REPORT

Country report: Poland

Exchange Group: Just Transition in the European Car Industry

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BEV	battery electric vehicle
CBAM	Carbon Border Adjustment Mechanism
CEE	Central and Eastern Europe
CNG	compressed natural gas
EU	European Union
EUR	euro
EV	electric vehicle
FDI	foreign direct investment
GWh	gigawatt hours
ICE	internal combustion engine
Li-ion batteries	lithium-ion batteries
OEM	original equipment manufacturer
PLN	Polish zloty
R&D	Research and Development
TSL	Transport, Services & Logistics
V2G	Vehicle to grid

Abstract

Being one of the most important manufacturing sectors, the automotive industry plays a major role in the Polish economy. Despite its significance, Poland does not have a clear strategy to address the urgency to achieve climate neutrality and just transition within the automotive industry. The lack of dialogue between private and public stakeholders hinders the process, as transformation challenges increase. Although there is no established pathway for the domestic market, our research shows that Poland is in the transition towards zero-emission mobility, with an emphasis on electric mobility (especially focused on exports of e-buses and batteries). Our report presents key challenges of the automobile industry in Poland and proposes various transition pathways. It may serve as a base for future discussions in Poland and beyond, which hopefully facilitate just transition of the automotive industry in line with the European Union climate policy.

1 An overview of the automotive industry in Poland

The study presents an overview of the automotive industry in Poland with a brief historical context, political changes and a handful of facts and statistics about this sector. We place it in the context of European climate policy, the energy crisis, the COVID-19 pandemic, and the resulting disruptions in the supply chain.

We detail the current and future legislative changes noting the EU ban on the sales of ICE cars and the policy developments towards alternatively-fuelled zero-emission mobility. We also do not leave out the issues of the electricity market and the sources of fuelling power plants with lignite and hard coal combining this with underdeveloped renewable energy sources. This makes the Polish energy mix dirty and expensive, putting the automotive industry in a difficult position in terms of its carbon footprint and the transition to electromobility.

1.1 Transformation of the automotive industry in Poland. A brief history.

The automotive industry has always played an important role in the Polish economy with a vital history dating all the way back to the late XIXth century. In the interwar years, the share of the Polish automotive industry was small in comparison with the countries of Western Europe, but the automotive industry existed and has been developing until the late 1930s.

Rebuilt after war damage, the glory days and intensive development of the automotive industry were in the 1950s – 1980s. In this period, vehicles like FSO Syrena, Fiat 125, Fiat 126p, FSO Polonez (passenger cars), Żuk, and Nysa (light-duty vehicle) JELCZ and STAR (trucks) or AUTOSAN (bus) were produced in Poland.

Due to political and economic shifts of the 1990s the automotive companies went through restructuring which led to their privatization, limiting production and ultimately their liquidation. Joining the European Union in 2004, attracted foreign direct investment (FDI) which made Poland one of the leading countries among the other CEE countries.

The automotive industry has been heavily affected by the pandemic of COVID-19 and its direct and indirect effects. It resulted in the disruption of the supply chains of the entire sector.

Due to COVID-19 and the energy crisis, the automotive industry is in the process of transition (e.g. resulting in changes in car manufacturing and technological switch due to climate policy and coal phase-out). The Polish automotive industry is currently experiencing rapid transformation. The industry comprehensively takes part in the global vehicle supply chain through factories of conventional (ICE) and battery electric

vehicles (BEV) with the role of producers of parts and accessories increasingly important.

The electrification of transport in Poland is already underway and is gaining momentum. Polish actors are already present in many areas of the electromobility sector. This especially applies to the export of electric buses and the battery industry (Poland is the leader in lithium-ion battery production in Europe).

However, the role of electric mobility in the Polish automotive industry is still relatively small. The upcoming years will determine whether our country will take advantage of the historical and economic opportunities related to the development of zero-emission transport.

1.2 Key stats of the automotive industry in Poland

Currently, Poland has the largest automotive industry in Central and Eastern Europe (CEE). Numerous investments in the previous years made the Polish automotive a key player in the manufacturing of vehicles, parts and accessories, followed by trade and repair services[1].

According to The Polish Automotive Industry Association (PZPM) data[2] at the end of 2021, the total amount of FDI in Poland was EUR 239 billion which allowed Poland to become one of the largest producers of parts and components for the automotive industry in the region.

