SABANCI UNIVERSITY
STIFTUNG MERCATOR INITIATIVE

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EXECUTIVE SUMMARY

The "Decarbonization of the Turkish Steel Sector" project, implemented by Istanbul Policy Center (IPC) in mid-2022, provides a comprehensive analysis and assessment of the steel sector's decarbonization process in line with Türkiye's 2053 net-zero greenhouse gas emissions target. The project is based on an extensive research and consultation process structured in four separate phases.[1] The project aims to provide an evidence-based foundation that is recognized by industry, academia, and other relevant stakeholders, and to contribute to future public policy discussions.

The final study in the technical report series, *The Decarbonization of the Turkish Steel Sector: Policy and Actor Analysis*, evaluates the policy framework shaping the sector's decarbonization, the approaches of key actors influencing the process, and the system's current capacities and limitations from a multidimensional perspective. The report highlights the main challenges encountered in transitioning to low-carbon production and opens a discussion on policy and institutional interventions to accelerate the transformation process.

The study focuses on crude steel producers and analyzes the sector's transformation capacity in collaboration with public institutions, industry associations, and other stakeholders that directly or indirectly influence these producers' activities. Based on these assessments, key findings on the dynamics of the transition and concrete policy recommendations are presented.

1 For more information about the project and to access the prepared technical report series, see: https://ipc.sabanciuniv.edu/en/decarbonization-of-the-turkish-steel-sector-project.

The report aims to share field-based observations and insights on actors, challenges, and potential solutions in the decarbonization process of Türkiye's steel sector with a broader audience, thereby contributing to enabling the transformation required in the industry.

FINDINGS ON THE CRUDE STEEL PRODUCTION SECTOR

Institutional Dynamics of Industrial Decarbonization

The decarbonization process in Türkiye's industrial sector is a new area of transformation that became prominent after 2020 and is still in the process of institutionalization. In this context, the institutional positions, strategic approaches, and governance capacities of public institutions, companies, and industry representatives have not yet reached maturity. The decarbonization agenda often arises not from internal environmental or climate policy priorities but through external pressures such as maintaining competitiveness in foreign trade, meeting access-to-finance criteria, and complying with European Union (EU) regulations.

Despite this general trend, it should be noted that there is a significant group of sector employees who perceive decarbonization not only as a compliance requirement but also as a responsibility to reduce energy and resource consumption, promote technological development, and mitigate environmental impacts in production processes. This group—including engineers, technical experts, and staff in environmental management and strategy units—and their teams play a key role in decarbonization efforts.

At the facilities visited, the employees interviewed were observed to act not merely to fulfill procedural responsibilities but with a motivation that integrates personal values with environmental responsibility. The individual motivation of these employees and their teams represents an important intrinsic driver that should not be overlooked in the sector's transformation..

Although the dominant approach in the sector is still shaped by economic sustainability and competitiveness, employees and, in some cases, senior managers demonstrate varying levels of ownership of the transition. Therefore, evaluating many Turkish producers' decarbonization efforts solely as compliance with external regulations risks overlooking—or even undermining—the emerging institutional awareness and willingness to undertake the transition at the employee level. A similar observation applies to the limited public staff responsible for activities that improve current conditions, particularly in pollution prevention and public access to environmental information.

Assessment of the Current State of Steel Sector Decarbonization

Decarbonization efforts in the Turkish steel sector have gained momentum following the EU Green Deal, particularly in the last two years, thanks to producer initiatives and partially supportive public policies. Technical and digital solutions to improve energy and resource efficiency, investments in next-generation furnace technologies, pilot tests for hydrogen production and use, and renewable energy investments by many producers are among these concrete steps.

During the same period, the sector has also responded to global trade pressures, with the Turkish Ministry of Trade enforcing protective measures on certain product groups following anti-dumping investigations on imported steel products.

Additionally, the disclosure of short- and long-term greenhouse gas reduction targets and the adoption of voluntary transparency mechanisms, such as sustainability reporting and environmental product declarations, indicate growing producer-level motivation for transformation. This trend has been observed across employee groups, from steelworks staff to environmental units, and clearly emerged in field interviews.

