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**Nemzetközi tudományos konferencia
a Magyar Tudomány Ünnepe alkalmából**
International Scientific Conference
on the Occasion of the Hungarian Science Festival

Sopron, 2025. november 6.
6 November 2025, Sopron

**FEJLŐDÉSI PÁLYÁK ÉS ÚJ TÖRÉSVONALAK A
FENNTARTHATÓSÁGI ÁTMENET IDŐSZAKÁBAN**

DEVELOPMENT TRAJECTORIES AND NEW DIVIDES IN TIMES OF SUSTAINABILITY TRANSITIONS

Szerkesztők / Editors:

RESPERGER Richárd, SZÉLES Zsuzsanna, TÓTH Balázs István

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CONFERENCE PROCEEDINGS

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Szerkesztők / Editors:

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Organizational Theory in the Context of Climate Change and Potential Application for the Green Transition of the Iron and Steel Industry

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Abstract:

The paper presents a review of various organisation theories used in relation to climate change and businesses within the scope of the research on the green transition of the Hungarian iron and steel industry. The steel industry is a vital sector within the global economy; however, the industry is accountable for over 7% greenhouse gas emissions globally. With net zero pledges a detailed analysis of the sector from an organisational theory lens can play a crucial role in the green transformation by providing frameworks and strategies for existing or new organisations. The study provides a general overview about organisation theory and theories used in relation to climate change and green transition of industries via literature review involving a thorough search and critical evaluation of existing research. The combination of organisational environment and stakeholder theory have been identified as a theoretical basis for developing a potential methodology to support strategic, responsible and sustainable decisions for the decarbonization of the sector. To identify the suitable performance metrics of the analysis will be part of further research.

Keywords: iron and steel industry, organisation theory, environment, stakeholders

JEL Codes: L61, M14, Q56

1. Introduction

The steel is an essential material to modern life, and the steel industry is a vital sector within the global economy, serving as the basis for various other industries such as construction, automotive, infrastructure, and manufacturing. From an environmental perspective the iron and steel industry is accountable for over 7% of worldwide greenhouse gas emissions and it has the largest CO₂ emissions among the heavy industries. With net-zero pledges organisations in the industry need to go major transformation in order to reduce emission, while emphasise on the achievement of strategic goal such as staying competitive in the transforming market and optimizing financial performance.

Organisation theories have been used in the research of effect of climate change on businesses and therefore similar theories can play a crucial role in the green transition by providing frameworks and strategies during the transition of existing or new organisations in the iron and steel industry.

2. Objective of the Study and Research Methodology

As part of the research of the green transition of the Hungarian steel industry, the aim of the study is to review various organisation theories used in relation to climate change, green transition and business. By reviewing previous studies, it can offer opportunities to determine and identify a suitable model which can be later applied for the research of the topic.

So, the objectives of this study are:

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- Give a general overview about organisation theory.
- Provide an overview of theories used in relation to climate change and green transition of industries.
- Provide a potential methodology to be used in the research of the green transition of the Hungarian steel industry.

The literature review involved a thorough search and critical evaluation of existing research. The data for the study is secondary including a diverse range of sources, including scientific papers, journals, publications from databases like Google Scholar and ScienceDirect, books from various online platforms. The main keywords were "organisation theory and climate change and/or green transition" but related phrases, synonyms, and variations were also employed to ensure a comprehensive exploration of relevant information.

3. Steel sector and Environmental Considerations

Steel is an alloy of iron and carbon containing less than 2% carbon and other elements. Iron has a long history by ancient civilization utilizing it for centuries and since the Industrial Revolution it became the foundation of human development. The steel is an essential material in the world to modern life, and the steel industry is a vital sector within the global economy, serving as the basis for various other industries such as construction, automotive, infrastructure, and manufacturing.

While steel remains a crucial component in the transition to decarbonization with its essential role in various technologies, such as electric vehicles and wind turbines; the iron and steel industry is accountable for over 7% of worldwide greenhouse gas emissions (*Figure 1*). The sector has the largest CO₂ emissions among the heavy industries, and second in terms of energy consumption. The iron and steel industry considered to be hard-to-abate sector, because of the nature of the energy-intensive process and fossil fuel, makes it difficult to achieve significant reduction with current technologies (International Renewable Energy Agency [IRENA], 2024; Kumar et al., 2024).