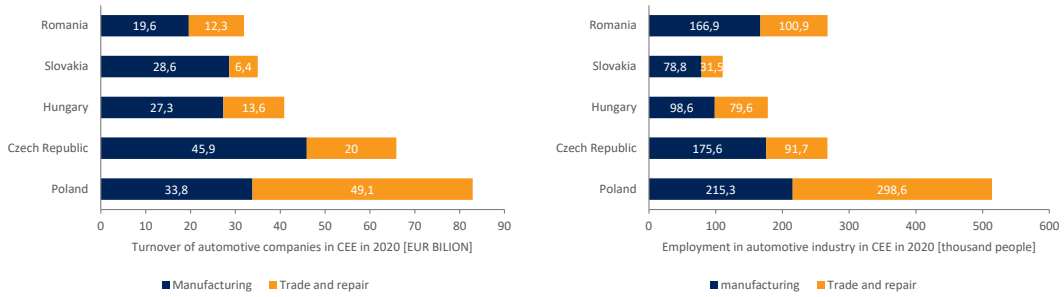
The Polish automotive sector generated EUR 35.4 billion sold production value in the industry sector in 2021, which is 14% higher than a year before[3]. The value of the sector's exports in 2021 amounted to EUR 33.1 billion (11.8% share in total export in Poland), 5.3% higher than a year before.

The turnover of Polish manufacturing companies amounted to EUR 33.8 billion in 2020, 16.3% less than a year before – see Fig. 1. In total, the Polish automotive industry turnover (manufacturing and trade and repair) was EUR 82.9 billion in 2020, 9.2% less than in the previous year. These numbers are lower than during the previous years due to the direct and indirect effects of the COVID-19 pandemic.

The automotive sector companies employed in 2018 in total 509 thousand people, 58% of which in trade and services and 42% in manufacturing. For comparison, there are 293.1 thousand employees in Romania and in the Czech Republic 272.4 thousand[4]. The pandemic had an impact on employment in the Polish automotive industry – employment in 2021 in manufacturing was reduced to approx. 200 thousand people. The automotive sector employed 7.3% of all people working in the industry sector in Poland.

[1] PZPM (2021). Rynek transportowy w Polsce i Europie. Obecna sytuacja i prognozy na roku 2023.
[2] PZPM (2022), Automotive Industry Report, 2022/2023
[3] PZPM (2020). Automotive Industry Report, 2020/2021.
[4] PZPM (2021). Rynek transportowy w Polsce i Europie. Obecna sytuacja i prognozy na roku 2023.

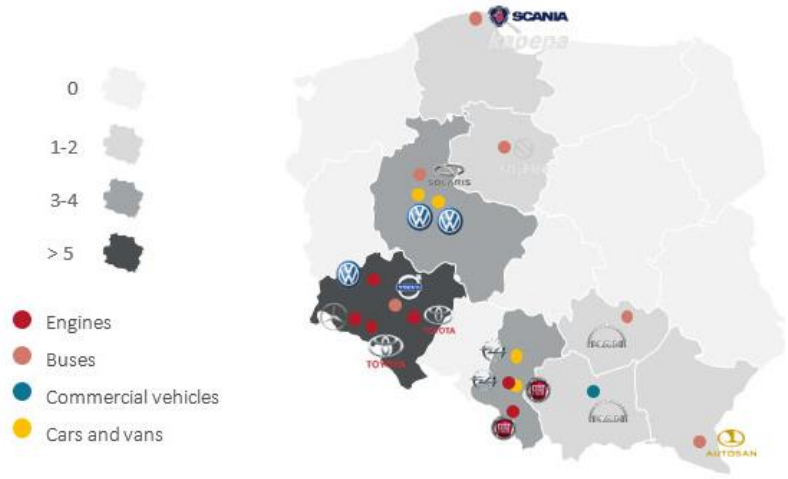
Figure 1 Turnover and employment in the automotive industry in CEE in 2020



Source: The Polish Automotive Industry Association based on KPMG

In 2017, there were 1 380 enterprises in the automotive industry in Poland (both vehicle manufacturers and parts and components producers), compared to 1 093 in Czechia, 501 in Slovakia and 489 in Hungary[5]. This includes both ICE and EV production. Figure 2 depicts the geographical distribution of key Polish automotive companies. Their largest share is in three voivodships: Lower Silesian (Dolnośląskie), Silesian (Śląskie) and Greater Poland (Wielkopolskie). The lack of this type of industry in the vicinity of the capital Warsaw and in Central and Eastern Poland is worth noting. Such geographical distribution is due to the road network determining the place of Polish manufacturing facilities in supply chains.

Figure 2 Polish automotive companies



Source: Polish Investment and Trade Agency (PAiH).

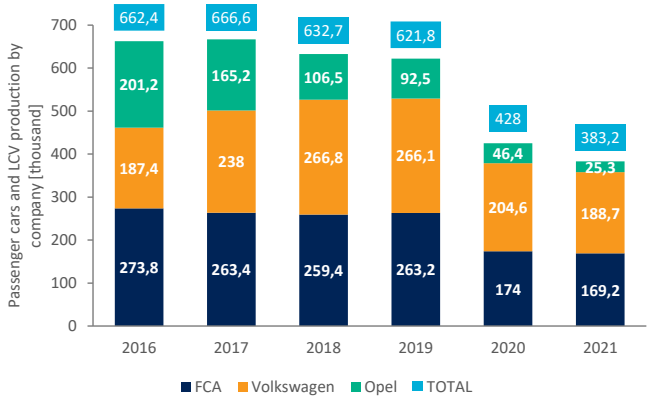
The main factories producing passenger cars are Volkswagen Polska, FCA Poland and Opel Manufacturing Poland. The largest manufacturing site in Poland is Volkswagen factory in Poznań, which produce almost half of Polish passenger cars and LCVs. This plant produces commercial vehicles: VW Caddy and VW Transporter. The second facility of this company located in Września produce also commercial

