Recharging the batteries: How the electric vehicle revolution is affecting Central, Eastern and South-Eastern Europe

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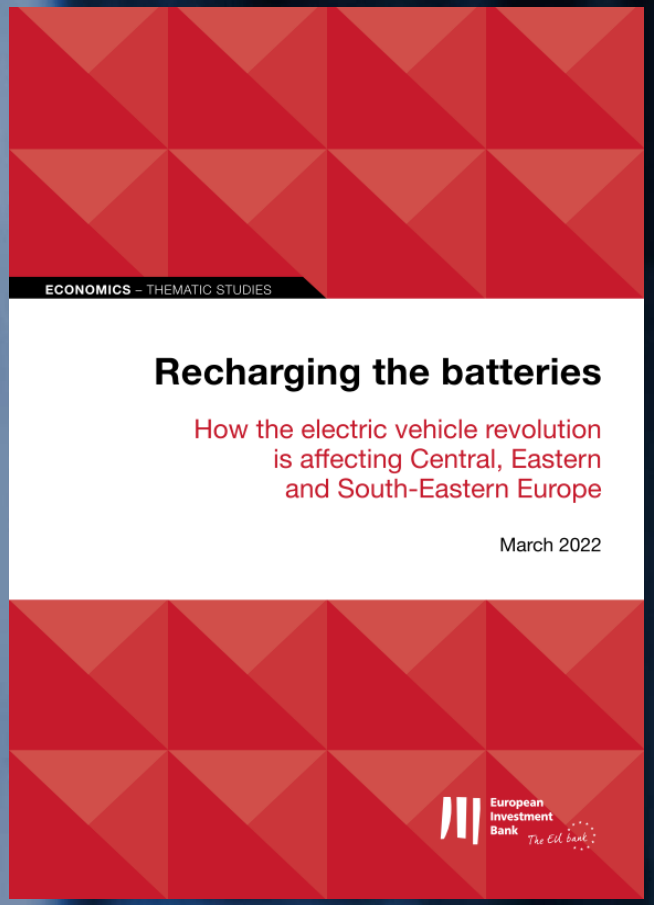
International Conference on Automotive Industry 2022

ŠKODA AUTO University

Mladá Boleslav, CZ - June 08, 2022



Overview

Selected global trends and structural transformations ahead

The pathway to electrification

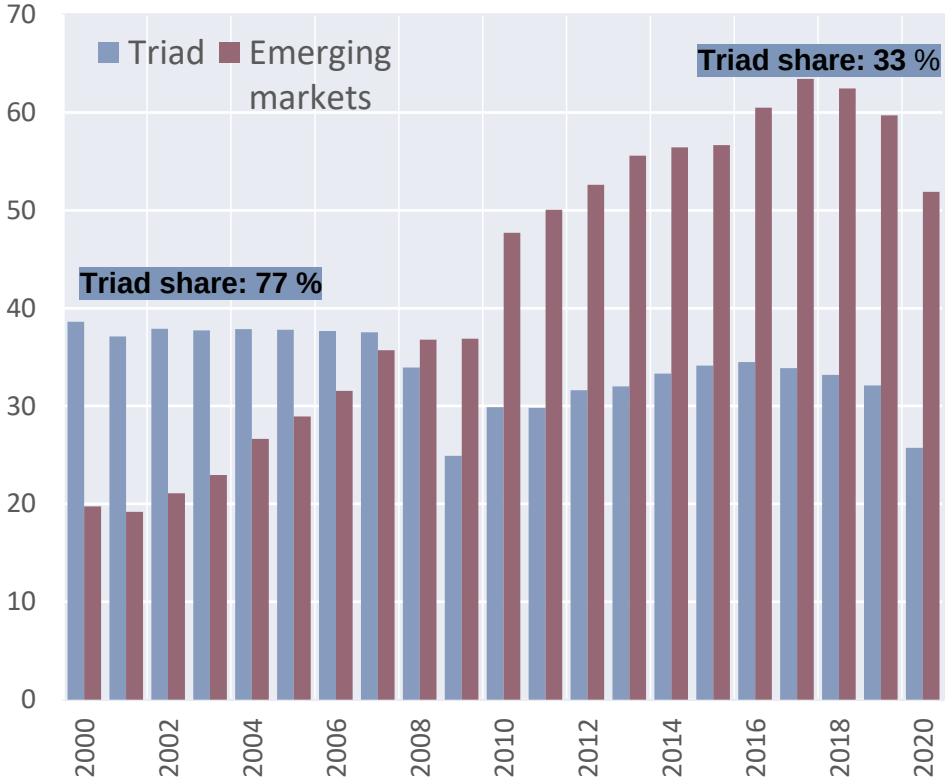
Automotive sector in CESEE: ready for transformation

Implications, risks and opportunities

Global patterns and trends

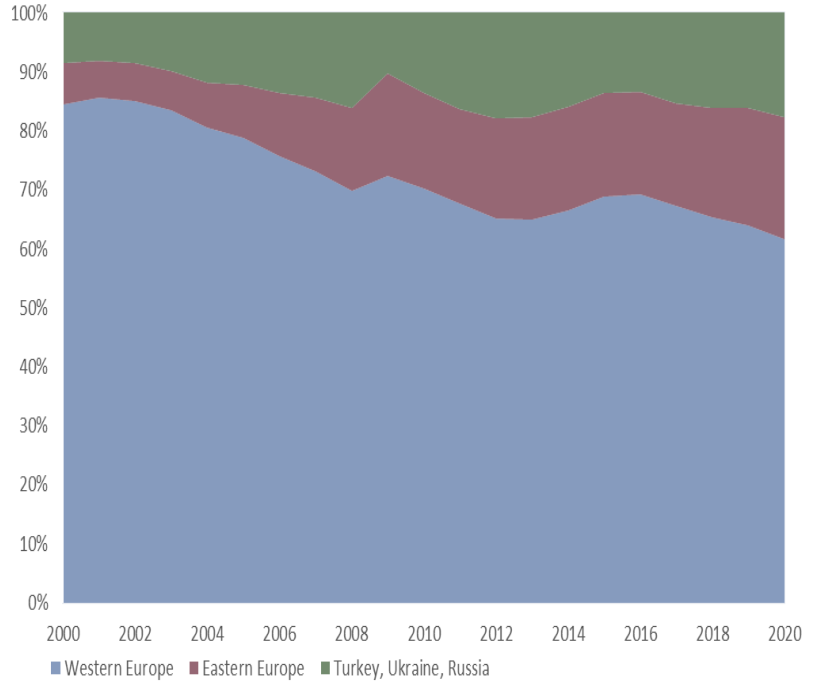
World production patterns and trends

World production (number of vehicles, mn)



Source: OICA.