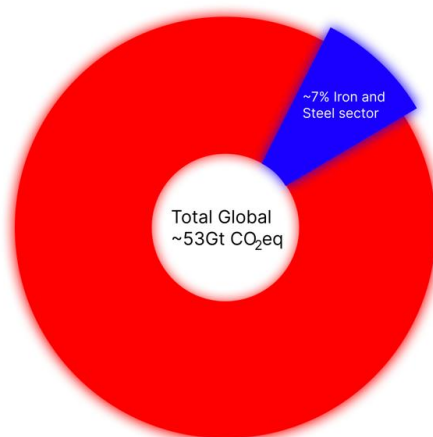


Figure 1: Total Global GHG Emission and the Iron and Steel Sector Proportion, 2023

Source: International Energy Agency (2024)

Based on Worldsteel data the CO₂ emission of the steel industry was around 3.6 billion tonnes in 2023. Without any changes the emission figure could increase to around 4.8 billion tonnes of CO₂ in 2050 with the increased production to meet the estimated demand. The required change in CO₂ reduction is approximately 90% for the steel industry to meet committed emission level by Paris Agreement in 2050 (OECD, 2022). Consequently, the industry needs to go major transformation in other to reduce emission which require careful planning and strategic implementation.

4. History of Organisation Theory

Organisations are extremely complex social formations, where the individual theories have specific approaches and aspects, highlighting certain characteristics and relationships while ignoring other elements (Veresné Somosi, 2013). Before the industrial age there was not much written about organisations, but after there was an interest in how to design and manage organisation in order to improve productivity and also to explore the role of an organisation in the changing society. Researching these changes on economic and social life by political-economists and organisational sociologists the field of organisational theory had been created (Hatch, 2013).

There were and are various inspirations to different perspectives of organisational theory beyond economic, engineering, sociology and political science. The field also got influenced by biology-ecology, social psychology, cultural anthropology, folklore studies, linguistics, semiotics, hermeneutics, postmodern architecture, post structural philosophy, literary theory, cultural studies etc. (Hatch, 2013; Sarkis et al., 2011).

The organisation theories are merged into leadership theories; therefore, their historical development shows many similarities. The development of theories parallels the increase in the complexity, modernity and scope of industrial production and corporate activity. While initially researchers' attention was on technical and organisational factors of management, that is gradually shifted to human factor. Later, the scientific approach and the systems perspective became dominant (Veresné Somosi, 2013).

In the 1950s organisation theorist started to define organisational environment. The idea was that compared to management theorist who treated the organisation as their internal operation is only management concern; the organisation is a part of the supersystem of organisational environment, and it became of the study how the organisation is related to their environment. It offered a wider approach compared to organisational and management approaches which were detached from the prevailing social and political perspective (Hatch, 2013; Wittneben et al., 2009).

5. Organisation theories and climate change

While climate change is associated with the diverse set of environment impacts, global warming strongly is associated with concept of greenhouse effects and human causes (Unter et al., 2024). The greenhouse effect is caused by greenhouse gases (GHGs) that trap heat in the atmosphere. This effect keeps the planet temperature in the range where life is supported, but enhanced greenhouse effect causes global warming. Changes in temperature can change weather patterns, natural systems causing climate change. Climate change presents the inhabitants of Earth with major environmental risks, and it also alters the organisational landscape with direct and indirect impact on the economy, culture and politics (Wittneben et al., 2009).

The terms climate change and global warming are often used interchangeably, and this approach will be applied in this study too. Businesses can significantly affected by climate change (Kolk & Pinkse, 2007). Whereas changes in weather can have direct impact on businesses and their supply chain, on the other hand the organisation will be affected for example by new regulations, ethics, social activism, and innovation of new technologies in order to decrease carbon footprint to mitigate climate impact (Furlan Matos Alves et al., 2017).

Since the Kyoto Protocol came into force (2005) companies appeared to be prone to face carbon regulations, however it was found in research a couple of years later that the relation between management/organisation theories and climate change had not been widely examined for various reasons such as institutional, political and theoretical (Daddi et al., 2018; Goodall, 2008). Others argue that the climate change received little consideration by organisation research, because it is highly uncertain and difficult to predict (Winn et al., 2011).

Early research of climate change and businesses are focussed on various issues such as corporate involvement (Levy & Egan, 2003; Newell & Paterson, 1998), social responsibility strategies (Banerjee, 2008; van den Hove et al., 2002), market and strategic dimensions (Kolk & Pinkse, 2005; Weinhofer & Hoffmann, 2010) and the physical impact of climate change on businesses (Hoffman, 2007; Linnenluecke et al., 2013).

Some researchers later argued though, that the traditional organisational approaches to address climate change, such as risk management, technological innovation, entrepreneurship and corporate social responsibility were not appropriate and innovative theoretical approach would be required (Daddi et al., 2018; Goodall, 2008; Wittneben et al., 2009).