[5] https://www.paih.gov.pl/sectors/electromobility

vehicles: VW Crafter and MAN TGE, also an electric version of those. The FCA Poland manufactury in Tychy produces the following car models: Fiat 500, Abrath and Lancia. Opels's factory in Gliwice produces Opel Astra 5th generation. In 2021, these factories produced a total of approx. 380 thousand vehicles

The production of passenger cars and LCVs in recent years is presented in Fig.3. It is worth noting the decreasing values in 2020 and 2021, resulting from the COVID-19 pandemic and supply chain disturbances.

Figure 3 Passenger cars and LCV production by company [thousand]



Source: PZPM

In the segment of electric buses, there are three main producers: Solaris in Bolechowo near Poznań (Urbino Electric), Volvo in Wrocław (7900 Electric) and MAN Truck & Bus in Starachowice (Lion's City E). In 2020, Poland was the largest producer of electric buses in the EU[6]. To show the scale of e-bus manufacturing in Poland, in general, in 2021 over 5,204 buses (including all engine types) were produced and it's almost 14% lower than the previous year. MAN is the largest producer (1,781 buses). The second manufacturer is Solaris with 1,492 buses, of which almost 45% are electric vehicles. Volvo has produced over 670 buses, none of which had a diesel engine. Scania has produced 603 buses and Autosan has produced 60 buses in total (including the first hydrogen vehicle)[7].

In 2021 more than 5 200 buses were produced and it's 13,8% less than in 2020. The value of bus exports from Poland in 2020 amounted to EUR 213.4 million (an increase of over 50% compared to 2019). The year 2021 saw the deepest drop in export of the buses – almost 21% from 2020.

Poland is a leader in the production of batteries used in electric cars. In late 2020, the value of export of lithium-ion batteries reached €400 million a month, which now accounts for as much as 2% of all Poland's exports. That amounts to almost a third of European demand for electric vehicle batteries[8]. The largest factory of lithium-ion

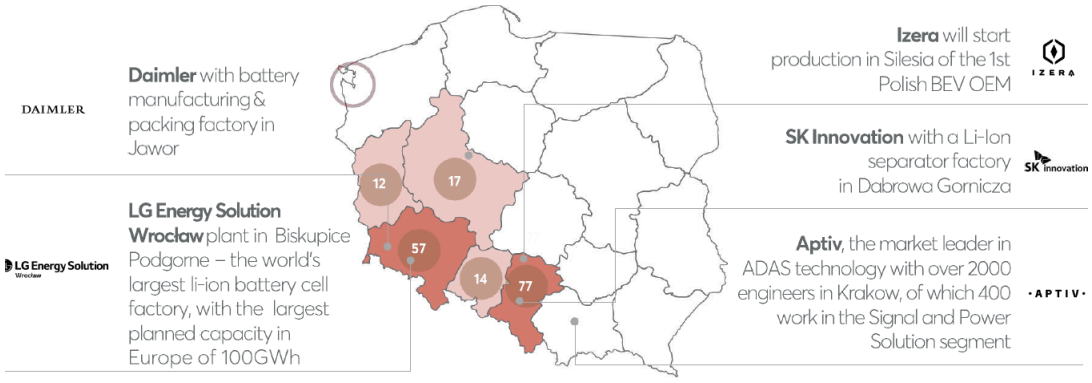
[6] https://www.transport-publiczny.pl/mobile/polska-najwiekszym-eksporterem-autobusow-elektrycznych-w-ue-67498.html

[7] PZPM (2022), Automotive Industry Report, 2022/2023

[8] https://www.politico.eu/article/central-europe-eu-e-car-battery-supplier/

batteries in the EU and the largest facility of the concern LG Energy Solution in the world, with a production capacity of 100GW, operates in Poland. The construction of the Northvolt factory in Gdansk has also started, the capacity of which in 2022 will amount to 5 GWh, with the possibility of expansion by 12 GWh[9].

Figure 4 Key battery manufacturing and packing locations for automotive industry



Source: PAIH (2021). Succeed with Poland. The Electromobility Sector.

As Figure 4 shows, the geographic distribution is along the German and Czech borders. In particular, key sources of suppliers are located in Lower Silesia and Silesia regions.

1.3 Polish automotive sector in the light of legislative developments

The European Commission has decided to ban the sale of cars and light commercial vehicles with internal combustion engines after 2035. According to the automotive industry, this decision negatively influenced the research, development, and tests of low-emission internal combustion engines, as they were halted. Additionally, in the short time horizon, R&D activities and the implementation of new low- and zero-emission technologies are not cost-effective due to the high investment.

