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THE GREEN TRANSFORMATION OF POLISH COMPANIES - THE SPILLOVER OF GOOD GREEN PRACTICES BETWEEN INDUSTRIES IN LIGHT OF EXISTING BARRIERS AND OPPORTUNITIES

This article investigates the green transformation of Polish companies through the prism of the transfer of good practices between industries and the identification of the main barriers and opportunities accompanying this process. The aim of the study is to assess whether the specific nature of the industry influences the implementation of circular economy (CE) and ESG principles and whether there is potential for the transfer of cross-sector solutions. Based on case studies of three companies – o ArcelorMittal Poland, BALMA, and LPP – it was shown that although the activities vary across industries, many practices (e.g., decarbonization, recycling, education) are universal and can support the development of economic symbioses. The article emphasizes the importance of cross-sector cooperation as a condition for an effective green transition in Poland.

1. Introduction

In the face of the intensifying climate crisis and regulatory pressure from the European Union, more and more companies in Poland are faced with the need to implement environmentally friendly solutions. The transition to a low-carbon, resource-efficient economy is becoming not so much a choice as a requirement for competitive development in line with social expectations. However, the green

transformation of companies is not only a technological or formal adaptation – it is also a complex cultural and organizational process in which the transfer of good practices between industries plays a key role. In this context, the concept of the circular economy (CE), one of the main promoters of which is the Ellen MacArthur Foundation, takes on particular significance.

According to the model proposed by the Ellen MacArthur Foundation [4], the circular economy is based on three pillars: eliminating waste and pollution at the design stage, keeping products and materials in use for as long as possible, and regenerating natural systems. The transition to the CE model does not only apply to resource-intensive industries such as heavy industry and construction, but is also becoming possible in service and creative sectors, where material efficiency is combined with new business models [4].

In Poland, this transition varies in terms of pace, scope, and sources of motivation. As indicated by a report by the Polish Economic Institute [14], large companies, especially those participating in international supply chains, are the most active in this area. They are the ones that are quickest to implement ESG (Environmental, Social and Governance) standards, invest in energy efficiency and seek innovative solutions that fit into the GOZ model [14]. On the other hand, the SME (small and medium-sized enterprises) sector often reports financial, organizational and competence-related barriers [9].

These problems were also presented in the publication entitled 'Are the production companies in the Lodz region ready for a 'green approach' in management?' [8] on the level of readiness of manufacturing companies in Poland to implement green management practices. The assessment covered environmental awareness, environmental management tools used and barriers and motivators for the implementation of green solutions among companies in the manufacturing sector in the Lodz Province. The results of the study indicate that although the declared environmental awareness of entrepreneurs is growing, the implementation of green practices is still selective and reactive, mainly implemented under the influence of legal regulations or the expectations of foreign contractors [8]. Most of the activities carried out in the surveyed companies concerned basic aspects of environmental management, such as waste segregation and investments in energy-efficient machinery, while complex circular economy models and green process innovations were not very popular in the surveyed companies [8].

Importantly, from the perspective of the topic addressed in this study, the research does not identify active channels for the transfer of knowledge and cross-industry practices and companies often operate in specific 'sector bubbles,'

without access to knowledge transfer platforms or networking tools [8]. The study also shows that one of the factors limiting the development of green competencies is insufficient institutional support and the lack of regional policies targeting the development of green competencies in SMEs [8].

In light of the analysis of available sources, it appears that the transfer of good practices between industries is becoming increasingly important. Companies in the clothing sector (e.g., LPP) are drawing on the experience of heavy industry (e.g., ArcelorMittal Poland) in emissions management and environmental certification, while the furniture sector (e.g., BALMA) is adapting solutions known from the textile industry, such as designing for reuse and easy recycling of components [10]. The transfer of knowledge and good practices often takes place informally – through industry partnerships, industrial associations or participation in EU-funded projects [18].

It is also worth noting that although many barriers are internal (e.g., lack of resources), some of them stem from the institutional environment – regulatory instability, low financial incentives and insufficient availability of expert knowledge at the regional level [19]. On the other hand, strong factors conducive to green transition include consumer expectations, the pursuit of competitive advantages and the changing structure of the labor market, with an increasing emphasis on 'green' skills [20].

In light of the above, an analysis of the green transition of Polish companies should take into account not only the specific characteristics of individual industries but also the dynamics of cross-industry learning and adaptation of solutions. It is at the intersection of different sectors that the most innovative business models emerge, integrating a circular approach, social responsibility and new consumption models. Considering these phenomena in the context of barriers and opportunities allows for a better understanding of the conditions for the effective implementation of green transition policies in Poland.

Although the literature increasingly addresses the green transition in specific industries – e.g., heavy industry [17], construction [21] and clothing [6] – there is a lack of in-depth analyses focusing on the transfer of good practices between sectors. Most studies are vertical (i.e. sectoral) in nature, without taking into account the processes of so-called intersectoral learning or cross-sectoral spillovers which are increasingly recognized in Western research [5], [16].

Research gap: Polish literature rarely analyzes the transfer of green innovations and circular economy (CE) models between industries – e.g., from heavy industry to the service sector or from light industry to furniture manufacturing.