Europe

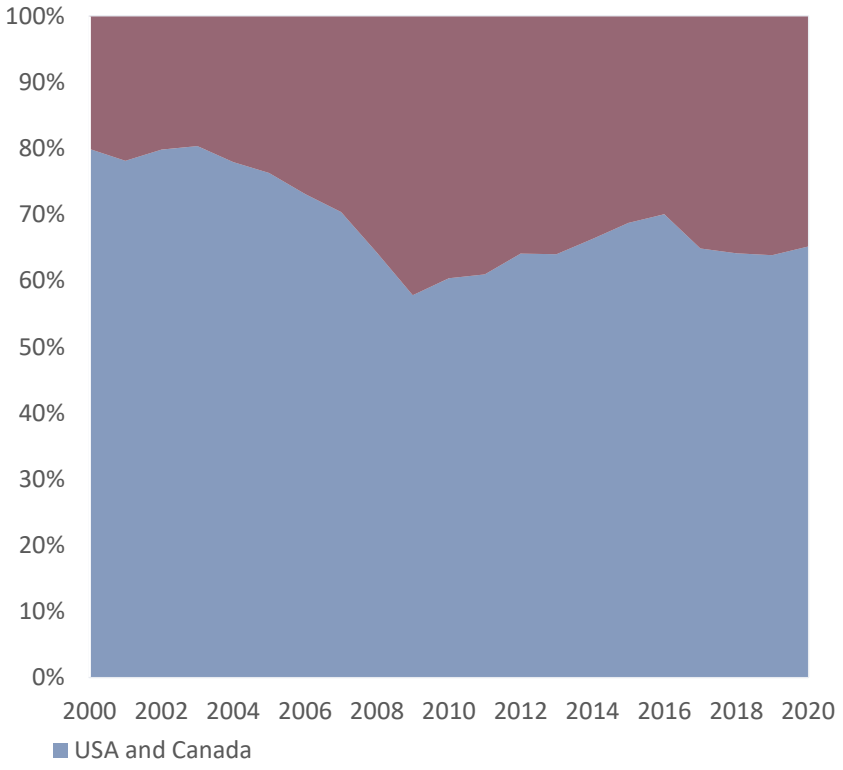


Source: OICA

*Triad: EU, JP and US

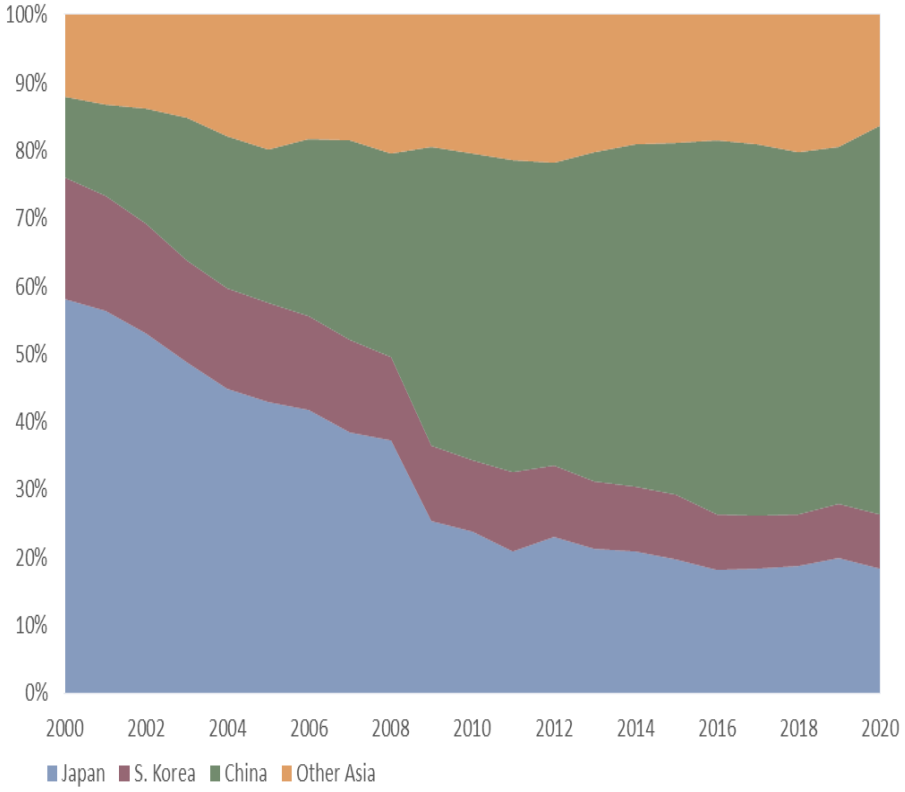
World production patterns and trends

America



Source: OICA

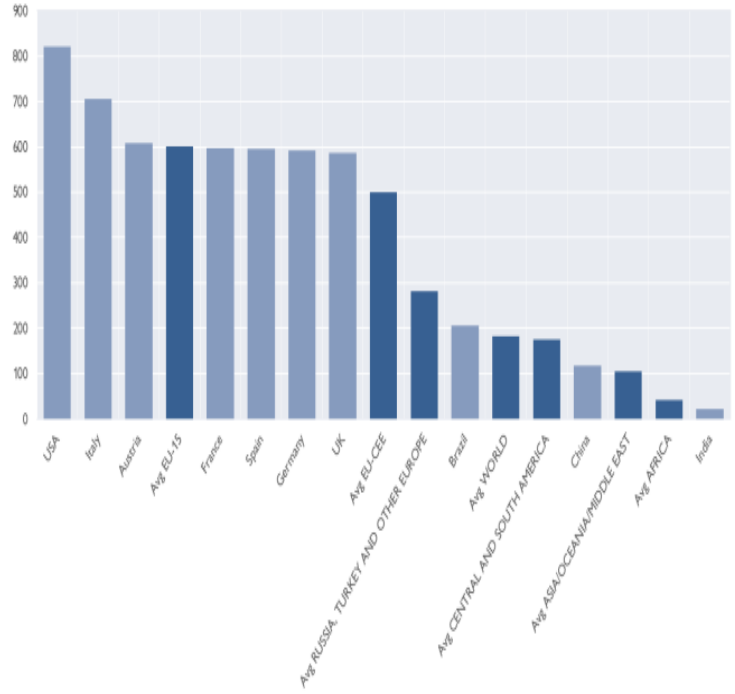
Asia



Source: OICA

Usage rates are still very different

Motorisation rate (vehicles per 1 000 people, 2015)



Source: ACEA.

Strong impact of COVID-19 pandemic

New vehicle registrations across the world (million vehicles)

	2019	2020	% change
Europe	20.9	16.7	-20.2%
EU27, EFTA, UK	18.4	14.1	-23.6%
Russia, Turkey and other	2.5	2.6	5.1%
NAFTA	20.3	17.0	-16.6%
Latin America	4.5	3.3	-26.9%
Asia, Oceania and Middle East	43.5	40.1	-7.8%
China	25.8	25.3	-1.9%
Japan	5.2	4.6	-11.5%
Oceania	1.2	1.0	-14.8%
Middle East	1.1	0.9	-19.6%
Africa	1.2	0.9	-22.6%
World total	90.4	78.0	-13.8%

Source: ACEA.

The pathway to electrification

Long-term and new short-term trends at play, on top of electric transformation

LONG-TERM TREND

- Relocation of production to Emerging markets: in triad (EU15+USA+JP) from 70% in 2000 to 33% of world production

MORE RECENT MOBILITY TRENDS

- Autonomous vehicles
- Shared mobility and connectivity
- Public transport and interconnectedness

COVID-19 RELATED

- Collapse in sales and production
- Supply bottlenecks (chip shortage)
- Increased teleworking and social distancing