The recent decision of the EU further excludes other types of low-emission fuels that could be used, such as synthetic fuels and gas (LNG and CNG). Therefore, appropriate legislative changes should be adopted in Poland to protect the vehicle stock from an excessive import wave of second-hand vehicles from Western Europe, which should be replaced by zero emissions ones. This could take the form of a tax based on vehicle emissions or a restriction on the registration of older and more pollutant vehicles.

One of the main concerns is access to adequate EV charging infrastructure, both in terms of fast charging on the main cross-country roads and in cities as well as slow charging in car parks in housing estates and residential buildings. Additionally, there

[9] Transport & Environment (2021). From dirty oil to clean batteries. Batteries vs. oil : a systemic comparison of material requirements

is no single public hydrogen-filling station operating in Poland. Difficult and limited access to charging infrastructure, in addition to the insufficient range and increasing operating costs as a result of rising energy prices, is, according to available studies, one of the factors that strongly limit the development of electromobility in Poland[10]. The development of the technical infrastructure may indirectly allow for an increase in the number of electric vehicles on the market and their importance in the Polish transport sector. In the field of legislation, some actions should be implemented to facilitate the investment process and unlock the charging infrastructure as well as the financing of these investments.

An additional, equally important aspect is to ensure access to cheap and green energy for vehicle charging and production. Poland's current energy mix is based on almost 86% fossil fuels, including 80% coal[11], which makes the Polish energy system one of the most carbon-intensive in Europe. Hence, fossil fuel-powered electric vehicles are not generally considered to be zero-emission ones.

An additional aspect is a need to report in the future on the carbon footprint of vehicle production, the supply chain, and the use of vehicles themselves so that vehicles produced and used in Poland will have a much higher carbon footprint. This will result in a worse carbon balance for Polish companies, which may ultimately be forced to be the subject of cancelled contracts for this reason and will not be competitive with companies from other countries.

Particular attention from the perspective of the decarbonization of the Polish economy should be paid to the lack of a coherent transition strategy. The EU authorities set targets for member states in this matter that lacks pathways to reach them. Poland itself is unwilling or unable to define such a roadmap.

The automotive industry of Poland, as the main sector of the national economy, should have a clear plan of development and measures to reduce the impact of the transition. It's also important to mobilize external funds including the blocked Polish Recovery and Resilience Plan. Planned adaptation of the CBAM mechanism is also an important issue for the automotive industry growth as it includes producers of steel and copper, products used in the production of vehicles[12].

[10] PSPA (2022). Barometr Nowej Mobilności 2022/23

[11] https://www.rynekelektryczny.pl/produkcja-energii-elektrycznej-w-polsce/

[12] Based on the information from the interview.

2 Challenges driving the transformation of the car industry

The Polish car industry is currently facing major challenges that will either facilitate the transformation of the sector or will lead to its hindrance. Key actors in the automotive industry are in a place where, at the same time, they need to effectively develop business models (responding to post-COVID-19 economies or the ongoing energy crisis) while implementing environmentally friendly and innovative processes and products in accordance with the EU and national climate policies.

We interviewed representatives of the automotive industry and sector organisations using an in-depth survey methodology. These were leading managers, to whom we reserved anonymity. We wanted to know their true opinions, including those behind the scenes and not always revealed to the public. The following section describes the opinions formulated by WiseEuropa based on the qualitative description of the situation provided by managers and actors of the automotive industry in Poland.

2.1 Climate change and environmental considerations

There is no doubt among respondents that the transformation in the automotive sector will involve environmental issues. The climate change-driven approach is externally shaped, as both emission standards and reduction targets are EU-imposed. There was a consensus among the interviewees that urgent actions should be taken to achieve climate neutrality in the Polish transport sector. Such opinions were expressed despite the lack of specific national goals (as we discussed earlier).

In particular, the reduction of CO_2 emissions from transport and the creation of regulations enabling green transformation in Poland were highlighted as challenging. To achieve these goals, the importance of deploying various technological solutions (and not only one) was specifically pointed out. It is crucial to have in mind that climate neutrality should be achieved by all possible means and developing different solutions is especially important in view of a current energy crisis, energy shortages, and the need to reduce electricity consumption by the industry. The latter seems especially problematic.

Including environmental goals in just transition strategies should not only be limited to electromobility or other alternative fuels. It should also include the reduction of the carbon footprint throughout the life cycle of the products and processes. In the context of Poland's coal-based energy industry, this is not so straightforward and will take many years.

Although many representatives are in favour of the climate goals set by the EU, they are also aware of the risks following such ambitious objectives. It is especially anticipated that the established reduction targets for the car industry might have a

negative impact on employment, key value chains or supply of raw materials (and their increased price). There is a need for immediate actions, including a dialogue between decision-makers and car industry actors - including the employees of the industry.