Therefore, this study will focus on whether the specific nature of an industry generates specific groups of actions for green transformation.

In view of the above, **the specific objective of the study is to identify the transfer of good greening practices between organizations** in light of the key barriers and opportunities for Polish business, with particular emphasis on the circular economy (CE) and ESG (Environmental, Social and Governance) strategies resulting from an analysis of available publications and reports carried out in 2022-2025, in terms of the diversity of industries present in Polish enterprises. Governance) resulting from the analysis of available publications and reports carried out in 2022-2025, in terms of the diversity of industries present in Polish enterprises.

Bearing in mind the adopted research objectives, the research will address several key research questions:

1. What do the key studies presented in the latest reports on ESG and GOZ reveal about the opportunities and barriers for the green transition of Polish companies?
2. How can the barriers and opportunities present in the surveyed companies be classified?
3. Does the specific nature of the industry generate specific groups of activities that form the core of the green transition?
4. How can the good practices of the analysed companies be transferred between companies in different industries?

In view of the above, this article will present data indicating the transfer of green practices between companies in different industries in the context of key barriers to implementation and the benefits of implementing them. These barriers and benefits will be presented in chapters 2 and 3.

2. Barriers to green transition in Poland

The transition to sustainable development and adaptation to ESG requirements pose a number of significant challenges and barriers for companies, especially for small and medium-sized enterprises (SMEs). Research conducted by the GS1 group [7] indicates that **knowledge and awareness** of sustainability reporting **requirements** in companies are low [7]. Only 6% of SMEs are familiar with ESG, and as many as 62% of the companies surveyed are not aware of the current end legal regulations on sustainable development, while 49% do not know what obligations and risks arise from the CSRD [7]. As a result, as many as

80.7% of respondents are not familiar with the principles of the digital product passport (DPP) which highlights the need for education and preparation for the implementation of the DPP [7]. This is probably due to the fact that as many as 88.1% of respondents have never participated in ESG training [7] and have not yet had any experience with ESG reporting which results in limited awareness of sustainability issues and a lack of experience.

Another problem area is **the financial barrier and high costs of transformation**. This is indicated by research conducted by the Polish ESG Association under the guidance of a team of experts from Ayming [15]. These include a lack of adequate financing – as many as 57% of Polish companies indicated this as the main obstacle to the implementation of ESG strategies [15], [8]. This is due to the fact that many companies rely on their own resources and make little use of available external support tools. They fear that the high costs of implementing ESG principles and the complexity of new regulations may negatively affect the competitiveness of their companies. Based on the data, it was found that as many as 67% of companies experience financial constraints in their ESG initiatives, with 22% considering these constraints to be significant .

Overall, in Poland, lack of funds is a serious barrier for 31% of companies, which is the highest result among all countries surveyed. German companies also report high financial burdens associated with stricter regulatory control [15]. The financial issue seems to be crucial here, as ESG implementation involves costs ranging from investments in green technologies to compliance with regulatory requirements, training and reporting.

The complexity of regulations and the lack of uniform standards are another obstacle to the implementation of CSRD reporting. Many entrepreneurs point to the complexity and rapidly changing reporting requirements [15]. They see this as the main obstacle to the implementation of ESG measures in their own companies. The situation is further exacerbated by complicated application processes and doubts about eligibility for financial support [15]. Italian companies indicate that difficulties in interpreting regulations (e.g., the transition from GRI to ESRS) are hindering progress [15].

The obstacles to the effective implementation of the green transition in companies are also the result **of a shortage of specialized personnel**, such as health and safety managers [15]. This is exacerbated by the fact that most SMEs do not have sufficient resources and financial capital to support training or the recruitment of new employees [7]. This is confirmed by research described in the oto-GOZ project which points to the existence of a skills gap, including a lack of educational

programs and a lack of resources (including financial resources) necessary to implement CE activities [11]. In addition, companies are struggling with employee skill shortages and the resulting difficulties in integrating technology [15]. Overall, as many as 21% of respondents point to the complexity of ESG issues as a key barrier, followed by 12% and 7% who cite data management problems (inconsistent indicators) and the lack of industry standards, respectively [15].

Companies point to **regulatory uncertainty and delays in the implementation of CSRD reporting** as sources of losses. Companies were forced to operate in conditions of uncertainty which increased costs and the risk of errors, partly due to the delay in the implementation of the act transposing the CSRD Directive into Polish law and the lack of clear guidelines complicated preparations and burdened teams [15].

In this situation, it is natural to point to **the lack of internal motivation and market pressure** as another barrier to the implementation of the green transition. Companies do not always see the benefits of additional measures if they are not required by law [7], [8]. Smaller companies often have different priorities – they focus on day-to-day operations and covering operating costs [15]. At the same time, entrepreneurs are unaware of the seriousness of the situation and doubt that the new regulations actually apply to them and will be so extensive [15]. Even German companies are under considerable pressure to prioritize financial results, often at the expense of sustainability goals [15].

