GTAI GERMANY TRADE & INVEST

OVERVIEW GERMAN TRANSPORT SECTOR

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Agenda

Driving Performance through Technology

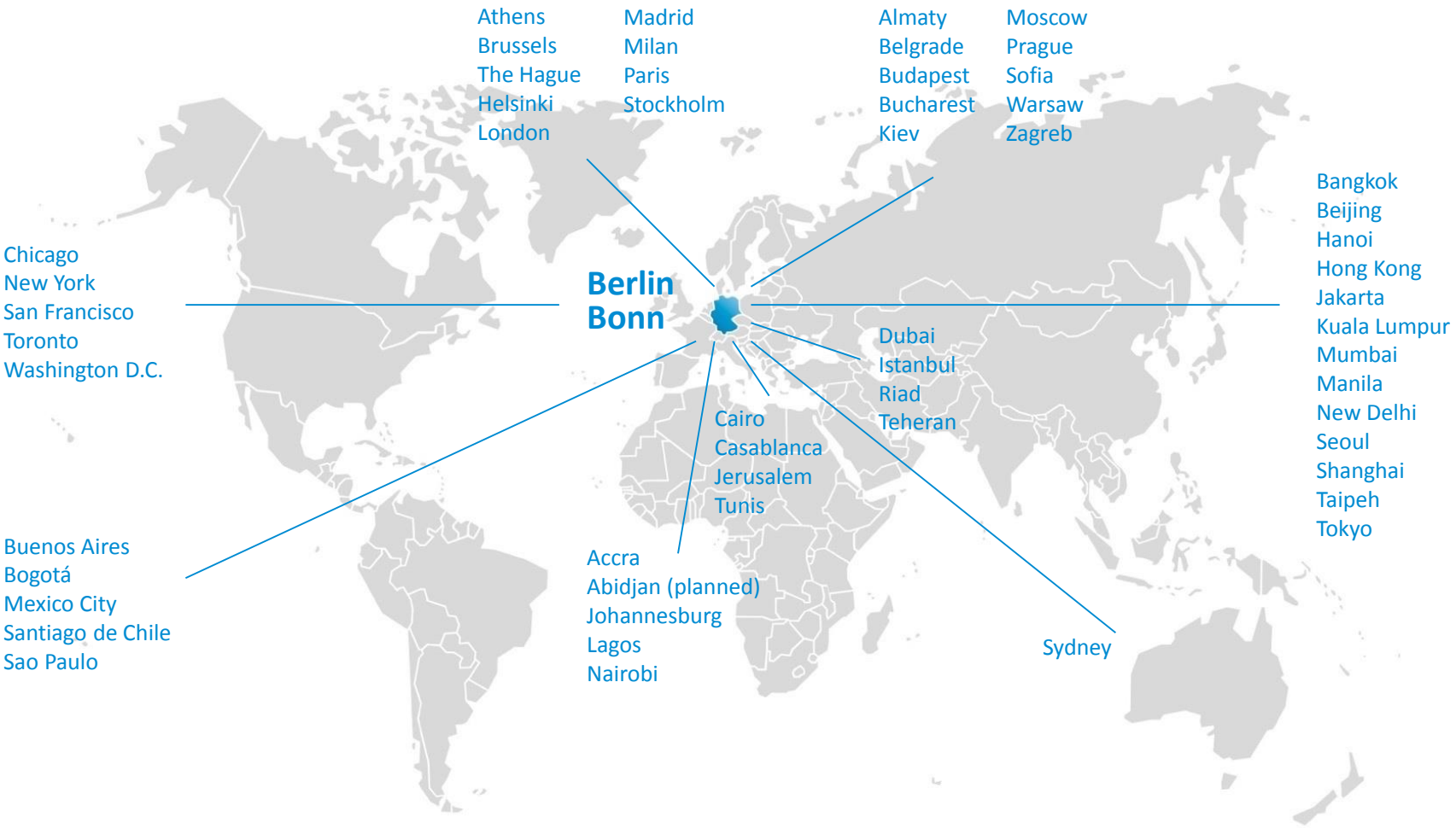
1. About Germany Trade & Invest
2. Automotive Executive Summary
3. Market Trends – Green Transportation
4. Business Opportunities

1. ABOUT GTAI

Germany Trade & Invest (GTAI) is the economic development agency of the Federal Republic of Germany.

Business Location Germany

- Market and industry analyses
- Market entry analyses
- Extensive legal information (tax, labor law, etc.)
- Funding and financing information



1. EXECUTIVE SUMMARY

THE GERMAN AUTOMOTIVE INDUSTRY

Strongest Industries in Germany

Automotive is the strongest and the most export driven industry in Germany (by industry sales)

	**Automotive Industry**	**EUR 435.3 bn**
	**Mechanical Engineering Industry**	EUR 229 bn
	**Chemical Industry**	EUR 198 bn
	**Food & Beverage Industry**	EUR 184 bn