Sustainable development implies optimising activities aimed at reducing their environmental impact. For these reasons, the importance of using recycled materials or recycling Li-ion batteries should also be considered if the Polish car industry wants to compete with other actors on the market. Taking a direction based on a well-to-wheel approach and a life cycle that takes into account the positive contribution of sustainable renewable fuels and materials to climate protection will be of a significant importance to the industry.

The end-of-life of EV batteries is relevant for deploying electromobility in Poland especially as the number of EVs is constantly growing. Interviewees acknowledge that it is necessary to properly manage and recycle materials needed for batteries, especially in the face of increased limited raw materials. According to PSPA (Polish Alternative Fuels Association)[13], *"the EV batteries are able to withstand 1500 charging cycles before degradation"* which corresponds in a Polish context to a total average of 600 thousand km travelled. Interviewed representatives highlighted that a proper strategy for reusing and recycling EV batteries will allow Poland to remain a significant producer of car batteries and become a pioneer in their disposal.

2.2 Digitalisation and electrification

The representatives of the car industry who were interviewed agreed that adaptation in the context of technological advancements will play a vital role. If the Polish automotive sector wants to remain the driving force of the economy, it needs to transform using the newest technological solutions (e.g., electric mobility). For this purpose, cooperation between academia, public, and private sectors may be found as a significant factor enabling full-scale adaptation of research results, including the commercialisation of the latter. Another common voice in the discussion is the demonstration of electromobility and digitalisation as an opportunity for achieving climate goals, reducing dependence on fossil fuels, and increasing national energy security.

Poland in terms of the rate of electrification still lags behind western Europe, however, in the CEE region is one of the leading countries. Although the number of EVs increases, there is a big geographical differentiation in their registries. Major Polish cities have the highest EVs registrations, while in smaller cities and provincial areas the number of vehicles is very often not greater than 10. Adding on, almost 25% of the entire EV car park is registered in the capital Warsaw[14].

[13] PSPA (2022). Wpływ elektromobilności na rozwój gospodarczy w Polsce

[14] PSPA (2022). Polish EV Outlook 2022.

All the interviewees agree that the development of electromobility will facilitate major changes in the industry. Noteworthy, some of the interviewees estimate that in the upcoming years the demand for spare parts for electric cars will be 30% lower than for cars with combustion engines (this results from their production and servicing being more expensive and requiring more specialisation).

In view of the Fit for 55, revenues from the automotive aftermarket might significantly go down in the short and medium term.

There is also a risk that the abovementioned changes on the market might contribute to excessive imports of used cars from Western Europe to Poland as well as to an increased number of combustion cars' repairments (hence leading to an increased lifespan of the non-ecological vehicles). However, the majority of the surveyed representatives highlight that this threat is only short-lived and electromobility will definitely become a more common option.

Opinions are being expressed that electric vehicles are already more viable in production than combustion engine models. It is only a matter of additional components, specifically, lithium-ion batteries used for BEVs which are currently playing a significant role.

Although some barriers to the development of electromobility still exist (mostly of infrastructural nature), there are still positive predictions when it comes to electrification. According to PSPA[15], in 2025 the total number of BEVs (both passenger cars and vans) will increase to almost 300 thousand, 20 times higher than currently. The number of public and private charging stations will also expand to ca. 145 thousand in total (where ca. 43 thousand will be provided by public organisations). However, as the interviewees noted, this schedule could also be influenced by national support schemes such as 'My Electric Vehicle" which is currently offering financial aid for purchasing or leasing BEVs.

An additional key to improving both existing and under-construction charging infrastructure is to loosen administrative procedures which currently make the investment process longer and more complex than necessary. This is more important as the development of electromobility in Poland will not be possible without the involvement of both private and public funds.

Public administration can accelerate this process by introducing regulations that stimulate the expansion of public infrastructure by implementing financial or regulatory incentives for companies and households that facilitate the installation of private chargers.

Another challenge related to this topic is the importance of increasing the electrical grid capacity. Unfortunately, the Polish energy network is not presently adequate for electromobility-related goals. The most-mentioned solution which could minimise this challenge, according to the interviewees, could be the popularization of Vehicle-to-Grid (V2G) technology which could allow the return of surplus energy back to the grid

[15] PSPA (2021). How will e-mobility change the Polish labour market? Green sectors of the future

during peak demand hours. The technology has the potential to contribute to improving the stability of the energy system and could increase the Polish energy mix.

Finally, the interviewed representatives of the automotive industry pointed out the challenge related to the electrification of heavy-duty transport. Although Poland is the leader when it comes to the production and export of e-buses (e.g. in 2021 Poland was the 5th country with the highest registration of new e-buses in Europe[16]), there is little concern when it comes to e-trucks or e-vans. There is a need to include this aspect while preparing long-term strategies aimed at developing electromobility in Poland. This challenge is not only about technological aspects (e.g. the production of efficient batteries for e-trucks), but it is also a matter of proper planning when it comes to infrastructure (e.g. readaptation of motorway service areas – MOPs – in the context of heavy-duty vehicles).