As of 2025, nearly ten producers have disclosed greenhouse gas reduction targets and roadmaps for the 2030 and/or 2053 target years.[2]

New support mechanisms have also been introduced through public incentives, national programs, and external financing. However, a comprehensive vision for the transformation of the entire steel supply chain has not yet been debated in the sector. Demand-side policy instruments, such as public procurement, green product standards, embodied carbon, and "lead markets" (green premium), have not entered the sector agenda.

In November 2024, Türkiye submitted its long-term climate strategy (TR-LTS) under the United Nations Framework Convention on Climate Change (UNFCCC), including some reduction targets for energy-intensive sectors, including steel, for 2040 and 2053. However, national climate policies, technology strategies, and decarbonization roadmaps directly relevant to the steel sector have yet to provide actionable guidance to producers. On the public sector

2 Producers such as Çolakoğlu Metallurgy, ÇEMTAŞ, and ERDEMİR have shared their decarbonization roadmaps with the public.

side, these documents have not translated into practical enforcement or monitoring mechanisms that would generate institutional transformation capable of changing sector and state practices.

The fact that most transformation proposals focus on innovative production technologies with debatable technical feasibility and that are postponed to after 2040 (e.g., hydrogen-based direct reduced iron, carbon capture and storage) keeps the decarbonization process away from setting feasible short- and medium-term steps.

Despite the positive steps mentioned above, structural gaps and delays persist in the steel sector's decarbonization journey. Binding, absolute sectoral greenhouse gas reduction targets for 2030 have not yet been defined. An effective national emissions trading or carbon tax system has not been established for the manufacturing industry, which accounts for a large share of industrial and energy-sector emissions; ongoing efforts have yet to evolve into a comprehensive, timely greenhouse gas management system. Proposed system alternatives have not been supported by extensive impact analyses.

The sector's energy intensity, production scale, and raw material dependence require substantial infrastructure and financing for the transformation. Despite continuous increases in production capacity since the 1990s, energy efficiency gains and reductions in the CO_2 intensity of electricity generation have not been sufficient to offset total emissions. While partial reductions in emissions intensity are observed in many producers, cumulative sectoral emissions have increased.

In visited regions (particularly Gebze-Dilovası-Kocaeli, Aliağa-Foça-İzmir, İskenderun-Payas-Hatay, Karabük, and Zonguldak), cumulative industrial pollutant emissions and air pollution have adversely affected public and environmental health. The fact that the sector has historically and continues to be associated with environmental issues has caused its image as a "dirty industry" to persist in public perception. Industrial pollution control and prevention regulations aiming to reduce emissions and increase energy/resource efficiency remain inadequate, and needed institutional restructuring has not yet begun. The By-Law on Industrial Emissions Management, published in January 2025, maintains the status quo and defers implementation to after 2030, falling short of guiding the sector in alignment with preventive environmental policies.

Steps taken by the sector and producers to improve occupational health and safety, employee rights, and environmental and social performance will also determine social acceptance, labor supply, and local industry-community relations. Strengthening these relations can enable stakeholders to participate constructively in the decarbonization process.

PUBLIC PERCEPTION OF THE STEEL SECTOR

In Türkiye, the steel sector has long been associated with "dirty" industry and harsh working conditions, negatively affecting public perception and making workforce attraction challenging. However, meaningful actions for workers, the public, and environmental health in line with decarbonization goals have the potential to generate transformation not only environmentally but also in industry-society relations. In this context, clean production goals, the transition to low-carbon production systems, and socially beneficial initiatives in local regions can serve as levers to improve the sector's public image.

Attracting young, skilled, and environmentally conscious talent can enhance the sector's attractiveness and help break the entrenched "pollution" image. Improving socioeconomic conditions and quality of life in industrial regions is critical not only for employment but also for social acceptance.

Following the privatization of some formerly publicly owned integrated facilities, the industrial sector's public dimension has weakened, and social amenities, public spaces, and cultural interaction opportunities for local communities have significantly declined. This situation signals a problematic transformation not only environmentally but also in terms of democratizing industry-community relations and sharing local value. A few producers nationwide have demonstrated tangible social contributions and visible social presence in their regions through education, culture, scholarship programs, and infrastructure investments.