The studies related to the topic can be categorized by the unit of analysis - individual level, organisation level and institutional level. *Figure 2* shows multi-level approach levels of the various studies.

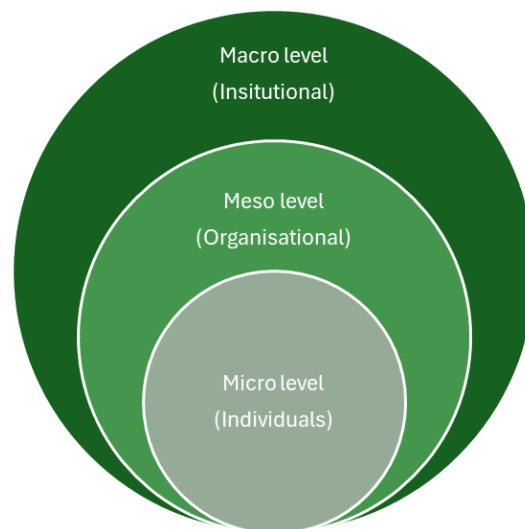


Figure 2: Multi-Level Approach for Organisation Theories and Climate Change

Source: Based on Gonzalez-Porras et al. (2021)

Theories used on individual level are focusing on green consumption, climate-friendly behaviour and climate adaptation (Daddi et al., 2018). However, these approaches are suppresses numerous important relationships for climate strategy (Wittneben et al., 2009).

Research on the organisation level focuses on internal culture and structure of organisations and investigates how organisations respond to climate pressure referring to corporate strategies, governance structure and sustainability practices. There can be a link between meso and macro level, for example coercive pressures (i.e., regulations, laws) from institutional level influencing organisations to address climate issues on a meso-level (Daddi et al., 2018; Galbreath, 2010; Zhang & Welch, 2023).

Research on institutional level investigates organization relationship to policy level and/or among the network of stakeholders relationships (Daddi et al., 2018). The studies examines corporate responses to external policies, norms and rules (Jeswani et al., 2008), strategic behaviour to climate change mitigation programs (Brouhle & Harrington, 2009), stakeholders pressure, other than policy and influence of environmental strategy (Hasan & Chen, 2025).

In general, organisations face the same challenges concerning climate change and green transition. The iron and steel industry encounter increasing pressure by governments via various policies, regulatory frameworks, and by shareholder, other stakeholders to reduce their CO₂ emissions. Therefore, a border overview and analysis how the organisation act in this changing environment to accomplish its strategic goals is valuable. Therefore, the proposed research should focus on external factors which has system wide influence across the sectors and additionally direct influence on organisations in the sector.

6. Review of theories used in use in relation to climate change and green transition

Although, direct application of organisational theories to climate change is still emerging, there are several literature reviews already examining the topic from various perspectives, such as Berkhout (2012), Linnenluecke et al. (2013), Marco Daddi et al. (2018), Juan Sebastián Díaz Tautiva et al. (2024), Tobias Hahn et al. (2015), and Unter et al. (2024).

The review studies found that the most used organisational environment theories on the macro level for the topic are the institutional theory and complexity theory. Besides organisational environmental theories, stakeholder theory, game theory, prospect theory and transaction costs were applied in various studies (*Table 1*). These theories emphasize on the importance of considering various stakeholders, how individuals and organisations make decisions or consider the costs associated with organisational activities and being selected for further review.

Table 1: Applied Theories on Macro-Level

Organisational Theory	Main Concept
Institutional theory	Organisational behaviour and structure are influenced by social norms, values, and cultural expectations; meaning, that a business also depends upon the acceptance of the societies. (DiMaggio & Powell, 1983; Hatch, 2013)
Complexity theory	Unites the unpredictability of nonlinear systems with structure and offers an understanding of how system grow, adapt, and evolve. (Doğru, 2015; Sammut-Bonnici, 2015; Uotila & Morrell, 2025)
Stakeholder theory	Instead of the organisations consider only shareholders interest, they should consider all stakeholders to achieve long-term success. (Freeman, 2010)
Game theory	This decision-making theory is a crucial analytical tool for understanding behaviours in situations and focuses on understanding the relationships that are made and broken during conflict and cooperation. (Akorede et al., 2021; Kelly, n.d.)
Prospect theory	Analysis of decision -making process, assuming that individuals or organisations make decisions rationally and making deliberate choices based on choices between uncertain alternatives. (Barberis, 2013; Kahneman & Tversky, 1979)
Transaction costs theory	The transaction is the basic unit of the analysis, and the emphasis is on the effort, resources and costs involved. Businesses should not reduce the number of transactions, but to minimize the cost of carrying them out. (de Camargo Fiorini et al., 2018; Mohn, Elizabeth, 2023)

Source: Own compilation

6.1. Institutional theory (and New Institutional Theory)

The institutional theory argues that organisational behaviour and structure are influenced by social norms, values, and cultural expectations; meaning, that a business also depends upon the acceptance of the societies (DiMaggio & Powell, 1983; Hatch, 2013).