Overcoming these challenges will need the cooperation of public administration and the industry which should, besides the above-mentioned aspects, focus in general on supporting the sale and production of electric vehicles. Most importantly, the automotive industry must be provided with the conditions to increase the attractiveness of the EVs fleet in relation to combustion vehicles by lowering their price and improving charging infrastructure. It is also essential to maintain the strategic and leading position of Poland in terms of lithium-ion battery production in Europe and worldwide.

As electromobility involves many challenges, all the interviewees also see it as an opportunity for new companies and new business models to appear. This applies not only to suppliers of goods (vehicles, parts, batteries, and charging stations) but also to companies operating in the service sector both in areas related to electromobility directly (such as vehicle charging, service of electric cars, and charging stations) and indirectly (e.g. in industries such as IT or shared mobility).

As a consequence, companies in the automotive sector will need to be prepared to implement costly low- and zero-emission investments to cope with changes in the market. The scale and pace of the adaptation process to the observed trends and challenges in the coming years will be critical for the development of the Polish automotive sector.

Vehicle manufacturers will be forced to look for innovative solutions and include services that were not previously associated with the car industry (e.g. IT industry). However, the transformation might be challenging, observed changes will not only pose threats but also open up new opportunities.

2.3 Production automation and digitalization

Almost certainly, digitalisation will play a crucial role in the transformation of the automotive sector in the upcoming decade. It is a challenge, but also an opportunity

[16] PSPA (2021). How will e-mobility change the Polish labour market? Green sectors of the future

to develop new business lines related to vehicle maintenance throughout their lifetime.

The interviewees agree that digitalisation in the automotive industry will be throughout the life cycle and will not only apply to the production stage, but will also be included within the manufactured cars. What is important, technologies such as AI, 5G, IoT and robotics are becoming more and more complex, as well as compatible with some other processes. For instance, it is anticipated that in-build car software will be synchronised with road infrastructure allowing up-to-date and real-time data acquisition and analysis. Data obtained from vehicles will be also used for maintenance purposes (e.g. information about needed servicing or repairment) or automotive-related digital services (e.g. connected payments for parking through integrated applications in the car).

SDCM (Stowarzyszenie Dystrybutorów i Producentów Części Motoryzacyjnych – eng. *Association of Distributors and Manufacturers of Automotive Parts*)[17], estimates that in 2025, nearly 40% of passenger cars and delivery vehicles will have integrated basic digital functions (the so-called “connected features”). The key players in the automotive sector will need to then consider that the competition will be within the digital services market, where the quality of data will be associated with the quality of the service and product itself. As digital technologies in the car industry advance rapidly generating new data, digitalisation is even more of greater importance to a whole new range of players in this growing market which could offer new products based on innovative business models.

Therefore, the transition will be especially important in the area of software, which will also result in the increased demand for high-skilled professionals, e.g. programmers or engineers specialised specifically in electromobility. On the other hand, automation of production is another issue that may affect the Polish labour market, reducing the number of blue-collar employees. These processes have, of course, been going on for some time, but further developments in automation technology and digitalisation can accelerate them.

2.4 R&D ecosystem development

Due to the technological backwardness inherited from the period of the Polish People's Republic, the Polish automotive industry developed mainly on the basis of licences and know-how from Western leading car brands. Similarly, sub-suppliers tended to supply parts to foreign car manufacturers, which were created within local economic ecosystems often created within Special Economic Zones (SEZ). The largest one is Katowice Special Economic Zone with two Stellantis group automobile manufacturers: Opel Manufacturing Poland and FCA Poland S.A. There are also

[17] Based on the information from the interview.

numerous associated plants within this zone, whose business model is based on supplying these manufacturers.

While the future of car manufacturing plants depends largely on the owners of these brands, Polish influence over them is limited. The type of these factories is also a challenge. They are largely assembly plants rather than research and development centres. R&D centres are only just emerging, such as the one of BMZ Poland – a branch of a german Li-Ion battery manufacturer.

One of the reasons for this is the state of research and development in Poland. It is dominated by state-run research institutes, with a good level of scientific and research staff, but an outdated structure and unstable funding. At the same time, technological research is mainly financed by the state. For many years the leading opinion has been that these funds are too small in relation to current needs. The situation is improved by European Union funds, including international projects. However, the participation of Polish partners in programmes such as Horizon 2020 or Horizon Europe is negligible given the size of the country and its development potential.

The Polish authorities acknowledge these problems and one of the measures is the enactment of the National Smart Specialisation NSS, with environment-friendly transport solutions and automation and robotics of technological processes among them. Another government measure is the R&D tax credits and supporting strategic programs like Gospostrateg, which aims, among other things, to avoid the middle development trap.