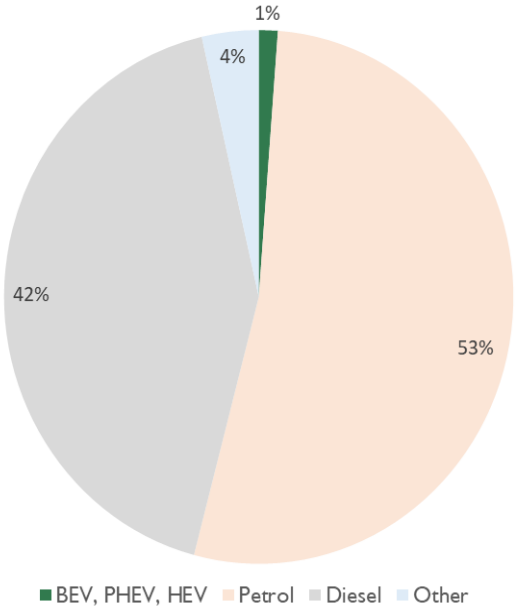
WAR RELATED

- Supply (and price/demand) factors

The adoption of electric vehicles is taking off rapidly

Vehicles in circulation in Europe

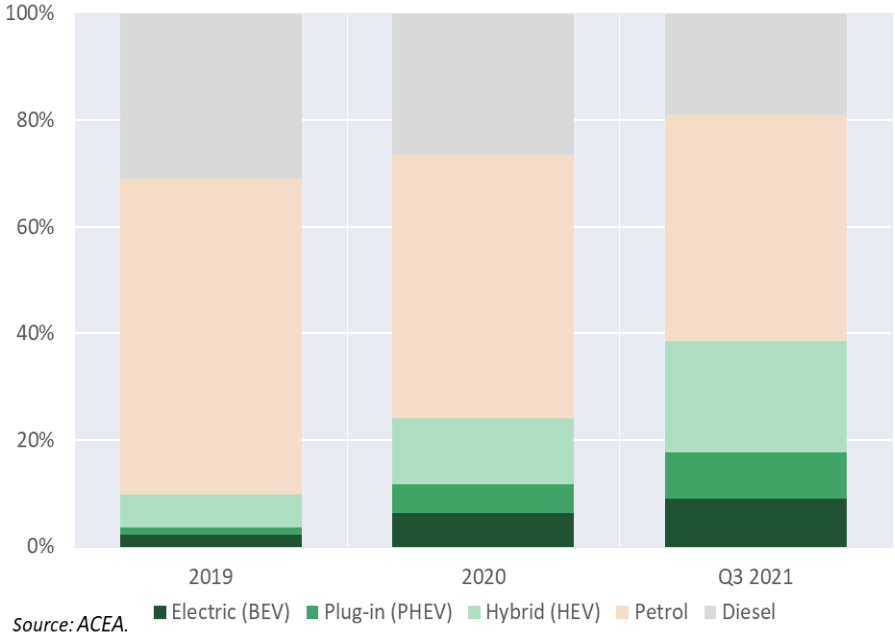
(% on total, 2019)



Source: ACEA.

New vehicles sales in Europe

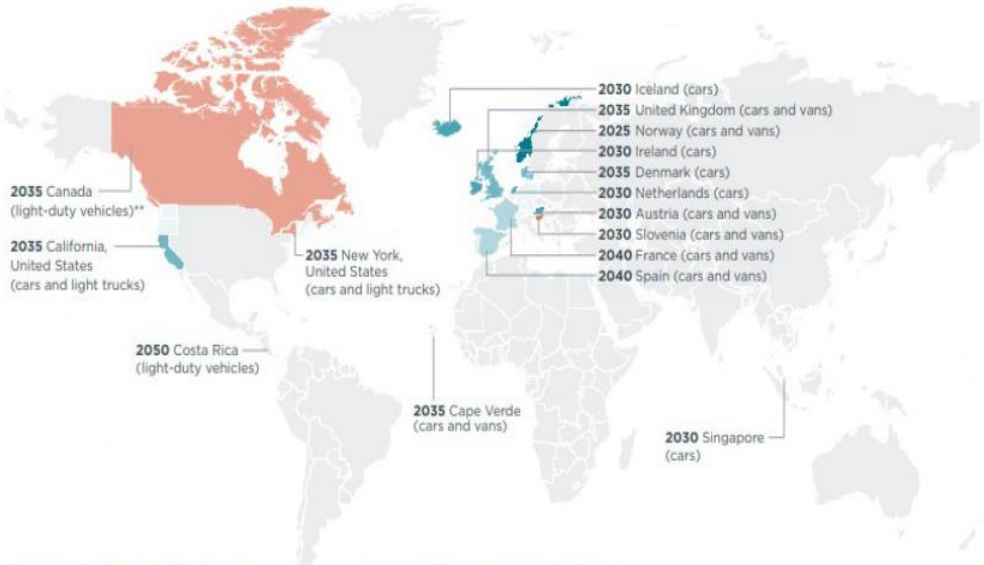
(% on total)



Source: ACEA.

Note: BEV … battery electric vehicles, PHEV … Plug-in hybrid electric vehicles, HEV … Hybrid electric vehicles, FCEV … Fuel cell electric vehicles (hydrogen)

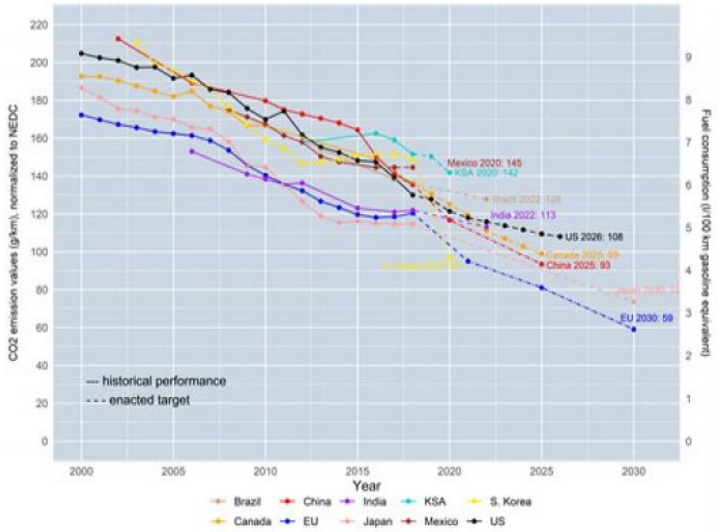
Governments' target dates for a 100% phase-out of sales/registrations of new internal combustion engine cars (as of September 2021)



* Includes countries, states, and provinces that have set targets to only allow the sale or registration of new battery electric vehicles (BEVs), fuel cell electric vehicles (FC vehicles (PHEVs). Countries such as Japan with pledges that include hybrid electric vehicles (HEVs) and mild hybrid electric vehicles (MHEVs) are excluded as these ve
** The Canadian province of British Columbia has set its 2040 target into binding regulation; the Canadian province of Québec has also set a target for 2035.

Source: International Council on Clean Transportation (ICCT).

Passenger car CO_2 emission and fuel consumption values (normalised to New European Driving Cycle[14])



Source: International Council on Clean Transportation (ICCT, updated May 2020).

New internal combustion engine vehicles might be implicitly disqualified from the market earlier as the set CO2 targets require average petrol consumption per 100 km that will soon be technically infeasible without the employment of electric vehicles, despite the continuously increasing efficiency of combustion engines.

Acceleration of electrification trend in EU to a large extent driven by regulation

European Commission

European Green Deal

(climate neutrality in 2050)

European Commission "Fit for 55" package (July 2021)

CO2 Emissions: **-55%** by 2030, **-100%** in 2035

"all new cars registered will be zero emission"

Upcoming Euro 7 targets

100% phase-out of sales of new internal combustion engine cars

Norway (2025), Netherlands, Slovenia, Ireland, Austria (2030), UK, Denmark (2035), France, Spain (2040)

De facto ban on fossil-fueled engines from 2035

Quick rush of all major automotive producers toward ambitious electrification targets

Share of Battery Electric Vehicles (BEVs) in total sales: producers´ targets

	2025		2030	
	EU	World	EU	World
Toyota				50%
Volkswagen			70%	50%
Skoda (VW Group)		25%		
Audi (VW Group)		**40%**	**100%**	**100%**
Hyundai-KIA		15%		40%
GM*			**100%**	**100%**
Ford			**100%**	**100%**
Renault		30%		90%
Stellantis (PSA, FCA)			70%	
Daimler**	**50%**		**100%**	**100%**
BMW		25%		50%
Jaguar	**100%**	**100%**	**100%**	**100%**
Honda				40%
Nissan			**100%**	**100%**

*by 2035;** incl. PHEV;
Source: Companies` plans and announcements.