Another obstacle to the implementation of ESG principles is **the low level of networking and cooperation in the value chain**. Companies rarely put pressure on their business partners to meet ESG standards. Only 9% of medium-sized and 15% of large companies say they always or often require their suppliers to meet ESG standards. Sustainability measures are often taken in isolation, within the internal organizational structure of the company, in isolation from other links in the value chain [14]. These are additional measures and do not form the basis for the company's strategy.

The degree of preparedness of companies for CSRD reporting is not supported by **the** existing **investment gap at the macroeconomic level**. The biggest challenge in achieving the 2030 Agenda goals is the growing investment gap in developing countries, estimated at around USD 4 trillion per year, with more than half of this gap (over USD 2 trillion) corresponding to a lack of investment in the energy sector [14]. This gap stems from **insufficient political support from governments.** Companies unanimously expect clear and consistent guidelines from governments on the path to net zero emissions [15]. As many as 77% of

companies consider a transparent climate policy to be crucial, and one in three companies indicate that success is impossible without it [15]. In Poland, companies point to the need to extend subsidies for capital expenditure on decarbonization and energy demand reduction, as well as to increase subsidies for innovation [15]. At the same time, entrepreneurs are calling on EU member states to take a proactive role in driving innovation and decarbonization processes, emphasizing that communication and financial solutions are key levers [15].

The level of development of the green economy is also not supported by **low innovation and experience** in the Polish economy. It is characterized by high emissions and energy intensity, and Polish companies have little experience in determining their own impact on the environment [14]. They also attach very little importance to innovation (SDG 9) and industrial development, considering this area to be of little importance and declaring that they have the least impact on it [14]. Most companies in Poland did not engage in innovative activities in 2020-2022 and only one-third introduced product, service, or process innovations [14].

The short-term focus of Polish entrepreneurs is identified as a barrier to the introduction of the green deal. Thinking in terms of short-term investments and decisions was the third most common barrier, identified by 14% of companies [15]. The situation is not improved by the fact that the financial services sector is struggling to reconcile high initial outlays with uncertain returns on ESG-related projects [15] which discourages green investments.

Overcoming these barriers requires a comprehensive and long-term approach, including raising awareness, providing financial and expert support, simplifying regulations and promoting cooperation across the entire value chain.

Spending funds must be commercially viable and actions must be consistent which is why 48% of the companies surveyed have set up dedicated ESG teams within their structures. These teams are most often involved in employee education and engagement, process automation and ESG risk management, including climate risk.

Based on a review of reports related to GOZ and ESG analysis and empirical research [Kukołowicz et al., 2024], [3], [15], it can be assumed that the key categories of barriers that entrepreneurs are facing and will face in the near future are:

- legislative gaps due to inconsistent regulations, constant changes and the lack of legal instruments that entrepreneurs could refer to – 34% of companies point to the ambiguity of regulations [15];
- low awareness of the importance of organizational change in line with ESG and GOZ principles: 31% of Polish companies report serious difficulties in acquiring knowledge about ESG [15];

- financial barriers: 83% of companies invest less than 10% of their revenue in ESG [15].

The existing barriers will be particularly burdensome for SMEs, as the skills gap related to the shortage of ESG specialists will generate difficulties and delays in greening value chains.

3. Opportunities for companies in the era of green transformation

Despite the challenges and barriers faced by Polish businesses, the green transition in Poland creates a number of significant opportunities for companies at various levels, from strategic development to day-to-day operations. Companies that proactively address the challenges of sustainable development and ESG (Environmental, Social, Governance) reporting can gain a significant competitive advantage and achieve long-term benefits. Research [7], [15] indicates that the transition to sustainable development is becoming **a new element of competitiveness and is considered one of the most important market advantages in acquiring and retaining customers.** Reported ESG data confirming the sustainable economy of companies will play an increasingly important role for **investors, customers and business partners** interested in cooperating with partners creating sustainable supply chains and will strengthen the position of the company [7], as well as the entire chain on the market. Another important aspect of building competitiveness is **strengthening brand reputation** through the introduction of ESG reporting, as it leads to **increased customer satisfaction,** which is key to long-term success [14], [15]. Based on research [15], it can be concluded that companies that are proactive in ESG are becoming **leaders of change in the new economy**, as they set new standards of responsibility. One of these is **the** increasingly well-understood **advantage in the value chain,** as data presented by GS1 [7], companies that adapt to ESG requirements make it easier for larger contractors to meet their reporting obligations which **increases their attractiveness as suppliers** and, thus, allows them to maintain customer satisfaction at an appropriate level, as well as translating into sustainable financial management throughout the supply chain. This phenomenon is also a prerequisite for building supply chains that include supra-regional partners and **for establishing cooperation and technology transfer** [11]. Building sustainable chains is a major challenge in creating sustainable value chains, as unfortunately many companies, especially in the SME sector,

are not fully prepared for this. The CSRD requires large companies to obtain data from their suppliers which puts **pressure on smaller entities to adapt,** but at the same time offers them an opportunity to **remain in global supply chains** [7], [15]. Such practices allow for the development of yet another opportunity, namely **compliance with regulations and risk minimization.** Based on available research [7], [15], it can be concluded that meeting ESG requirements throughout the supply chain is a necessity in order **to maintain market access** and avoid exclusion from supply chains.