The situation may be improved by the recently created Łukasiewicz Research Network. It brings together previously independent research institutes, including, among others, PIMOT (Łukasiewicz Research Network - Automotive Industry Institute). As part of the consolidation, regional technology institutes are also being created, combining R&D potential located in close proximity to each other. Examples of such institutions include the Łukasiewicz Research Network - Poznan Institute of Technology, which specialises in hydrogen technologies and Łukasiewicz Research Network - the Upper Silesian Institute of Technology, with expertise in engineering materials and manufacturing technologies. These institutions are increasing the scope of their activities, but they are still quite small-scale projects in terms of financial impact as well as the potential impact on the automotive industry.

3 Just transition pathways

Fostering just transition in the automotive industry will require dealing with the following challenges:

- Climate change and environmental considerations
- Digitalisation and electrification
- Digitalisation and automation in production
- R&D ecosystem development

which are described in the previous chapter.

The pathways proposed in the sectoral strategies should take into account both the positive and negative aspects of the expected changes associated with the transition. However, the transition will require enormous investment in technology, it will also involve social aspects (changes in employment, necessity of rebranding and reskilling).

The discussion around the just transition in the Polish automotive sector is mostly considered by the industry itself. What is noticeable is the lack of visible commitment on the part of the government and local authorities. This is surprising given the activity of authorities in other countries in the region. There are no governmental plans or strategies that suggest that there is no proper dialogue between private and public entities on that matter. The lack of a holistic and strategic approach, as most of the interviewees highlight, cumulates additional risks associated with the transformation. As a result, no major changes are expected in the automotive industry, especially in terms of component production for electric vehicles. Taking into account also the insufficient R&D activities in Poland, it also seems unlikely that transformation will be based on innovation.

3.1 Expected changes in the industrial sector

The European automotive industry has been preparing for the transition towards climate neutrality for a longer time. Quite a few major automotive corporations have pledged to end production of an ICE vehicle earlier than would be implied by the deadlines imposed by the European Union. The transformation process seems smoother for large, multinational companies, where decisions are often taken by the board of directors and affect all brand facilities.

Changes in the Polish automotive industry dependent on multinational companies will therefore be directly facilitated by these foreign decisions. On the contrary, the transformation of Polish companies independent of multinationals may not be as fast and smooth, as it will mainly be driven by government or national decisions. According to interviewees, companies (both foreign-owned and domestic) are adapting, but this is only a consequence of internal company strategies.

There is no doubt that leat least a part of the Polish automotive industry will adapt to the upcoming changes, while the other part will go out of business or collapse. Regarding the vehicle manufacturing entities, where a significant part of the Polish market is related to the production of parts and components, it is expected that combustion engines will no longer be produced. Additionally, there is a high possibility that some of the businesses specialised in components will move their operations to other (non-EU countries), where climate policy may be less ambitious allowing uninterrupted ICE production. However, on the other hand, it is also feasible that a significant part of the market will re-brand and adapt to new realities and begin producing parts and components for electric vehicles.

The transition of the automotive sector and the increasing use of electric vehicles is also a great opportunity for battery and component manufacturing and their recycling sector. Poland is already a major player in this area in Europe and even worldwide, and this trend is expected to grow. Hence, new companies prioritising circular economy principles in the whole life cycle of the products might appear on the market.

In addition, it is very important for the transition that the industry will have an access to green and clean energy sources. Hence, industrial facilities should invest in renewables and improvement of energy efficiency. Here, however, state support is needed, which is insufficient.

3.2 Expected changes in the labour market

The transformation of the automotive industry will affect the Polish automotive sector. The latter is concerned that the number of jobs will shrink as a result of the transformation, especially in the subsectors of car parts and components.

Reductions are inevitable, not only because of automation of production. Many of the current jobs associated with an ICE are at risk, as BEV needs about 30% fewer parts. Admittedly, new jobs can and probably will be created, but we estimate that this is not necessarily at the same location and time. This results in the fact that the employees in this area of production might be negatively affected by the transformation, as they may have problems in reskilling and retraining. They may also be affected by the geographical factor - new jobs will be created elsewhere than the current ones.

The development of e-mobility may also be perceived as a chance for the industry in terms of bus production. At present, Poland is one of the biggest manufacturers of urban battery electric buses in Europe [18] and the fifth battery producer in the world[19]. Further development of e-mobility will increase the number of jobs in the whole production chain. The vehicle services and repair industry will also need to change. It will be crucial to retrain staff on the specifics of the BEV in terms of motors and

[18] https://ceesen.org/en/2022/07/20/polish-electric-buses-the-most-exported-in-eu/

[19] https://about.bnef.com/blog/chinas-battery-supply-chain-tops-bnef-ranking-for-third-consecutive-time-with-canada-a-close-second/

batteries. Some of the repairs will be the same; however, knowledge of the new drivers will be important.