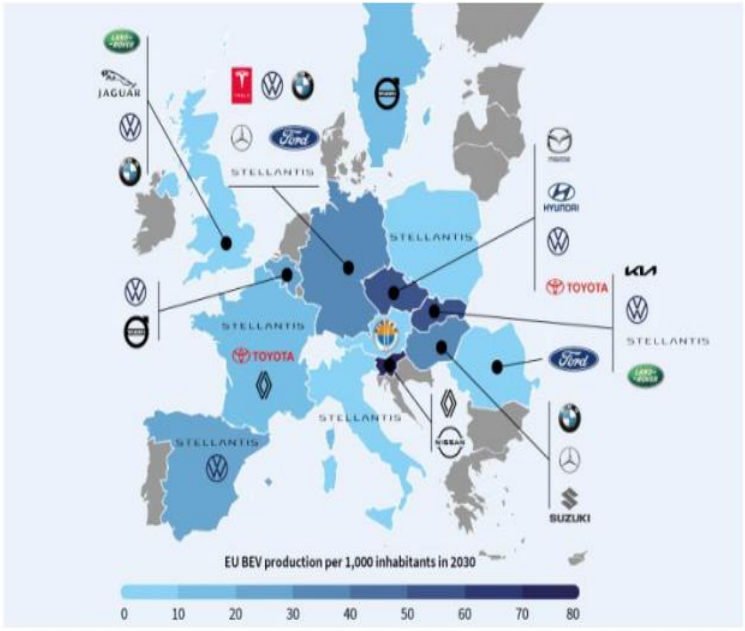
Sales of petrol and diesel cars declined by more than 35%, while hybrid vehicles and battery electrics almost doubled. This electrification of sales continued in 2021: almost 40% of new car sales were battery electrics, plug-in hybrids or hybrids (with 18% covered by battery electric and plug-in hybrid vehicles), up from a mere 10% in 2019.

Yet there will still be a role for traditional internal combustion engine vehicles and hybrid models. Some automakers see (partial) internal combustion engine vehicles only as an **interim solution before the ultimate breakthrough of full electric vehicles** in developed and - with a delay - emerging markets. Various companies have explicitly or tacitly voiced that internal combustion engine vehicles will continue to play a role in their plans - in emerging and developed countries - at least in the short term.

Many major automakers see alternatives such as fuel cell technology as very promising (fuel cell technology, hydrogen, e-fuels (electrofuels, synthetic fuels). As a result, while the European automotive industry argues in favour of an open technological race to achieve CO2 reduction objectives, **it seems that for now this race has been won by electric vehicles** and that not even e-fuels can save the internal combustion engine. Consumers seem to get adapted to electric cars.

Quick rush of all major automotive producers toward ambitious electrification targets

Forecast of Europe's battery electric vehicle production per population unit in 2030



Note: Only carmakers with battery electric vehicle production above 10 000 units are displayed.

Source: Transport & Environment, based on IHS Markit car production forecast (202106_EV_Report-Final (transportenvironment.org)).

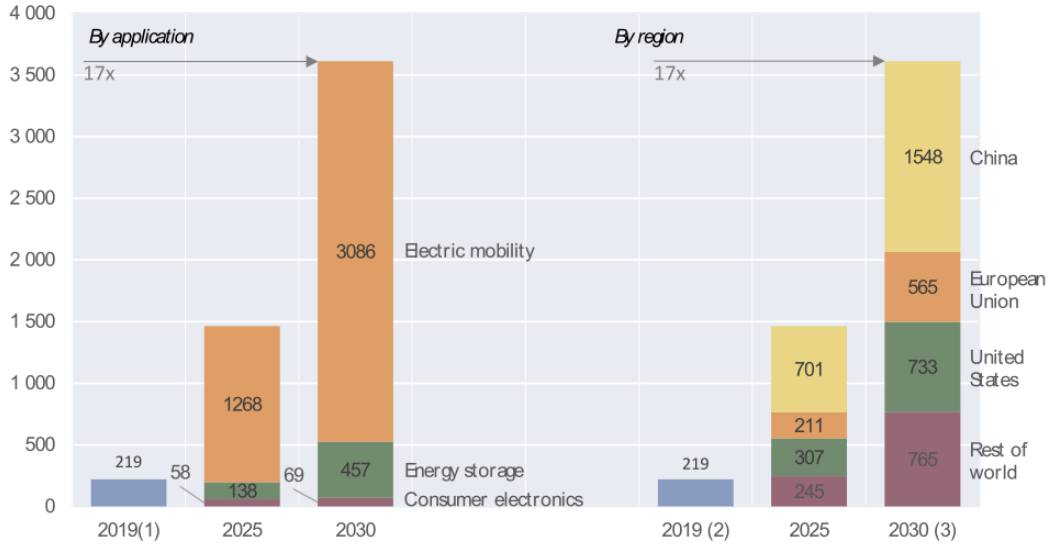
Even the most optimistic electric vehicle sales targets from automakers might not be sufficient to achieve carbon neutrality by 2070, and even less so by 2050.

The IEA thus projects the sales share of electric vehicles to go up from about 5% globally (10% in Europe) in 2020 to 17-36% in 2030 (36-78% in Europe 19), depending on the scenario. However, in another publication, the IEA estimates that for net carbon neutrality to be reached by 2050, the number of electric vehicles worldwide would have to rise to 350 million in 2030 (50% of sales in emerging and developing markets and 75% in developed markets) and 2 billion in 2050 (IEA 2021b).

The organisation [Europe's leading clean transport campaign group] concludes that even in the best-case scenario (with carmakers delivering on production plans and voluntary commitments), estimated battery electric vehicle sales in the European Union would be around 57% in 2030, still 10 percentage points short of a Green Deal-compliant trajectory that requires battery electrics to account for no less than 67% of sales by then.

Batteries play key role in localization of production and vehicle costs

Global battery demand (GWh) forecasts



(1) of which 171 GWh for electric mobility; (2) of which 24 GWh for the European Union; (3) figures do not sum to total because of rounding.

Source: McKinsey analysis (2020) based on Global Battery Alliance and World Economic Forum data.

Capacity announcements in Europe have ramped up since 2019, though many have not been implemented yet.

The European automotive industry in particular needs a competitive and innovative battery industry with **all up and downstream stages to be developed** on an unprecedented scale.

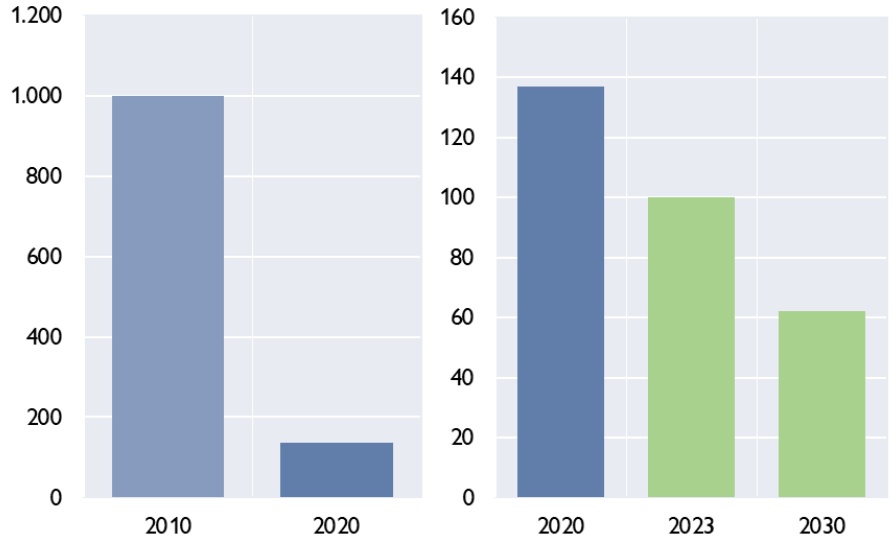
Asia currently accounts for over 80% of total installed capacity of Li-ion batteries (with China alone representing over 70% of the total), whereas Europe accounts for less than 10%.

The **battery supply chain is not limited to the central stages of cell manufacturing**, battery module and pack assembly. It also includes the upstream stages of raw and processed materials supply and logistics, active materials and cell components manufacturing and the downstream stage of (cell to metal) recycling, after the installation and use of batteries in electric vehicles, at the end of their life cycle.