10 KEY FINDINGS

1. **There is significant motivation among sector employees to implement the transformation:** While employees in production and environmental management units demonstrate strong personal motivation to support transformation efforts, there is a lack of systematic support for them. In addition, setbacks in labor rights, low wage levels in the sector, pollution issues in the working environment, and inadequate occupational health and safety performance reinforce the industry's image as "dirty" and associated with harsh working conditions. Overall, it should also be noted that producers' local-level social legitimacy and industry–society relations are weak. This situation both negatively affects public perception and makes it more difficult to attract labor to the sector.

2. **Decarbonizing the steel sector is not a process that can be achieved solely by crude steel producers**: The decarbonization of the steel sector is a multi-stakeholder process that cannot be reduced to the sole responsibility of crude steel producers. However, current policy debates largely address sectoral transformation from a producer-centered perspective. This approach fails to make visible the role of private sector and public actors in the supply chain who provide raw materials, fuel (coal, natural gas), and electricity, as well as the sectors and public institutions (for example, through public procurement and tenders) that use steel in their final products. This narrow, producer-focused perspective that overlooks the role of these actors weakens the sector's transformation capacity.

3. **There is no comprehensive national climate policy framework to support the decarbonization of the steel sector**: The decarbonization process in Türkiye's industry and steel sector is affected not only by technical and economic factors but also by the lack of a planned, guiding, and clearly binding climate policy framework. The absence of well-defined mandates for public institutions that should play an important role in the sector's transformation, and in some cases a mismatch between duties and jurisdictions, prevents the implementation of binding mechanisms to reduce greenhouse gas emissions, especially in the energy and industry sectors. This significantly limits the speed and scope of transformation.

4. **Concrete, measurable, and binding environmental, energy, and climate policy regulations to guide the steel sector's decarbonization have not been developed**: The absence of binding sectoral greenhouse gas reduction targets for 2030, which could significantly improve the sector's performance, creates uncertainty about the sector's transformation capacity and weakens the direction of investment decisions. This gap makes it difficult for the private sector to engage in long-term planning and limits the effectiveness of public policies.

5. **An integrated environmental permitting and information system for managing pollutant emissions from steel production facilities has not been established:** The legal regulations, institutional structures, and technical infrastructure necessary to implement integrated pollution prevention and control measures effectively in both new and existing highly polluting industrial facilities are inadequate. The alignment process with the EU Industrial Emissions Directive (IED), in place in the EU since 1996, has been delayed. The current version of the national By-Law on Industrial Emissions Management, published in 2025, does not fully reflect the integrated environmental permitting approach. In addition, full alignment has not been achieved with the EU Eco-Design Regulation, which is associated with the IED and aims to increase the energy and resource efficiency of products, reduce their environmental impacts, and ensure compliance with sustainable design principles. Delays in complying with these regulations could lead to technical barriers in Türkiye's trade relations with the EU and weaken competitiveness. While the establishment of a national Pollutant Release and Transfer Register (TR-PRTR) is a positive step, unlike the EU and UK examples, facility-level pollutant emissions data is not publicly accessible. This lack of transparency is not limited to pollutant emissions but also applies to key data such as production and capacity figures.

6. **Technological transformation in the steel sector is progressing slowly and weakly due to shortcomings in institutional infrastructure, concrete actions, and planning adapted to local conditions**: Unlike in other major steel-producing countries, institutional structures to guide technological transformation have not been established in Türkiye's steel sector. The limited number of pilot projects, the lack of public–private partnership mechanisms for technology development and deployment, insufficient financial instruments, and the inability of existing strategy documents to present a realistic, applicable roadmap all weaken the sector's technological transformation capacity. Considering current infrastructure, institutional capacity, and governance gaps, the likelihood of achieving the strategic

targets set for after 2040 is low. This poses risks to both ensuring a timely technological transition and maintaining competitiveness.

7. **Demand for low-carbon steel has not yet become a strong agenda item in steel-consuming sectors in Türkiye**: In steel-using sectors (construction-infrastructure, automotive, white goods, machinery, etc.), practices for using low-carbon steel have not yet developed. This is not only due to consumer preferences but also to the absence, at the national level, of a clear definition of low-carbon steel, technical standards, and policy tools—either incentive-based or mandatory—that would drive sectoral demand. This demand-side gap limits the sector's overall transformation. Without a guiding policy framework for low-carbon products, the domestic market is unlikely to play a catalytic role in this transition.