According to the PSPA, there are going to be additional trends in electromobility influencing employment in the automotive industry. In terms of car production, it is expected that it will not reach the pre-pandemic levels and will decrease by 0.6% annually until 2030 which may reduce the number of manual workers in the industry[20]. The development of digitalisation will also come into force as it is anticipated that the market for vehicle software will increase by 11% per year that is from ca. €329 per vehicle in 2020 to around €900 per vehicle in 2030 (increasing at the same time production efficiency). There will be also changes in vehicles' material characteristics with the increasing share of premium products and the constantly growing need for additional materials (an increase of 1,9% each year).

What is also very essential for the transformation towards electromobility is constant investment in higher education focused on e-mobility – both in secondary and higher technical schools. Poland is already offering various programmes that allow future employees to get specialised in electromobility, however, this pace of training and reskilling needs to be more dynamic and practical-oriented.

3.3 Strategies for a Just Transition

Despite the industry's interest in creating a Strategy for a Just Transition for the automotive sector, which would help to reinforce the issue in the public debate and give direction to the development of the industry, there is currently no such official document in Poland. Efforts to prepare such a strategy come mainly from private actors, while the public administration does not consider it a priority. There is an urgent need to enable Just Transition in the automotive industry, but what is needed first and foremost is a dialogue between the various stakeholders.

3.3.1 Political strategies: Recommendations from ministers and/or political parties on how to manage the transformation

The most important problem noticed during the project is the lack of dialogue between the public administration and the automotive industry. The development of the sector should be preceded by a series of discussions and analyses that take into account the need of the interested groups. The transformation of the automotive industry sector is not a priority for the government, especially at the time of the economic and energy crisis caused by the Russian invasion of Ukraine.

The Polish government also does not have a clear and in-force strategy for the transformation, providing direction to the changes, defining milestones and stages of the transformation. As it was very often mentioned by the interviewees such a strategy will allow the estimation of costs which would be very helpful for the transformation.

[20] PSPA (2021). How will e-mobility change the Polish labour market? Green sectors of the future

The lack of financial support for the development of heavy transport is also an important issue. Even though Poland is the European leader in this segment. Only a well-thought-out strategy for the development of the sector combined with a series of planned actions and interventions, together with financial support, will allow for rapid development and maintain its leading position.

The transformation will also not be possible without access to cheap, green and clean energy. The government should quickly unblock renewable energy in Poland, remove restrictions in its development (e.g. Distance Law) and support its development financially.

The transformation would certainly be boosted by the implementation of regulations that help to reduce emissions from transport. These include solutions such as an emission-based tax and measures to decarbonize Poland's increasingly ageing vehicle stock.

3.3.2 Enterpreneurial strategies: Which new products can/are currently already being switched to by automotive companies and suppliers

The situation will not improve quite a bit in the event of a transition to electromobility. Polish technological capacities are failing to create a Polish car brand. At the moment, such an attempt is being made with the creation of the "Izera" electric vehicle factory, which, however, will be largely based on technology imported from outside.

Hope for the development of innovative, entrepreneurial ventures can also come from the numerous technological universities that educate in the field of automation. These include faculties such as transport, mechanical engineering, materials engineering and environmental protection.

The laboratories available to them are not sufficient for the creation of innovative new products that could be commercialised for the benefit of the Polish automotive sector, but they do provide highly qualified personnel. There are also institutions such as incubation and technology transfer centres offering professional services related to the establishment of spin-offs. The problem, however, is the high barrier to entry the market.

The authors of the study see an opportunity for Poland as a supplier of software to the automotive industry. Poland is already a European leader in software development. In contrast to the automotive industry, research and development centres are also being established and the development of new computing techniques, including quantum computing, is dynamic.

3.3.3 Trade union strategies: What unions propose in the face of the upcoming changes

As Poland has a wide variety of small and medium-sized companies specialised in component production, automotive industry associations or unions play a crucial role

in shaping just transition pathways. They actively represent all members, trying to influence the public debate on topics such as the decarbonisation of the car industry.

The automotive industry is aware of the changes that are happening. It is very important to prepare this sector for the new realities. However, those changes and bans for sale ICE should result directly from changes in consumer behaviour and needs, support from the government is also necessary. Decisions made top-down by the EU have stopped the spread of work on low-emission engines and steered automotive development on e-mobility.

A major improvement is required, especially when it comes to the dialogue between the administration, policymakers, and private actors in the automotive industry. It is essential to develop comprehensive and coherent strategies for the development of the sector and to take appropriate legislative actions.

Transformation of the sector will consume huge financial resources. This includes manufacturers of vehicles, parts, and components, as well as service and repair. Implementation of financial support from public funds and all kinds of investments which will allow the transition is very important, especially for smaller companies that would not have enough time and own financial resources to adapt to the new reality. However, there are no plans to launch such subsidies.

The transition may strongly affect the Transport-Spedition-Logistics sector. There is a lack of electric tracks on the market, and it is not clear in which direction the development of the sector should move. Taking into account the current energy crisis and the war in Ukraine, completing the supply chain shortage and providing tangible solutions for the development of the industry will be of great importance today.

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