Batteries play key role in localization of production and vehicle costs

Battery pack costs over time

Pack wholesale cost (USD/kWh)



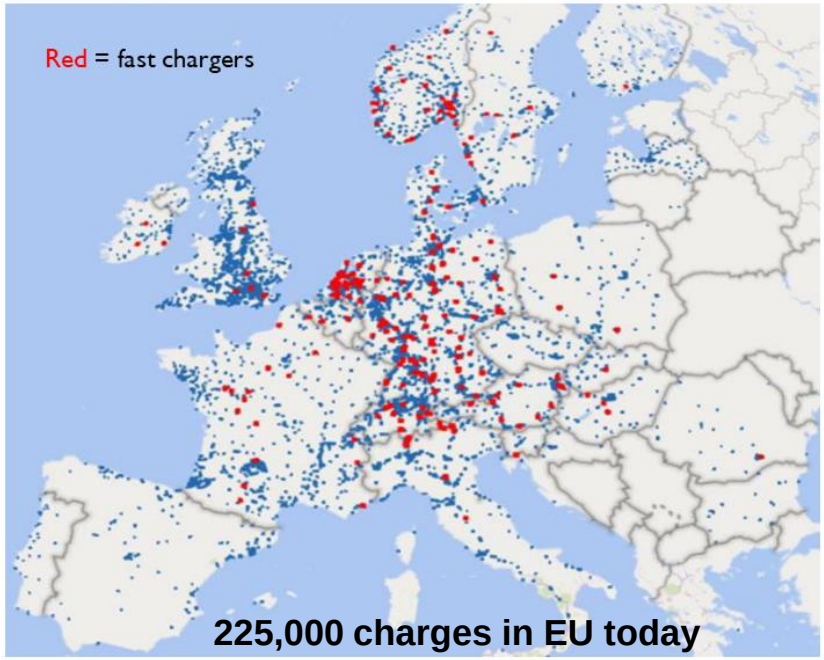
Note: the newest generation of the Li-ion battery pack.
Source: BNEF, LMC automotive.

Planned and realized gigafactories

Source: Deloitte, 2021.

Charging infrastructures a key prerequisite, but actually with very uneven distribution across Europe

Publicly accessible charging points



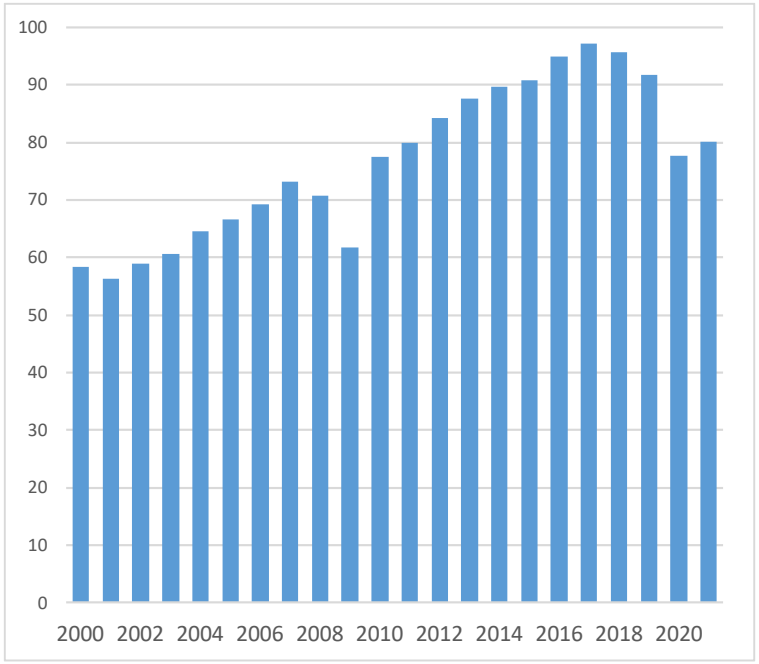
Source: T&E, 2020.

At least **1 mn publicly accessible recharging** stations are expected to be in place **by 2025** (European Green Deal) and **3.5 mn by 2030** ("Fit for 55" package), one **every 60 km**

Automotive sector in CESEE: ready for transformation

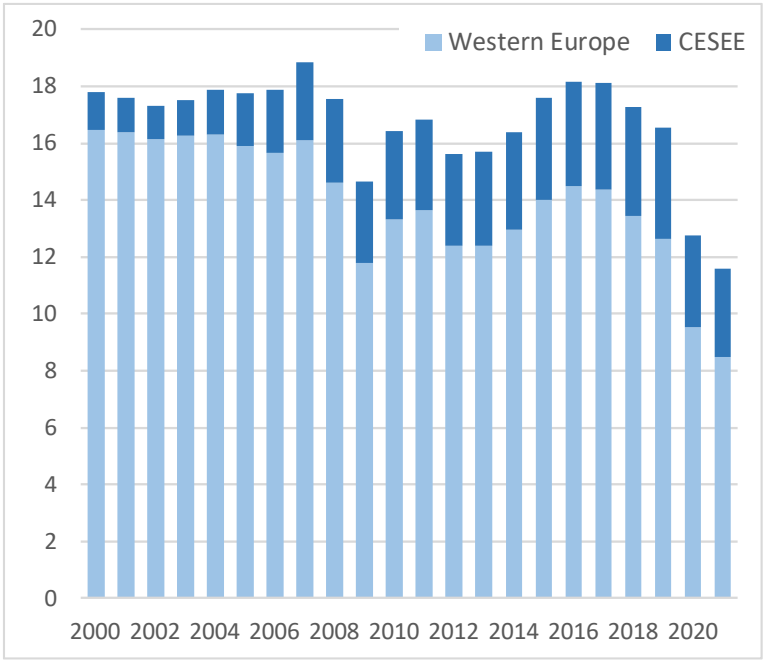
The general uncertainty, weakening of economic growth and higher inflation will weight on the sector

World Production (number of vehicles, mn)



Source: OICA

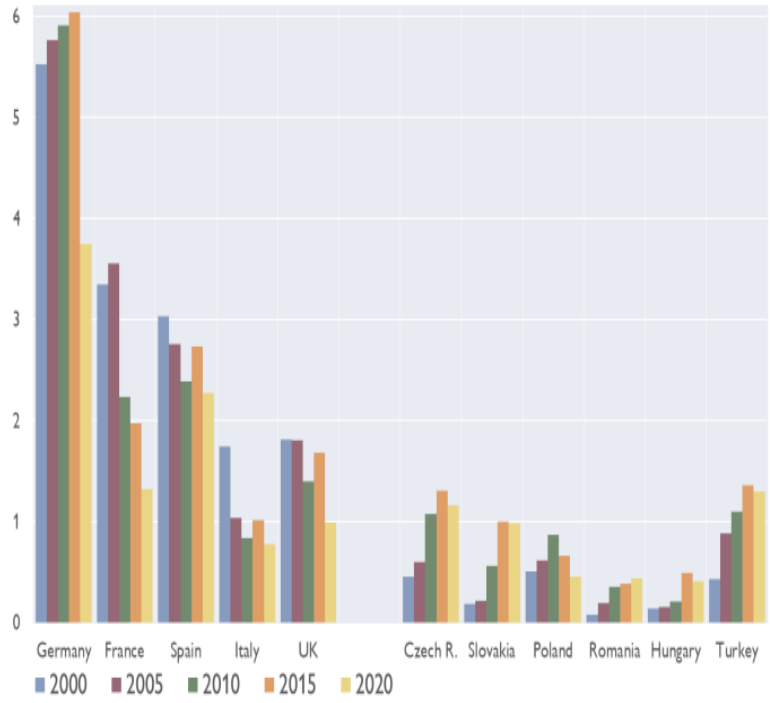
European Production (number of vehicles, mn)