The demands on organisations by the environments can be distinguish in two ways:

- technical, economic, and physical demands that require organisations to produce and exchange their goods and services in a market,
- social, cultural, legal, or political demands that require organisations to engage roles in society and to begin and continue certain external appearances (DiMaggio & Powell, 1983; Hatch, 2013).

In relation to climate change institutional theory could provide insights into how socially embedded actors, such as policymakers, competitors, NGOs (non-governmental organisations), industries, climate scientists, etc. can be motivated and encouraged to participate in a collective cause (Ansari et al., 2011; Wittneben et al., 2009).

Neo-institutionalists describe the processes well beyond acknowledging institutional foundations and expands the focus to include informal institutions, such as norms, values and cultural beliefs (Hatch, 2013).

Powell and DiMaggio identified three different institutional pressure mechanism:

- coercive: pressure to conform with governmental regulations or laws,
- normative: pressure to conform with cultural expectations (education, religious belief),
- mimetic: pressure to conform in service by looking like a successful organisation (DiMaggio & Powell, 1983).

Conforming to institutionalized expectations gains social support and ensures legitimacy which improves the possibilities for an organisation's survival (Hatch, 2013).

6.2. Complexity theory

According to traditional organisational theory, the organisations predict and stay in control to avoid chaos. The chaos theory emphasizes the unpredictable and nonlinear nature of organisational change (Thiétart & Forgues, 1995). While chaos and complexity theory, both unites the unpredictability of nonlinear systems with structure, the complexity theory offers an understanding of how system grow, adapt, and evolve (Doğru, 2015; Sammut-Bonnici, 2015; Uotila & Morrell, 2025)

The theory emphasizes on how system relates to its environment, among business units within a global company, or between corporations and regulators. (Sammut-Bonnici, 2015) The key components of complex systems are summarized in *Table 2*.

Table 2: The key components of complex systems

Component	Description
Increasing returns	A form of positive feedback
Self-organizing system	Starting with a few simple rules for individuals, which create a flowing complex system and can be applied for supply-demand, pricing strategy, purchasing decision
Continuous adaptation	A feedback loop of modifying behaviour to the situation of other components in the environment
Sensitivity to initial conditions	Two organisations starting out in similar, but are not essentially identical environment, and because the units within the system

Component	Description
	cooperate and adapt to each other, they will create completely different scenarios,
Nonlinearity	Certain inputs will have a disproportionately strong effect on others

Source: Own editing based on Sammut-Bonnici (2015)

Complexity theory emphasizes the limits to predictability and highlights the need for continuously re-evaluate the appropriateness of existing climate policies against the evolving realities, changing circumstances. Complexity theory may also provide insights into the emergence of regional or global industry standards for green technologies (Ansari et al., 2011).

6.3. Stakeholder theory

Freeman laid the foundation for Stakeholder Theory with his book of Strategic Management: A Stakeholder Approach in 1984. He highlighted that instead of the organisations consider only shareholders interest (shareholders theory of capitalism by Friedman), they should consider all stakeholders to achieve long-term success. Freeman defines the stakeholders as individuals or groups that can affect or be affected by the organisation objectives. All stakeholders have a right to the companies' outcomes as they are all operated via a social contract with society (Freeman, 2010).



Figure 3: The original stakeholder model

Source: Own editing based on Mishra & Mishra (2013)

Stakeholder theory is even more important in the new global economy. Ethical obligation of organisations is to consider their impact on the wider social and physical environments, and they can do it via environmental sustainability and corporate social responsibility. While only few studies have implicitly considered stakeholder theory with environmental issues that can influence firms' competitiveness, but adding environmental aspect can help corporations reduce their impact on the environment and improve corporate environmental performance (Salem et al., 2016).

In terms of sustainability and stakeholder engagement the stakeholder pressures can aid companies to engage in more environmentally friendly production in order to improve reputation, environmental performance (Salem et al., 2016). Unlike traditional investment approaches with sustainable investment value can be created for broader range of stakeholders (Habib et al., 2025). The stakeholders' collaborative relationships and interactions based on communication, resource sharing and shared interests, are the key component in stakeholder engagement to accelerate sustainability transitions (Gonzalez-Porrás et al., 2021).