8. **Fossil fuel-based electricity generation increases the steel sector's indirect emissions and hinders progress toward decarbonization targets**: Türkiye's heavy reliance on fossil fuels for electricity generation is a fundamental structural barrier to low-carbon steel production. This dependence causes high indirect (Scope 2) greenhouse gas emissions for the steel sector and makes it more difficult to achieve emissions reduction targets. In addition to publicly owned fossil fuel-fired power plants, some large steel producers own imported coal- and natural gas-fired power plants, which further increase the sector's carbon footprint. This situation clearly demonstrates the need for synchronized transformation between energy and industrial policies.

9. **The supply of steel scrap—the primary input for Türkiye's steel production—is highly import-dependent; informality is widespread in the domestic market, and scrap waste management is inadequate**: Although Türkiye's scrap-based steel production capacity offers a significant potential advantage for greenhouse gas reductions, this advantage is limited by high import dependency and structural problems in the domestic market. With 70–75% of scrap supply dependent on imports, risks are heightened by uncertainties in global supply chains and declining quality of imported scrap. Domestically, the inability to separate scrap at the source, the mixing of clean and contaminated scrap, lack of quality control, and the absence of traceability systems reduce sectoral efficiency. Moreover, informality is widespread in the scrap industry, and there are serious weaknesses in occupational health and safety and environmental management. These issues undermine the environmental benefits of scrap use.

10. **Producers' local-level social legitimacy and, more broadly, industry–society relations are weak**: In many residential areas where steel production facilities are located, relationships between producers and local communities are weak, communication channels are limited, and power dynamics are asymmetrical. This makes it difficult to manage environmental and social impacts. Under these conditions, it is likely that the sector's transformation goals will struggle to progress with public support and local ownership. Strengthening social legitimacy requires structural steps based on transparency, accountability, and democratic local participation in decision-making processes.

10 KEY POLICY RECOMMENDATIONS

1. **A national restructuring and modernization plan should be prepared for the steel sector:** A comprehensive national transformation plan is needed to shift the steel sector from resource-intensive, low value-added production to high value-added production models that reduce environmental and social costs. This plan should address plant-level modernization, technology transitions, compliance with environmental standards, and social impacts in an integrated approach. It is recommended that this national plan be designed based on the halted National Restructuring Plan negotiations within the framework of the Türkiye–European Coal and Steel Community (ECSC) Free Trade Agreement. Conducting the process in a participatory and transparent manner that considers the legitimate demands of industry representatives and social and environmental costs is crucial for the effectiveness and sustainability of the transformation plan.

2. **Develop a multi-actor, supply chain-focused responsibility framework for sectoral transformation:** The decarbonization of the steel sector requires a systemic transformation that involves not only crude steel producers but also supplier sectors such as raw materials, energy, and logistics, as well as industries using steel in final products and public authorities. Therefore, a multi-actor, holistic responsibility framework covering all links in the input, service, production, and consumption chain should be established.

3. **Review climate policy architecture and institutional responsibilities in the public sector:** To effectively support the steel sector's decarbonization, a planned, binding, and sector-focused climate policy architecture and institutional infrastructure should be established to ensure the alignment of environmental, industrial, and energy policies. New roles and responsibilities should be created for greenhouse gas reduction in the energy and industrial sectors, and existing governance structures strengthened. In this context, the timetable, sectoral obligations, and monitoring mechanisms for implementing the preferred emissions trading system for industrial and energy sector emissions should be clarified, and permanent governance structures created to strengthen coordination among relevant institutions. Strengthening institutional capacity will play a decisive role not only in the steel sector but also in the low-carbon transformation of emission-intensive sectors.

4. **Establish an Industrial Decarbonization Policy and Roadmap and an industry carbon budget:** A legally grounded Industrial Decarbonization Policy and Roadmap covering all industrial sectors, including steel, should be established to guide decarbonization. The roadmap should include mechanisms to reduce sectoral greenhouse gas emissions according to defined targets and clearly define critical parameters such as the annual carbon budget for the steel sector, peak emission year, and 2030 and 2050 targets. Industrial and energy sector growth planning should align with this carbon budget. The Climate Law should incorporate this approach to provide a binding framework for the low-carbon transformation of industry. Such planning will ensure coherence not only in emissions reduction but also in industrial and employment policies to meet emerging technology and skill needs.