Source: OICA

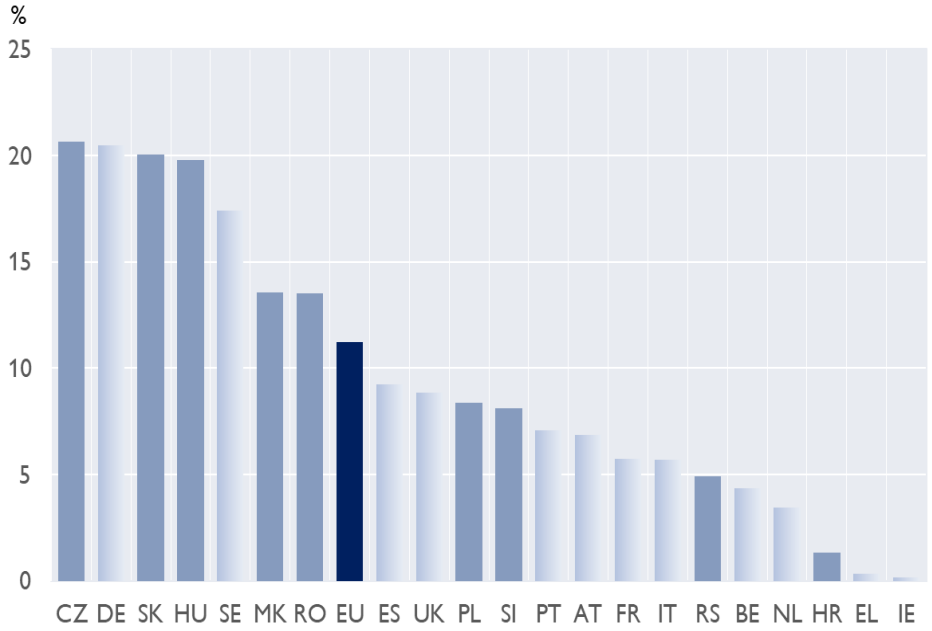
Strong specialization on the automotive industry in CESEE

Vehicle production in the last two decades (millions of vehicles)



Source: OICA.

Automotive sector value added (in % of manufacturing)



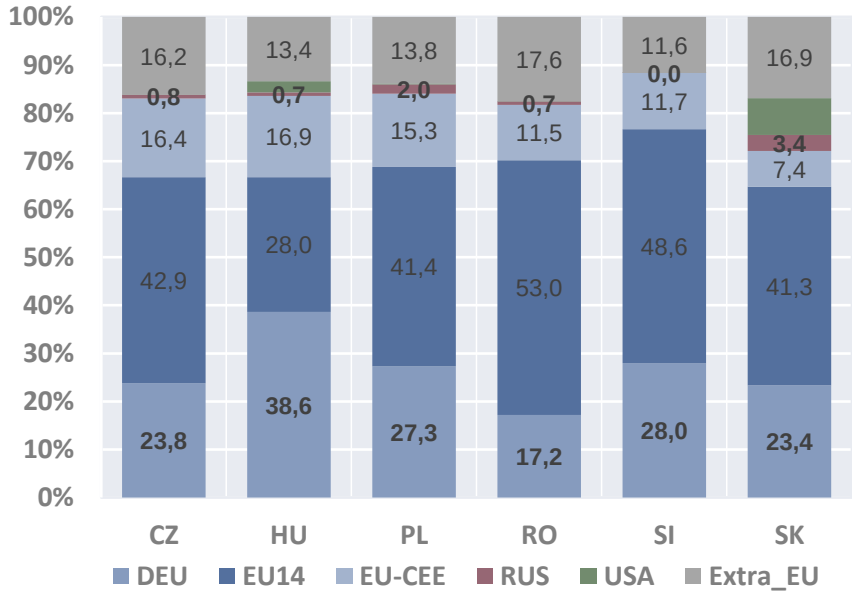
Note: Automotive sector defined as NACE rev. 2 C29 'Motor vehicles, trailers and semi-trailers'.
Note: EU includes the EU27+UK.
Source: OeNB.

Exports heading towards Germany and the EU

Automotive exports (in % of total exports)

Note: Automotive sector defined as NACE rev. 2 C29 'Motor vehicles, trailers and semi-trailers'.
Source: UN Comtrade.

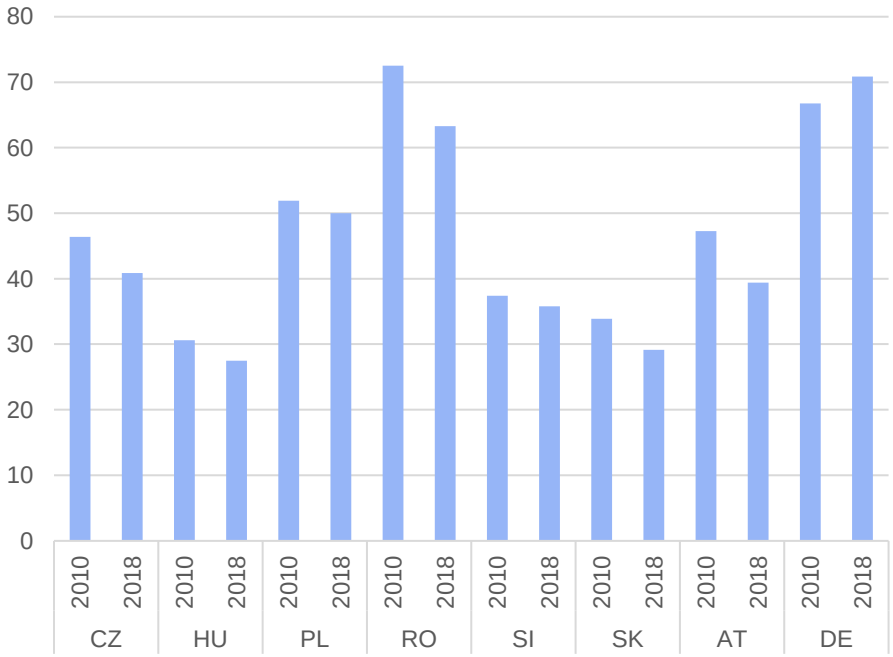
Motor vehicles exports (291), by region



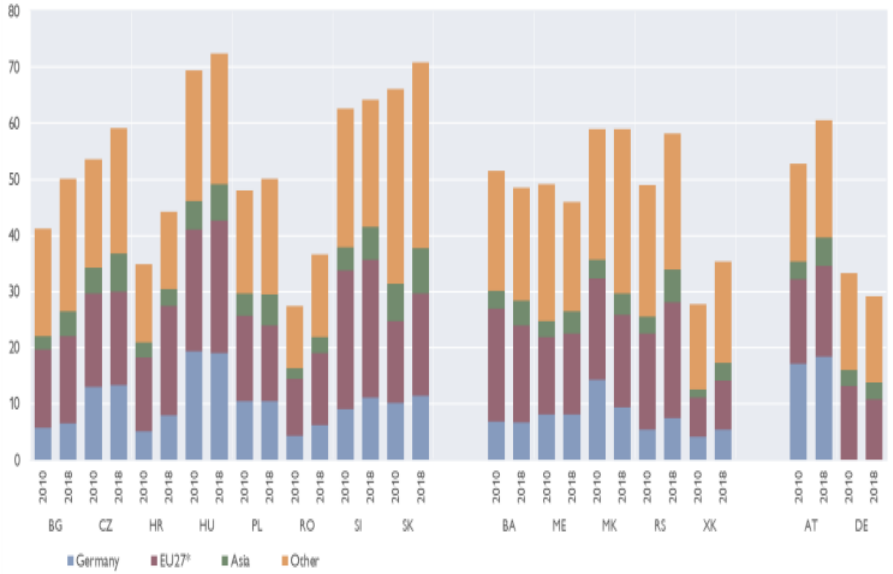
Source: UN COMTRADE.