6.4. Game theory

As subdiscipline of applied mathematics, economics, and social science, game theory emerged in the publication of *Theory of Games and Economic Behaviour* by John von Neumann and Oskar Morgenstern in 1944 (Akorede et al., 2021). After extensive reviews, the theory was developed in the 1950s primarily by A. W. Tucker and his students and used for analysing strategic interactions among decision-makers (Science Encyclopedia, n.d.). More special attention was paid for the theory after in 1994 John F. Nash, John C. Harsanyi and Reinhard Selten, game theorists won the Nobel price (Akorede et al., 2021).

In simple terms, game theory is the study of how and why people make decision (Srinivasan, 2017). This decision-making theory is a crucial analytical tool for understanding behaviours in situations and focuses on understanding the relationships that are made and broken during conflict and cooperation (Akorede et al., 2021; Kelly, n.d.). The concept applies when decision-makers are interdependent who are aiming to maximize their outcomes in scenarios of conflicting interests (Akorede et al., 2021; Savaşkan et al., 2025).

Tucker idea of prisoner's dilemma demonstrates the difficulties that arise in two-person noncooperative variable-sum games. Prisoner's dilemma is an intriguing hypothetical problem, where players act unselfishly and cooperation gives the best results (Brams & Davis, 2025).

The main elements of game theory are:

- the actors: players, the decision-makers,
- the actions: their strategies,
- the payoff: the outcomes which result from the combination of actions by different actors, and the positive or negative utility in each outcome (Bekius & Gomes, 2023).

The elements of the game can be represented as game trees, graph models or characteristic functions; the purpose of these is to examine non-cooperative or cooperative situations. The outcomes can be identified by solution concepts such as (Bekius & Gomes, 2023):

- Pareto optimal: An outcome where it is impossible to make any player better off without making at least one player worse off.
- Nash equilibrium: outcome in a noncooperative game for two or more players, where player's expected payoff can be improved by changing one's own strategy (Eldridge, 2025).
- Core: set of feasible allocations in a cooperative game where no coalition can obtain a better outcome on their own than by sticking to the proposed allocation.
- Shapley value: helps in determining the fair distribution of outcome among players, based on how much they contributed individually to the total value created by the coalition.
- Nucleolus: finds a stable allocation of payoffs among players in a coalition by minimizing the dissatisfaction of all coalitions (Fiveable, n.d.).

The game theory not just applied in economics and management, but further in accounting, biology, finance, law and politics. Environmental issues require actions at a global scale and game theory can help understand the actors' strategic considerations and their interrelationships considering each preference and provide the possible outcomes (Daddi et al., 2018).

The theory was found to investigate international environmental agreements, effect of carbon tax and tariff on companies (Daddi et al., 2018). It also used to investigate behavioural

strategies, strategy optimization in relation to decarbonization and but most recently to analyse green finance, green innovations (Bai & Lin, 2024), low-carbon transition pathways (Tian & Sun, 2022) and find ways to help cooperation between states (Kyuregyan & Baghdasaryan, 2025). Game theory was also used in the combination with fuzzy multi-criteria decision-making to model the complex decision-making processes in energy and environmental management (Savaşkan et al., 2025).

Most recently evolutionary game theory (EGT) has been used as a new research approach based on the traditional game theory in order to investigate sustainable energy development. While traditional theory is based on the complete rationality of human, evolutionary game theory believes that the human rationality is limited. The theory considers more complex initial conditions and influential factors and verifications feasibilities (Wang et al., 2022).

6.5. Prospect theory

The prospect theory was published by Kahneman and Tversky in 1979. It is an alternative theory to utility theory. Both theories are widely applied in behavioural economics. Economic behaviour highlights that people have cognitive limitations and sometime they make irrational decisions, also that social approval and status are their main motivations (Brekke & Johansson-Stenman, 2008).

While both theories analyse decision -making process, utility theory assumes that individuals or organisations make decisions rationally and prospect theory shows that individuals making deliberate choices based on choices between uncertain alternatives (Barberis, 2013; Kahneman & Tversky, 1979). The outcomes can be outlined as gains or losses which influence a person to accept or reject risk. The theory also suggests that people are more sensible to potential losses than equivalent gains (Bendor, 2010).

While in most research, prospect theory is used to determine demand for insurance coverage against climate impacts and natural disasters, others analyse mitigation and adaptation of climate change (Osberghaus, 2017), and influence on climate policies and international negotiation (Brekke & Johansson-Stenman, 2008). Taking into considerations offered by prospect theory can help to design more suitable climate policies (Osberghaus, 2017).