Therefore**,** proactive preparation for **ESG requirements, such as the CSRD directive or green public procurement, minimises the risk of regulatory uncertainty** and avoids potential errors and costs associated with delays in complying with legal regulations [7]. Adopting transparent data reporting across value chains and incorporating these measures into strategy [14], [15] is another benefit, as it helps **reduce the risk of greenwashing.** Another positive aspect of greening is the building of sustainable value chains through the creation of **new business models ( ) that enable the creation of green jobs. Such opportunities allow the introduction of the GOZ concept** into **new, sustainable business models,** such as sharing or using instead of owning and the development **of economic symbiosis** [11]. These activities contribute to **the creation of new jobs,** particularly in sectors related to repair, renovation, waste management, and recycling [11]. It is estimated that the implementation will result in a 30% increase in resource efficiency which could generate 2 **million new jobs in the EU** [11].

The introduction of CE and ESG models is a great opportunity to create **innovation and technological development.** Research [15] indicates that the ESG transition is **driving the implementation of modern technologies and solutions** that improve operational efficiency. The development **of eco-innovation** has a product, process, technological, organizational and marketing dimension.

Eco-changes are fundamental to the transition to a circular economy (CE) [11], as **the development of innovative products and processes** enables a green transition towards environmental and resource efficiency [11], [14]. Thanks to the introduction of green business models based on the CCS, companies gain **improved operational efficiency and resilience to change.** A key advantage is **increased resource efficiency and minimization of waste generation** which translates into efficiency throughout the value chain [11]. This is achieved by **reducing the resource and material intensity** of production and logistics processes [11], or by introducing product and process solutions that allow **materials and raw materials to function longer in a circular economy** and full waste recovery at the local level [11].

The development of innovations for green transformation is closely correlated with the development of Industry 4.0 tools, as digitization and electrification are **the foundation of business resilience** in a changing world [15]. Companies achieve emission reductions, energy efficiency, and transparent reporting through technologies such as **renewable energy technologies, the Internet of Things (IoT) and blockchain** [15]. On the other hand, the optimization of operational processes, advanced data analysis and the improvement of ESG strategies are achieved through the development **of artificial intelligence (AI) and machine learning (ML)** [15].

These opportunities allow companies implementing a green transition based on the circular economy and ESG to generate **financial benefits and reduce costs**. This is due to investments in sustainable development, such as recycling or own RES installations which **reduce waste disposal fees and** energy and water **bills**, generating real savings [11], [14]. Investments in ESG can **have a positive impact on companies' financial results by** attracting investor capital [14].

Financial benefits can also be generated through financial tools provided by government instruments that give companies access to **tax breaks, subsidies and favourable financing**, e.g., from the EU Recovery Fund which significantly reduces the costs of ESG transformation, making it more profitable, especially for the SME sector [7], [15].

The companies surveyed [15] also indicate that the introduction of greening based on the GOZ and ESG models allows for better risk management and optimization of operational processes which translates into **a reduction in operating costs.**

The green transition based on the GOZ and ESG models brings with it a number of diverse opportunities. Looking at the barriers that exist in Polish enterprises, it should be remembered that they can become the basis for creating an innovative industry. The barriers identified should be treated by companies as potential opportunities due to the constantly growing environmental awareness of society [11] which is and will continue to be a driving force behind key actions to promote innovation.

Therefore, one of the key directions for enterprises should be **to strengthen employee education and awareness, provide advisory support**, and **promote a culture of sustainable development** throughout the organization [7]. Companies that combine their ESG activities with their strategic objectives will not only meet the regulatory requirements set out in the Green Deal for Europe, but will also set a new standard [15] in a dynamic business landscape. A key task for companies in the green transition is also to develop business models based

on the sharing economy and to build industrial symbioses with all stakeholders in the supply chains.

When considering the aspect **of strengthening employee education and awareness, providing advisory support** and **promoting a culture of sustainable development,** it is essential to establish partnerships with scientific and educational institutions which should also be involved in the process of education for ESG and GOZ and in creating innovations for the green transition.

4. Methodology

The research conducted is part of management and quality sciences and economics, as it attempts to diagnose the factors influencing the green transition in light of the circular economy as one of the key actions of the Green Deal for Europe and the ESG reporting requirements as a key instrument for transparent presentation of environmental, society and management between different industries.

The research is also a continuation of analyses conducted in 2015–2020 on the preparation of companies in the Lodz region for a '*green* approach' in management [8] and the effects of the Erasmus+ project 'Cooperation partnership for innovation and development of green skills & knowledge enabling transformation and change for greening jobs and enterprises Grant Agreement: 2022-1-RO01-KA220-HED-000085618 Educate4Green'.

The existence of a number of factors influencing the slow pace of greening of companies in the Lodz region [8] prompts reflection on the changes that have taken place in Polish companies in recent years and the definition of a system for classifying opportunities and barriers to the introduction of green transformation, as well as the identification of the diversity resulting from the activities carried out in Polish enterprises.