CEEC supply chains: Slightly increasing role of imports from China

Domestic value added content of exports, 2010 and 2018



Foreign value added content of exports of transport equipment (NACE rev. 2, CL, C29+C30), 2010 and 2018



Note: EU27 denotes EU27 without domestic and Germany. Asia includes China, South Korea and Taiwan.*

Source: wiiw multi-country input-output database (wiiw MC-IOD).

… and CESEE risk to remain trapped in low value-added value chain functions

Relative functional specialization measure of the automotive sector

Germany

Note: Automotive sector defined as NACE rev. 2 C29 'Motor vehicles, trailers and semi-trailers'.
Data based on the fDI markets database.
Source: Stoellinger, 2021.

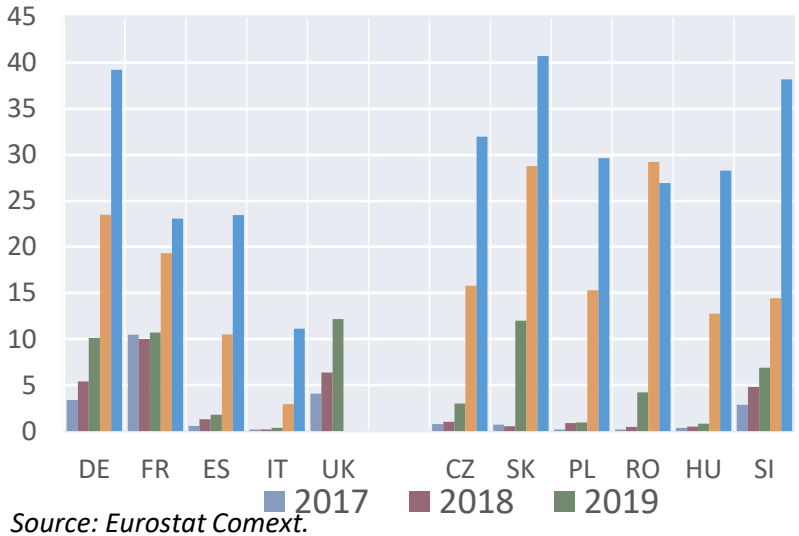
Czech Republic

Note: Automotive sector defined as NACE rev. 2 C29 'Motor vehicles, trailers and semi-trailers'.
Data based on the fDI markets database.
Source: Stoellinger, 2021.

Transition to electric vehicle production taking off in 2020

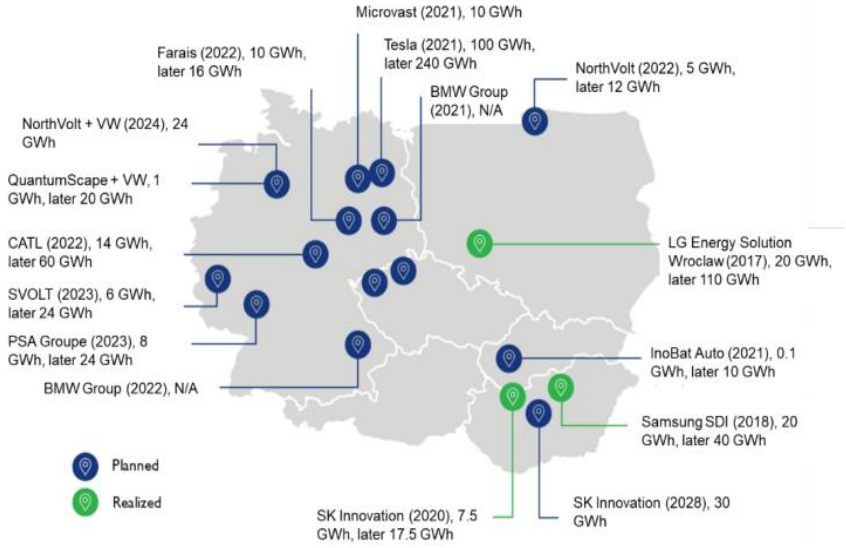
Exports of electric and hybrid cars

(share in % of total exported cars, 2017-2021)



Source: Eurostat Comext.

Planned and realised gigafactories in Central Europe



Source: Deloitte (2021).

Although the picture across the region is somewhat varied, **several CESEE countries are fully involved in the electrification process** and appear to have the potential to reap significant benefits from the electrification trend. CESEE automotive factories are heavily affected, given their **high level of dependence on the strategies of major automakers** and on the decisions taken in their respective headquarters. In many cases, countries in the region are expected to benefit: a large majority of the models they produce are set to be electrified and electric production in their factories will increase. **Some CESEE countries have the potential to become key focal points for electric production,** at least based on announcements by major automakers.

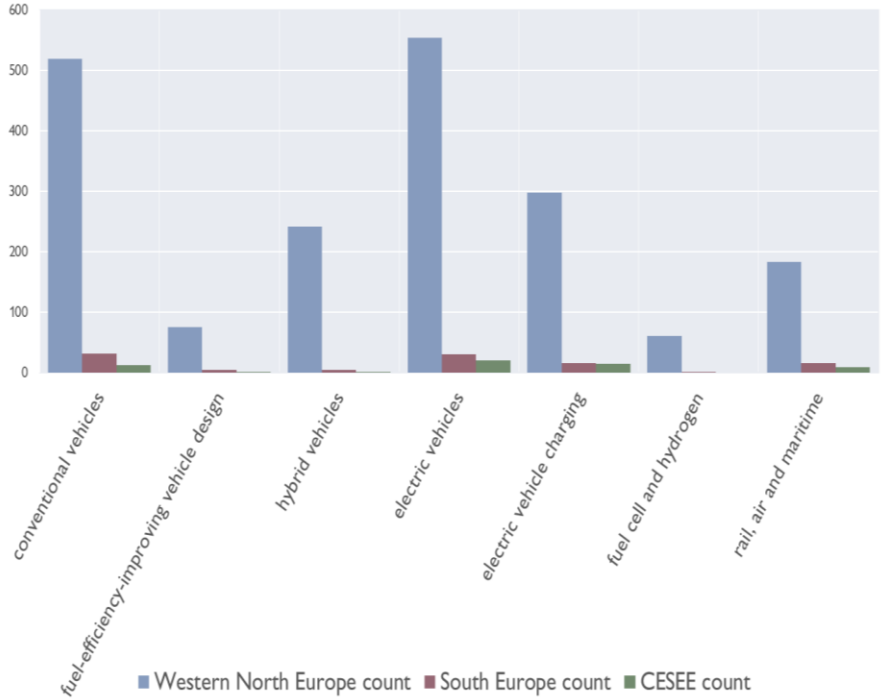
Not only major automotive producers: Rimac and other innovators

https://www.dreamstime.com/photos-images/rimac-car.html

https://www.dreamstime.com/sin-cars-l-city-geneva-switzerland-march-electric-cargo-van-presented-annual-international-motor-show-image144498517