6.6. Transaction costs theory

Transaction cost theory is originated from Ronald Coase: The Nature of the Firm paper. The study examines the costs associated with economic transactions (Coase, 1937). Later the theory was further developed by Oliver E. Williamson applying it to various aspects of organisational economics (Mohn, Elizabeth, 2023).

The theory considers transaction as the basic unit and emphasize on the two parties' effort, resources and cost of the transaction (de Camargo Fiorini et al., 2018). The transaction cost is the costs beyond the cost of the product or service needed to facilitate the exchange between two entities (Sarkis et al., 2011). Businesses should limit the number of transactions in order to minimize the transaction cost. Three types of transaction costs were identified, such as search and information costs, bargaining costs and policing costs (Mohn, Elizabeth, 2023).

The theory plays a key role in environmental policies since the early 1990s.(Garrick et al., 2013) It is used to address insurance systems, carbon trades, emission market, investment decisions on GHG reducing projects, intellectual property rights on the transfer of environmental technologies in the context of climate change, but also applied for renewable energy companies (Bohnerth, n.d.; Daddi et al., 2018; Godoy et al., 2014).

Transaction Cost approach also used in the research of the transformation of a firm from linear to circular economy. The linear business model is obsolete and will not solve future environmental challenges. It was found that the theory is a constructive approach to the analysis of the strategic formation of institutional structures (Nygaard, 2022).

7. Proposed methodology for the Iron and Steel Industry

Several organisational theories could provide a suitable framework for studying the green transition of the steel industry. The issue is complex, while GHG emission is a physical problem requires technical solution, there are also the social, cultural and political elements. The organisation needs to rethink not just its technology but deal with cultural change and rethink or develop a suitable competitive strategy besides the economic motivation.

Therefore, combination of approaches would be necessary to reconcile economic development, environmental protection and well-being of human population (Ansari et al., 2011). Climate innovations, development of technologies and applications to control, reduce, or eliminate GHG emissions, not only help to mitigate environmental uncertainty but similarly to capture economic opportunities (Genin & Bu, 2025; Levin & Steer, 2021).

Organisation environment can give a context about how the organisation is related to their environment which they are operate, identifying risk and opportunities. On the other hand, shareholders theory offers a framework to navigate the organisation’s environment strategically. *Figure 4* shows theoretical basis the combination of organisation environment theory forces including social perspective with the stakeholders of the green transition.

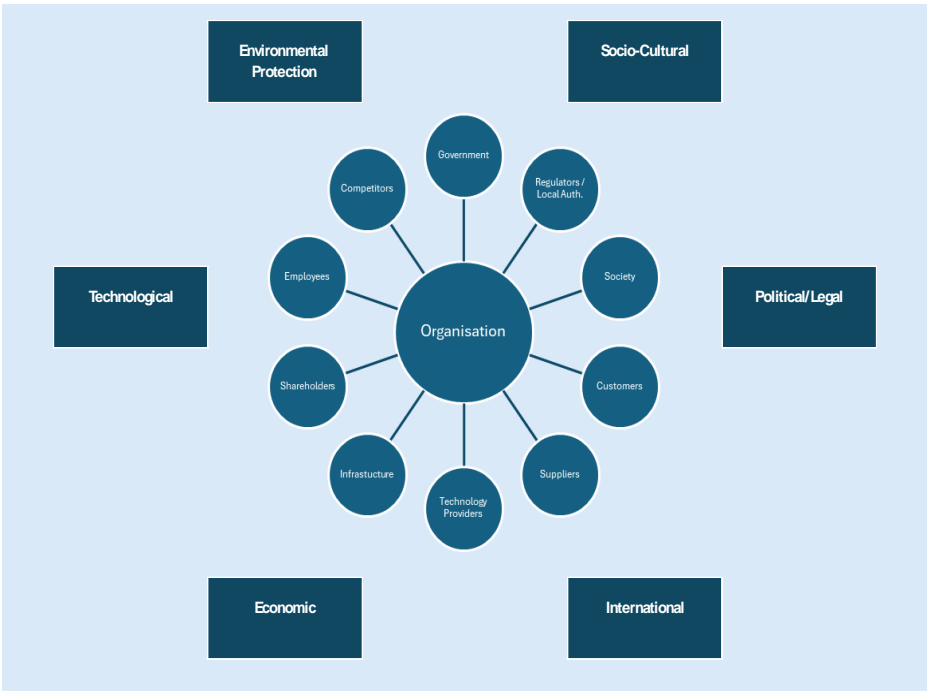


Figure 4: Organisation Theory Forces and Stakeholders

Source: Own editing based on Hatch (2013), Jones (2021) and Mosca (2018)

Table 3 summarizes the sectors of the organisational environment, various stakeholders and their relation to organisations operating in the iron and steel industry. With detailed analysis of the sectors of the environment, stakeholder perspective and their interests in organisational decision-making and behaviour, can provide framework and strategy for the transition of existing or new organisations in the industry identifying responsibilities and expectations.