Analysis of literature data ESG Barometer (2025) and Jałmużna et al. (2021) adopted a unified classification of barriers:

- regulatory barriers,
- financial barriers,
- competence barriers,
- organisational barriers.

The adopted classifications of barriers and opportunities resulting from the need to analyse data within the framework of the oto-GOZ, Barometer_ESG and SME_ESG projects form the basis for deepening the relationship between the assumed areas of research.

In order to answer the research questions, a two-stage study was conducted. The first part involved data collection based on desk research, while the second part was based on an analysis of selected ESG reports for selected companies representing a given industry. Both stages are qualitative in nature, based on an analysis of data from the latest available reports on GOZ and ESG produced over the last three years. The source data comes from sustainability reports (2023), research by the Polish Economic Institute (2024) and the Polish ESG Association (2025), as well as reports.

The analysis of selected case studies was carried out on three selected companies: ArcelorMittal Poland, BALMA and LPP. The selection of companies was dictated by the fact that the indicated companies are classic representatives of Polish manufacturing business from the top ten leading industries in Poland. The review of the reports also shows that they play an important role in the selection of various green practices for the development of their organizations which are presented in the available current ESG reports.

5. Good green practices of companies – comparison

Good green practices are a response by companies to the opportunities and barriers that arise in every industry. The challenges facing business in the era of green transformation affect every company without exception. How companies respond to these challenges depends on many factors, including the opportunities and barriers that arise in the external and internal environment of each company. Due to the fact that every company will be required to report on its activities in three areas, the study compared three companies from different manufacturing industries to define, based on their reports, the key determinants that influence the green transition process in the context of the GOZ and ESG models. Companies representing the most important industries in Poland were selected for the analysis of green governance activities: the steel and mining industry – Arcelor Mittal Poland, the furniture industry – BALMA, and the clothing industry – LPP.

ArcelorMittal Poland

ArcelorMittal Poland is the largest steel producer in Poland. It operates in three provinces: Małopolska, Opole and Silesia. It has six production plants in Poland. It is part of a global steel and mining group and employs nearly 9,000 people. In 2023, it produced over 3 million tons of steel and over 3.2 million tons of coke.

It supplies products to sectors such as rail transport, construction, automotive, household appliances and mining on the Polish and European markets. ArcelorMittal Poland's strategy is based on three pillars: Safety, Sustainability and Standards.

In 2023, the company made investments worth approximately PLN 1.5 billion, focusing on improving product quality, increasing energy efficiency and plant productivity. It aims to reduce CO2 emissions by 35% by 2030 and achieve climate neutrality by 2050, in line with the Group's targets in Europe [1]. The company is ResponsibleSteelTM certified which highlights its high standards of social responsibility, environmental protection, and diversity. Workplace safety is a priority for the company which strives to achieve 'zero accidents.' The company also invests in employee development, offering health and training benefits and actively cooperates with schools and universities to promote young talents. It reinforces the concept of a circular economy by utilizing resources and by-products, while adhering to a comprehensive compliance program outlined in its Code of Business Conduct.

BALMA

BALMA has been specializing in furniture design and production for 40 years, with a strong focus on office space arrangement and furnishing. The factory is located in Tarnowo Podgórne and exports furniture to five continents. In 2023, it produced 124,185 pieces of furniture, using approximately 130,000 m² of boards. The company fulfills non-standard orders in accordance with individual customer needs. Its operations are based on a sustainable approach combining economic, environmental and social aspects, as confirmed by ISO 9001 and ISO 14001 certifications. Its core values are: conscientiousness, care, and innovation, with the company striving for the lasting significance of its products and closeness to its customers' lives. The ESG strategy for 2024-2026 is based on dialogue with stakeholders and environmental and social challenges, covering six pillars: education, social engagement, wellbeing, sustainable management, innovation and environmental protection. The goals included in the strategy include the implementation of the UN goals for quality education, economic growth, innovation, responsible consumption and climate action.

The company optimizes raw material consumption through advanced cutting planning, supports the local community and education, and is the initiator of the Technical School Complex in Tarnowo Podgórne, offering internships and workshops. It cares about its employee relations by conducting satisfaction surveys

and offering benefits, and ensures compliance with human rights in accordance with international standards by engaging in dialogue with the Employee Council.

LPP

LPP is a Polish family-owned clothing company and one of the fastest growing companies in Central Europe. Its headquarters are located in Gdańsk, and it operates in nearly 30 countries in Europe, Asia and Africa. The company has four design offices, three distribution centers in Poland and one near Bucharest, as well as fulfillment centers in Poland and abroad, including Bratislava. LPP manages five fashion brands: Sinsay, Reserved, Cropp, House and Mohito, with around 2,300 stores and a total area of 1.9 million m². It employs over 33,000 people in its offices and sales structures. The company does not have its own factories – production is outsourced to over 1,500 external suppliers in Asia and Europe.