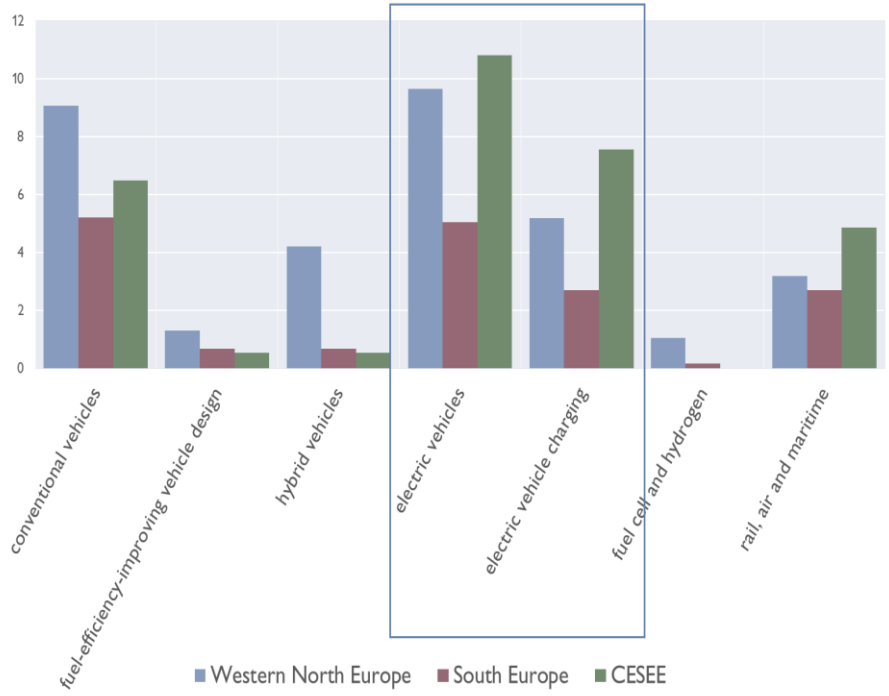
Catching-up in innovation activity a key prerequisite

Number of green patents in transport sector



Source: PATSTAT.

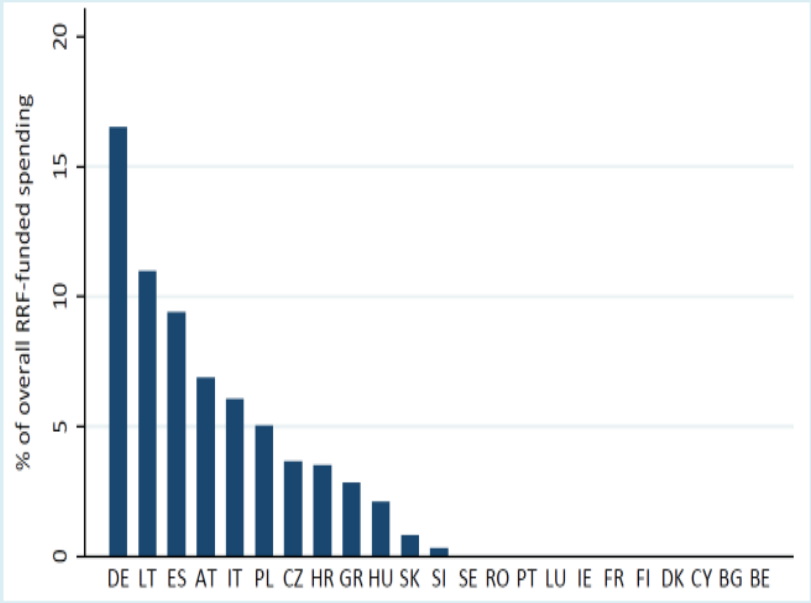
Share of green patents in transport sector (%)



Source: PATSTAT.

Recovery and Resilience Facility funds: only a small share goes to automotive and supporting infrastructure

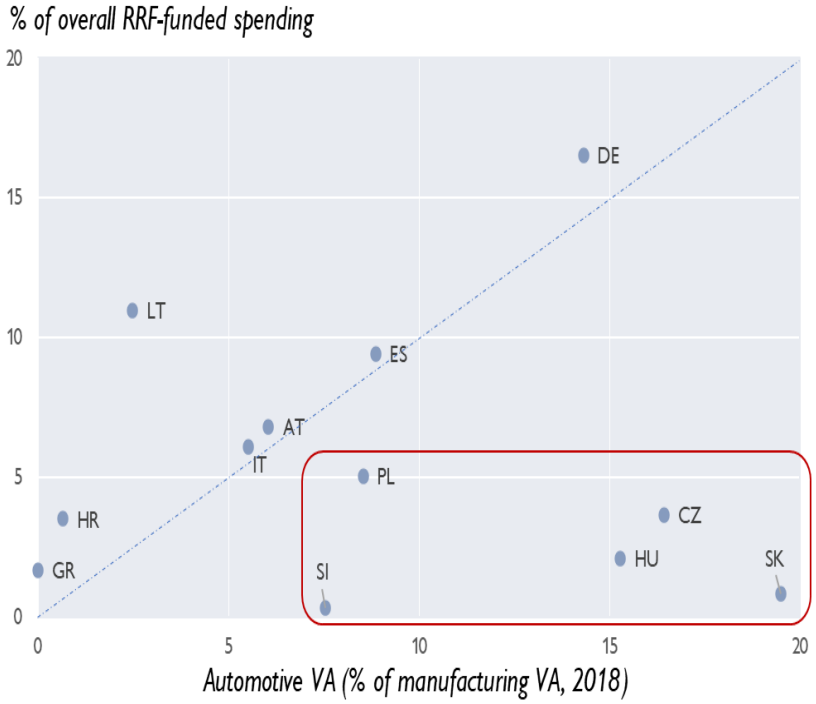
RRF-funded spending dedicated to the automotive sector



Note: Includes spending on electric vehicle purchase incentives and charging stations. Excludes spending on road. Based on RRP classifications as of June 2021.

Source: Eurostat, National Recovery and Resilience Plans, EIB.

Dedicated RRF-funded spending on automotive and supporting infrastructure



Source: Eurostat, National Recovery and Resilience Plans, EIB.

Implications, risks and opportunities I

- **Automotive supply chain will need to adapt** and the current structure and geographical distribution of activities will likely change
  - **Proximity** to **electric vehicle assembly** facilities will continue to be a factor in deciding where to locate **new battery factories** in Europe
  - Given **Germany's role** in the automotive sector and the strategy announced by German automakers, the country may emerge as the centre of a battery electric vehicle production core.
- **Consumer uptake** will be important (transitory phase?)
  - Price developments on increasing trend
  - Average age of cars rising
  - EU and national regulations are speeding up the transition.
- **Massive and risky infrastructure investment needs**
  - Battery production capacities crucial
  - Charging stations
  - Electricity generation and transmission (increase of demand between 5 and 15%), but peak-load strains

Implications, risks and opportunities II

- **Global competition for scarce resources** and inputs with ensuing geopolitical and ecological consequences
  - The global **chip shortage** might be the bellwether marking the beginning of a new era of reoccurring supply shortage risks.
  - The excess demand for **raw materials implies significant (geo)political, economic, environmental and social risks**, as well as price increases.
- Carbon footprint
  - While electric vehicles are seen as a means to achieve a carbon-neutral future, the **evidence on their carbon footprint is mixed**.
  - **Clean energy is a necessary prerequisite for enabling electric vehicles** to outperform alternative powertrains in terms of carbon emissions.
- **Future of individual mobility, new entrants and eroding comparative advantages of traditional automotive firms and countries**
  - Increasing number of Chinese companies that are — with strong support from the Chinese government — eyeing massive expansion to Europe
  - Connectivity of individual and public transport to be enhanced

Implications, risks and opportunities III

- Policy implications for CEECs
  - While the CESEE region will continue to play an important role in the automotive industry and the European automotive supply chain, **new opportunities** may arise beyond that. The region therefore has the **potential to be an integral part of the structural shift to electromobility, propelled not only by major automakers and automotive firms which are already well established locally, but also by potential newcomers**
  - Nonetheless, the adoption of new technologies and thus the **transition of the industry is likely to trail behind that in Western European cou**ntries, bringing both advantages and disadvantages.
  - **High dependence on the strategies of major automakers and on decisions taken at their respective headquarters**, CESEE automotive factories are deeply affected by the electrification trend. For CESEE countries to benefit from the electric vehicle revolution, the key priority is to **maintain integration with the manufacturing core**.
  - While keeping the importance of the automobile industry and its new trends in mind, it is **important for CESEE economies to diversify and address risks and opportunities**.

Thank you for attention!

Report can be downloaded at:
https://www.eib.org/en/publications/recharging-the-batteries

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