Table 3: Organisation Theory and Stakeholders of the Green Transition of the Iron and Steel Industry

Organisational Environment Forces	Stakeholders	Iron and Steel Industry
Social-Cultural	Society Customers	Changing consumer trends Cultural views
Environmental Protection	Government Regulators Public Pressure Groups	Climate Change Energy consumption Circular Economy Sustainability
Political/Legal	Government Local Authorities	Government policies and regulations International treaties Environmental Laws Carbon Trade/Taxes
International	Customers Competitors	International collaboration Joint ventures, integrations
Technological	Technology providers Infrastructure providers Governments Shareholders Investors	Research and development technologies
Economic	Employees Governments Customers Suppliers Competitors	Economic growth Prices and availability of resources

Source: Own editing based on Elekes (2014), Hatch (2013) and Jones (2021)

7.1. Social-Cultural Factors

In terms of socio-cultural views, the steel industry is associated with smog, fumes and pollution and with the rise of climate concerns, customers becoming more aware of their purchases and that is changing consumer preferences. The industry needs to overcome the perception from the past as there are lots of green technologies and emphasize on eco-friendliness and social responsibility.

Changing customer requirements and growing demand for carbon-friendly steel products can be observed already in various downstream industries, therefore steel producers need to promote sustainability in their operations to appeal responsible, environmentally conscious to customers. The customers demand products that are produced sustainably and ethically with the possibility to recognise the value of green steel products. The iron and steel industry needs to be responsive to these changing trends, as these customers are willing to pay for decarbonization through “green premiums” and it can drive the shift to more sustainable production technologies (McKinsey, 2020; Blanco Perez et al., 2025).

7.2. Environmental Protection Factors

From the point of environment protection, the most important force is climate change. Governments set national policies in line with international agreements; the regulators enforce the laws and monitor compliance while public pressure groups push for accountability.

Iron and steel production facilities consume significant energy, both in electricity and fuel, contributing to greenhouse gas emissions, approximately 7% on global level. If iron is produced via traditional process which is a carbo-thermic reduction, that creates the highest level of CO₂ emission of the sector. Electric Arc Furnaces', the other main production technology, CO₂ emission is mainly indirect, related to the electricity emission which is used in the process.

Steel producers must reduce their CO₂ emission and energy consumption by adopting or further improve energy-efficient processes, using renewable energy sources, and investing in low-carbon and energy-efficient equipment, technologies (WEF, 2014). The change is driven by companies setting greenhouse gas emission reduction targets for 2030 and for later for achieving Net-zero carbon emission, in line with climate commitments.

Although steel one of the most recycled materials, there is still improvement for steel companies to adopt the principles of the circular economy. With legislation by promoting the reuse, recycling, and remanufacturing of steel products and by-products, could help to minimize waste generation, conserve resources, and reduce the environmental footprint of the steel industry.

Sustainability should be integrated into long-term planning of governments to ensure that local steel production meets the needs of the present without compromising the ability of future generations. The steel companies need to balance economic viability, environmental and social responsibility to create value for society while minimizing negative impacts on the planet. Regulators could enforce ESG disclosures, sustainability reporting, while public pressure groups could raise awareness and highlight issues with greenwashing.

7.3. Political/Legal Factors

From political and legal aspects legal frameworks, policies and regulations being set by governments worldwide and implemented to protect the environment, promote worker safety, and ensure fair trade practices. The compliance with laws and regulations create significant challenges for the steel industry.

Due to regulations by local authorities, producers can be subject to numerous local rules, environmental regulations, in addition to GHG-emissions, disposal of hazardous materials and waste depending on location. Significant legal liability, fines, and other penalties can be imposed if they fail to comply with these regulations. Steel producers must also consider the potential impact of their operations on the environment and take steps to mitigate any negative effects.

More policies on GHG gas emission introduced in various countries, such as carbon taxes and Emissions Trading Systems. Until recently, only 24% of the global GHG emission is covered by Emissions Trading Systems (ETS) or carbon taxes, but the largest producer of steel, China is in the process of introducing a national carbon-pricing system. USA is taking a different approach and federal carbon pricing will not be introduced (World Bank, 2023). The national action will primarily focus on regulating emissions and product standards, green procurement, and tax incentives (Voigt et al., 2022).