The company is committed to decarbonization and a circular economy – it collects used clothing, invests in recycling, and eliminates plastic from its packaging. Its 'For People For Our Planet' strategy includes sustainable production, chemical control and infrastructure development. LPP's values are social responsibility, teamwork, ambition and energy (FAST). LPP is developing an omnichannel model, integrating online and offline sales. It works with suppliers in accordance with its Code of Conduct, conducts audits and participates in international initiatives (e.g., ZDHC, amfori BSCI).

It cares about employee development, offering training, benefits and a DE&I policy. It complies with health and safety regulations and employees have the right to refuse work in case of danger. Through the LPP Foundation, it supports hospitals, hospices and environmental activities. The company conducts risk management, consults with stakeholders and publishes sustainability reports.

6. Industry specifics and the core of the green transition

Based on the analysis of the cases presented, a summary of key good practices was compiled against the background of the barriers and opportunities faced by the analysed companies. Table 1 lists the factors (opportunities and barriers) that determine the application of sustainable practices.

Table 1. Company practices and barriers and opportunities for green development

Company	Barriers	Opportunities	Examples of activities
AMP	Competence gap (health and safety training), lack of systemic support	Digitization of health and safety processes, cooperation with foundations	HandS 2.0, Comarch wristbands, VR, Health Foundations
BALMA	Adaptation costs for SMEs	Education, local cooperation, product innovation	ESG strategies, furniture renovation, photovoltaics
LPP	Global supply chains, certification requirements	Circular economy, eco-transport, energy management	Recycling, rLDPE, Control Tower, educational campaigns

Source: Authors' own work on the basis of the data from ESG reports of selected companies.

Based on the data presented in Table 1, it can be concluded that the types of practices introduced vary across the analysed industries. By comparing the actions taken by the selected companies, it can be concluded that the characteristics of the industry largely generate specific groups of actions that form the core of the green transition. Companies from different sectors adapt the general principles of sustainable development to their unique processes, value chains and challenges.

ArcelorMittal Poland (heavy industry, metallurgy) focuses its activities on decarbonizing processes and reducing emissions [1]. This is due to the energy--intensive and emission-intensive nature of metallurgy. Massive investments in technological modernization aimed at reducing CO2 and dust emissions are key here. Examples of measures taken by ArcelorMittal include the strategic overhaul of furnace No. 2 in Dąbrowa Górnicza which is expected to reduce CO_2 emissions by nearly 45,000 tons per year [1], as well as the construction of new cooling systems and blast furnace gas treatment plants [1]. Planned modernization of Maerz furnaces in lime kilns and the construction of hydrogen furnaces in the cold rolling mill in Krakow will significantly reduce electricity and natural gas consumption. This industry faces high CO_2 emission charges and steel imports from outside the EU which requires specific market protection mechanisms and access to green energy.

The second strategic action for the steel industry is the circular economy for by-products [1]. Due to the scale of production, it is important to process and utilize post-production waste, such as blast furnace and steel slag which can be used in construction (e.g., in the cement industry or road construction). In addition, purified blast furnace gas is used to produce heat in combined heat and power plants and used oils are sent to refineries for regeneration. Steel itself has almost 100% recycling potential which is a fundamental element of their GOZ strategy [1].

The furniture industry represented by BALMA focuses on optimizing raw materials and production processes. For this industry, it is crucial to use raw materials consciously through advanced planning of board, sheet metal and profile cutting which minimizes production waste [2]. Furniture production also means caring for green energy and reducing VOCs. The BALMA factory declares that 100% of the energy it consumes comes from renewable sources. In addition, it monitors and maintains volatile organic compound (VOC) emissions from the wet paint shop below 10% of the permissible value [2].

Another important issue for this industry is minimizing packaging. At BALMA, they focus on optimizing packaging design and minimizing the use of plastic film in favour of cardboard and they also invest in machines for the production of cardboard packaging, and strapping using recycled materials.

Companies such as LPP which are involved not so much in manufacturing as in retail clothing, focus on decarbonizing the value chain (Scope 3), as most emissions in the clothing industry come from the supply chain (material production, clothing manufacturing, transport, consumer use). It is the first Polish clothing company whose decarbonization targets have been approved by Science Based Targets (SBTi), with a commitment to reduce emissions from the purchase of goods and services by 51.6% by 2030 [12].

The industry is also interested in the circular economy for clothing products. Therefore, LPP is investing in 'textile-to-textile' innovations and promoting the extension of product life cycles [12]. It collects used clothing in all its stores in Poland, sorting it and donating some of it to charity and some to recycling. It is actively changing its packaging policy, eliminating single-use plastic in favour of cardboard, recycled paper or reusable recycled plastics [12].

The specific nature of clothing production forces companies to focus their activities on responsible sourcing of materials. At LPP, they emphasize the use of preferred and certified materials (e.g., cotton from the Cotton made in Africa initiative) which have a lower carbon footprint and less impact on the environment [12]. They also cooperate with Zero Discharge of Hazardous Chemicals (ZDHC) to eliminate harmful chemicals from the supply chain.

7. The spread of green good practices across industries

Due to the key priorities that every company sets for itself in order to achieve the goal of sustainable business in a given industry, the question arises: 'How can the good practices of the analysed companies spread between companies in different industries?'