5. **Establish an integrated environmental permitting and information system and legally enforce best available techniques (BAT):** To effectively control the environmental impact of high-polluting industrial facilities, the current environmental permitting system should be comprehensively revised and an integrated environmental permitting and information system implemented. To enable the effective application of the BAT as foreseen in the EU IED, the institutional scope of the integrated permitting system should be expanded, and a multi-stakeholder governance structure established. For system implementation, institutional and technical infrastructure should be developed, and a legal framework should clarify roles and responsibilities for institutions beyond the Ministry of Environment, Urbanization, and Climate Change, including the Ministry of Industry and Technology and the Ministry of Energy and Natural Resources.

   The new system should aim for full compliance with EU IED standards and include mechanisms that mandate the application of BAT. Additionally, data collected in the national Pollutant Release and Transfer Registry (TR-PRTR – kstk.gov.tr) should be made publicly accessible to allow access to industrial emissions information and provide competitive advantage to facilities with high environmental performance. A publicly accessible industrial pollutant information system would act as a lever to prevent/reduce emissions and accelerate the transition to energy/resource-efficient production.

   For the system to function successfully, not only environmental authorities but also public institutions with responsibilities in the energy and industrial sectors should participate. Governance structures should clearly define institutional roles and establish mechanisms to ensure coordination. A planned human resource strategy should increase the number of competent technical personnel to ensure technical capacity.

   Finally, to align with the EU Eco-Design Regulation, which focuses on product-based environmental performance and best available techniques, institutional structures and regulatory tools should be established to reduce environmental impacts throughout the product life cycle.

6. **Establish a multi-stakeholder platform to guide industrial decarbonization and link public support to commitments:** The public sector, in cooperation with the private sector, unions, and NGOs, should establish a multi-stakeholder Industrial Decarbonization Platform to strategically guide the industrial decarbonization process. The platform should enable policy development and monitoring of the transition. Public support mechanisms, such as investment and technology funds, should be linked to concrete greenhouse gas reduction commitments by producers, ensuring strategic use of public resources while advancing the transformation with transparency and accountability.

7. **Develop a national definition, metrics, and standardization system for low-carbon steel:** To promote low-carbon production and ensure market trust, the concept of low-carbon steel should be legally and technically defined. Demand-side instruments, such as green public procurement, sectoral supply chain policies, and labeling, should increase demand for low-carbon steel, enabling

producers to differentiate products in the market and accelerating the overall sectoral transformation.

8. **Define a reduction target for electricity generation GHG emission factor (kgCO_2e/kWh) and align the energy transition with industrial climate goals:** A key prerequisite for low-carbon steel production in Turkey is reducing the carbon intensity of electricity generation. A national target for reducing electricity generation emissions factors should be established, ensuring alignment between the energy transition and industrial decarbonization goals. Both publicly owned fossil fuel-fired power plants and steel producers' own energy portfolios should be included in the transition. The energy transition program should support steel producers' shift from fossil-based energy to renewables, incentivized through financial and regulatory instruments.

9. **Develop a comprehensive transformation program for scrap management to strengthen worker health, environmental management, quality, traceability, and supply security:** A transformation-modernization program should improve occupational health and environmental standards in the scrap market. Mechanisms to reduce informality and enhance monitoring and enforcement capacities should be implemented. A national scrap inventory should be developed to improve supply security, quality classification standards for different scrap types should be established, and a national monitoring system should be implemented. The scrap monitoring system will enable quality control and environmental management oversight.

10. **Introduce mandatory GHG reduction targets for crude steel producers, define a common calculation methodology, and establish a publicly accessible GHG information system:** To make the steel sector's decarbonization transparent, traceable, and accountable, crude steel producers should be required to set mandatory GHG reduction targets. A common sector-wide GHG calculation methodology should be developed, and all producers should report according to this methodology. A national GHG information system should be established to publicly share, monitor, and verify emissions data. This system should integrate with the national PRTR and include infrastructure for Environmental Product Declarations covering life cycle emissions of steel products. The system will support the national emissions trading scheme, enable sector benchmarking, promote demand-side policies (e.g., green public procurement, private sector purchasing preferences), and reduce the risk of greenwashing.

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