On of the most prominent, the EU ETS was introduced in 2005 and covers the sectors most likely to face a real risk of leakage: energy-intensive and trade-exposed industries, such as the iron and steel industry (Marcu et al., 2020). The EU has recently introduced Carbon Border Mechanism (CBAM) which is designed to tackle carbon leakage when company decides

to move their production from a country with stringent policies. CBAM will be a tariff on steel imports based on the amount of carbon embedded in the products.

Compliance with these regulations can be costly, increasing production costs and decreasing manufacturer profitability. Governments must balance protecting the public interest and not hampering the growth or even survival of businesses in steel industry.

7.4. International Factors

While customers drive global demand and shape consumption, there is no standardized definition and there is a lack of consistency in the terminologies to define “green steel,” “low-carbon steel,” or “near-zero steel” (Blanco Perez et al., 2025) This lack of universal definition also causes challenges not just for steelmakers and customers, but for regulators and investors. Therefore international coordination could serve to develop worldwide low-emission production standards to prevent greenwashing and help all stakeholders to make informed decisions (Blanco Perez et al., 2025; Fan & Friedmann, 2021).

To build international collaboration among steel businesses can help sharing information regarding technology developments. Joint venture and integration via expanding the “green” supply chain into the downstream and/or upstream operations will appeal environmentally conscious customers. Steelmakers in various countries are investigating possibilities for global green iron market, low-cost renewable energy, green hydrogen with various strategies for the competitiveness of relocations, co-locations and cooperations (Bilici et al., 2024; Cao et al., 2024; Wang et al., 2023). However, the effect can be different to iron and steel makers depending on size and location of the organisation.

7.5. Technological Factors

The main approaches to reduce GHG emission of the steel industry is to decrease steel demand, increase material efficiency, circular economy with increased steel recycling and innovation in steel production technologies (Bataille et al., 2021; Kim, 2022; IRENA, 2023; Mission Possible Partnership [MPP], 2022; World Economic Forum [WEF], 2014). Technology providers carrying out research and development in these areas to deliver innovations. Utilizing technological improvement can build on the competitive advantage.

Most of the new low-emission technologies will involve the necessary infrastructure to be developed too and made available for the installations such as renewable electricity, green hydrogen with the requirement of governmental interventions in most countries.

The new technologies, technology upgrades and the necessitated infrastructure require significant up-front capital. The operating cost will also increase for the new technologies mainly due to the significant cost differential between fossil fuels compared to alternative fuels, such as carbon-neutral biomass, low-carbon hydrogen, and zero-carbon power which will be required (Fan & Friedmann, 2021). The new technologies, however, increase efficiency, reduce resource usage and decrease emission, hence strengthening the company’s competitiveness on the long-term and allow them to comply future regulations.

7.6. Economic Factors

One of the key economic factors affecting the industry is the state of the global economy. Steel industry gets affected because of the cyclical economic conditions; many industries like automotive, appliances and construction depend on the steel industry and if industries face any downturn in the economy, steel industry can face losses (Frost & Sullivan, 2018). Whereas governments drive national economic growth, investors seek for growth opportunities and the customers drive demand, with economic upturn employees benefit from job security, suppliers benefit from increased demand for their product, but on the other hand competition intensifies.

The availability and volatility prices of raw material, energy and transportation, labour and skill shortages also influence steel producers, shape their cost and resilience for issues with supply chain. Therefore, businesses in the steel industry as it mentioned above needs to invest in efficient technologies, skill development, secure resource supply by backward integrations, joint venture, multiply suppliers which could also help to capture demand with premiums for environmental performance.

8. Summary

The study maps the main organisation theories and their applications used in research of climate change and businesses. It identified the most widely used theories for the topic as institutional theory, complexity theory stakeholder theory, game theory, prospect theory, and transaction costs.

The analysis of these theories highlights on the importance of considering the organisational environment, various stakeholders influence, individuals and organisations decisions making process, and the costs associated with organisational activities.

The combination of organisational environment and stakeholder theory have been identified to provide a theoretical basis for developing a potential methodology to support strategic, responsible and sustainable decisions for the decarbonization of the sector. The approaches emphasize the importance of considering various stakeholders and their interests in decision-making and behaviour.

The framework enables businesses to identify the key stakeholders involved, clarify responsibilities and expectations across the different dimensions of social-cultural, environmental, political/legal, international, technological, and economic forces. Businesses in steel industry need to balance how stakeholders shape the environment and what the expectations is from the company in response and integrate these expectations into long-term decarbonisation strategies. Identifying suitable performance metrics for evaluating these strategies should form part of further research.

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