The key to the transfer of good practices is cross-industry transfer. Based on an analysis of individual companies, it appears that companies draw good practices from different industries.

These are practices built on the synergy of solutions generated within IT and automation. An example of such activities is the use of energy consumption predictions which allows for the proper management of electricity consumption in order to reduce costs and search for alternative energy sources. Such solutions allow companies from various industries to use to design and construct energy-efficient buildings which has been utilized by logistics companies such as Amazon and IKEA, and has also enabled LPP to reduce infrastructure maintenance costs by using BREEAM green logistics centre solutions.

Another example is drawing inspiration from the construction and furniture industries in the use of green building materials.

Another crossover can be observed in the area of product design which takes into account the principle of Design for Disassembly, one of the directions of the Circular Economy. Hence, BALMA manufactures furniture for reassembly, taking into account design for disassembly (DfD), the use of certified materials (FSC), low-carbon production and product modularity and durability.

IT companies play an important role in the convergence of good green practices by designing systems that enable product lifecycle management (PLM) which in the era of ESG and GOZ reporting is an essential solution in the traceability process in supply chains.

This is also where electronics-based solutions come into play, enabling the design of modules that allow goods to be tracked in logistics and product data to be monitored via a 'product passport.'

The FMCG industry also has a significant impact on its business partners and companies that require packaging and strive to use packaging systems that comply with GOZ principles.

Despite specific actions, there are many areas where good practices can spill over between industries, supporting the green transition more broadly. Below are those that will soon become key directions resulting from the introduction of CE and ESG models.

Setting science-based decarbonization targets (SBTi) is one of the common green goals of the companies analysed. LPP was the first Polish clothing company to have its emission reduction targets approved by SBTi [12]. This approach to scientifically verified and ambitious decarbonization targets is universal and can be adapted by any industry, including heavy industry (ArcelorMittal) and furniture manufacturing (BALMA), to ensure that their emission reduction strategies are in line with global efforts to mitigate climate change.

The implementation of circular economy principles (CE) is a universal measure that can be found in all the industries discussed. This can manifest itself in waste valuation. ArcelorMittal's practice of using slag and blast furnace gas as secondary raw materials [1] shows that every industry should systematically identify and find new uses for its waste streams. This could inspire Balma to further develop its recycling of waste from furniture production [2]. Another measure is packaging management. LPP's strategies for eliminating single-use plastics, using recycled materials, and reusing cardboard [12], as well as Balma's strategies for optimizing packaging, are directly transferable to other sectors, especially those with high shipping and logistics volumes. Product life extension, present in Balma's pursuit of creating long-lasting furniture [2] and LPP's initiatives on giving clothes a second life and the 'Take care of your clothes' campaign, also emphasize the importance of designing products with durability and reusability in mind [12]. Companies in any industry can incorporate this into their product strategies.

The search for energy efficiency and the use of renewable energy sources is becoming universal**.** Balm's use of 100% green energy is an ambitious goal for other companies. ArcelorMittal's activities in the systematic assessment and optimization of energy consumption [1] and LPP's activities in the optimization of energy consumption in stores and warehouses [12] show that investments in efficiency and renewable energy sources are crucial regardless of the industry.

In every industry, companies take **responsibility in the supply chain** (ESG due diligence). LPP's comprehensive audits of suppliers in terms of human rights, working conditions, and environmental protection (in accordance with the LPP

Code of Conduct, ZDHC, International Accord, amfori BSCI) [12] set an example for all industries. ArcelorMittal also assesses its suppliers in terms of financial health, compliance with procedures, and approach to safety [1]. BALMA works with reputable panel manufacturers that meet quality standards. A systematic approach to verifying and supporting suppliers in the area of ESG is fundamental to building a sustainable value chain in every sector.

Digitization and technological innovation are another element of greening the industry. The use of VR for health and safety training at ArcelorMittal, safety monitoring applications, computer vision systems for logistics and packaging robots demonstrates the potential of technology to optimize processes and increase safety [1]. BALMA uses advanced technologies for cutting planning [2] and LPP for supply chain management (Control Tower) and e-commerce [12]. These digital solutions are highly transferable and can bring benefits to any industry.

The most common is **employee education and involvement** in sustainable activities. ArcelorMittal (Safety Day, Health Week, Golden Rules for Saving Lives) [1] and LPP (ESG on Your Side series, Take Care of Your Clothes campaign) [12] actively educate and engage their employees and customers in sustainable development issues. This approach to building awareness and a pro-ESG culture is valuable for any organization seeking to change behaviour.

This scope is complemented by activities aimed at **cooperation with local communities and schools.** All three companies are involved in supporting local communities, education (cooperation with universities and vocational schools, scholarship programs, internships) and local health, and environmental initiatives. This is a universal good practice for building positive social impact and image.

Considering the cases of the three Polish companies presented in the analysis and analysing data from ESG and GOZ reports, it can be concluded that although the core of the green transition is shaped by the specific nature of each industry, fundamental principles such as the pursuit of decarbonization, the implementation of GOZ, the improvement of energy efficiency, responsibility in the supply chain, investing in innovation and new technologies, and stakeholder engagement are universal. Companies can learn from each other by creating economic symbioses and adapting proven solutions to their own business context to accelerate their green transition.

8. Discussion

The case study analysis of three companies representing different industries (ArcelorMittal Poland – steel, BALMA – furniture, LPP – clothing) confirms that the green transition in Polish companies is a process that is highly dependent on the specific characteristics of the sector and highlights the complexity and multidimensionality of the process of implementing CE and ESG principles. These results are consistent with earlier observations on the vertical approach to sustainable development in the literature [5], [16], while pointing to a gap in cross-sectoral research in Poland [18]. At the same time, the research results indicate the existence of universal areas of good practice that can be transferred between sectors on the importance of so-called *intersectoral learning* processes [5], [16].

In particular, there is a transfer of solutions from industries traditionally perceived as resource-intensive (e.g., the steel industry) to more diversified sectors such as furniture and fashion (Kowalski et al., 2024:71–74). For example, LPP's efforts to decarbonize its supply chain in line with SBTi targets [12] are an example of an approach that could also be adapted in heavy industry, as suggested by the authors of AMP reports [1].

Despite common goals, the ESG and GOZ transformation in Poland faces significant barriers. The study identified a lack of knowledge about ESG [7], competence gaps [11], low availability of financing [15], regulatory complexity and the lack of uniform standards [15]. These challenges are particularly acute for the SME sector which rarely has the resources to adapt to new regulations on its own [8], [9]. Research confirms that the SME sector requires specific systemic and educational support. It is worth noting that many of the identified barriers can be transformed into opportunities if they are properly addressed by public policies and corporate strategies.

At the same time, research confirms that proactive implementation of ESG principles is associated with a number of development opportunities: from increased competitiveness [15] and improved operational efficiency [14], to a positive impact on reputation and access to sustainable supply chains [7], [11].

An example of this is BALMA's activities in the field of local educational cooperation [2] which can serve as a model for companies in other sectors.

The activities carried out in the field of education, employee competence development and cooperation with local communities are universal and can be implemented in any industry. Companies such as AMP and LPP implement extensive training and education programs [1], [12] which is in line with the recommendations of the literature on the role of human capital in sustainable development processes [20].

It is also worth noting that the selected companies effectively implement circular economy principles. ArcelorMittal recycles blast furnace slag and used oils [1], BALMA minimizes production waste through advanced cutting planning [2], while LPP collects and sorts used clothing, implementing the idea of a 'second life' for products [12].

These conclusions are in line with the concept presented by the Ellen MacArthur Foundation [4], according to which the CE model is based on waste elimination, keeping products in use and regenerating natural systems. Companies representing various industries are increasingly adapting these principles which creates space for mutual learning and the development of economic symbioses.

9. Summary

The green transition in Polish enterprises is uneven and varies across industries. This is due to various factors such as the scale of operations, the use of different business models, the maturity of ESG reporting, the international scope of operations and the specific nature of supply chains. Therefore, it is recommended that in-depth research be conducted in this area to identify the factors determining the existing relationships.

The analysis of the AMP, BALMA and LPP cases indicates that although sectoral specificities determine the choice of specific practices, many of them – such as decarbonization, closed-loop recycling, supply chain responsibility and investments in digital technologies – are universal in nature and can be effectively transferred between industries. This is due to consistent regulations applicable to all companies.

The identification of barriers such as low ESG awareness [7], insufficient regulatory support [15] or lack of competence [11] shows the need to build systemic support for companies, especially those in the SME sector. At the same time,

the opportunities arising from the implementation of ESG and GOZ strategies – including improved competitiveness, increased resource efficiency and a positive impact on reputation – make the green transition not only a regulatory obligation but also a strategic tool for development.

Further research is recommended in the area of cross-sector transfer of good practices and the development of policies supporting such processes based on a larger research sample. In particular, such research should be conducted in the SME sector in order to define mechanisms facilitating the flow of cross-sector experiences. Cross-sector cooperation, integration with educational institutions and the development of green skills should be a priority for development policies in the context of implementing the European Green Deal. Therefore, research on tools supporting sectoral cooperation, knowledge exchange and ecosystem building is very important for the successful transition towards sustainable business development.

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THE GREEN TRANSFORMATION OF POLISH COMPANIES - TRANSFER OF GREEN GOOD PRACTICES BETWEEN SECTORS IN THE LIGHT OF EXISTING BARRIERS AND OPPORTUNITIES

Summary

The article undertakes an analysis of the green transformation of Polish companies through the prism of the penetration of good inter-industry practices and the identification of the main barriers and opportunities accompanying this process. The aim of the paper is to assess whether the specifics of the industry influence the implementation of the principles of the closed loop economy (GOZ) and ESG and whether there is potential for the transfer of cross-sectoral solutions. On the basis of case studies of three companies – ArcelorMittal Poland, BALMA and LPP – it was shown that although the activities are sectorally differentiated, many practices (e.g. decarbonisation, recycling, education) are universal and can support the development of economic symbioses. The article highlights the importance of cross-industry cooperation as a condition for effective green transformation in Poland.

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