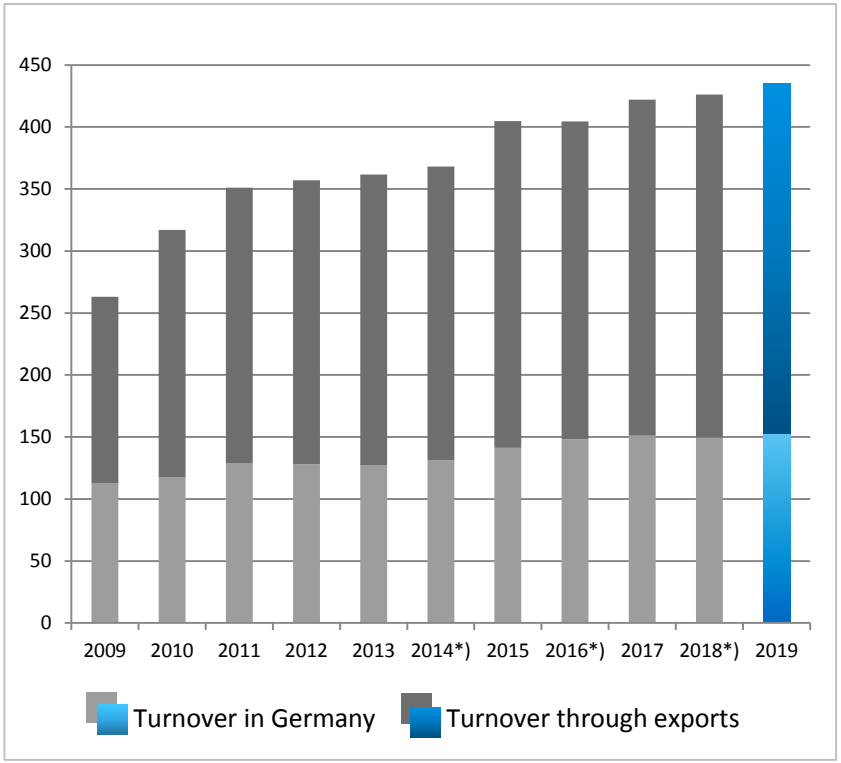
Picture Credits: © iStock.com/Photoblaz; Zbynek Jirousek – Fotolia.com; Roman Lipovskiy; www.fotolia.de - Kaikoro

Turnover in the Automotive Industry

Germany´s automotive industry remains strong

Turnover of the German Automotive Industry in Germany

(in billion EUR)



Total turnover of **EUR 435.3 billion**

High export share: EUR 282.4 billion generated in foreign markets.

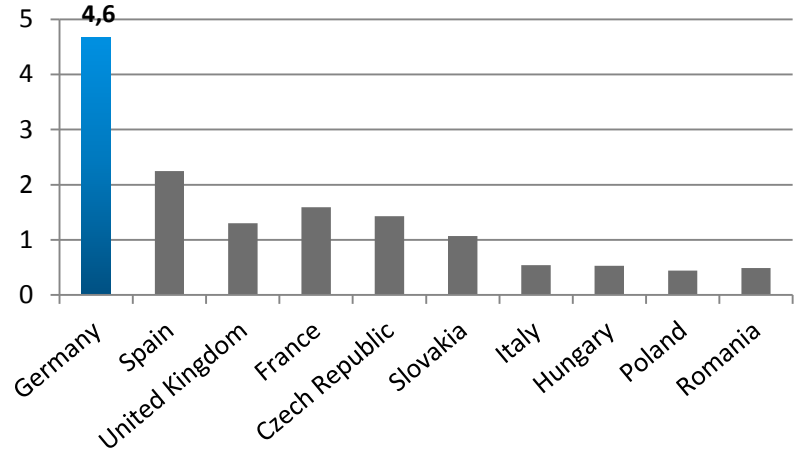
81% of the industry's turnover (EUR 343. billion) is **generated by the OEM**

Source: VDA (2020)

Germany´s Automotive Market Size

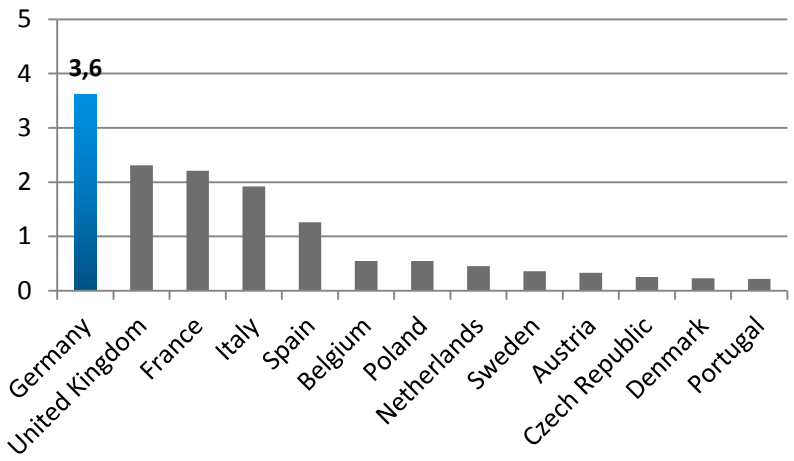
Germany is Europe´s largest automotive market

Passenger car production in Europe 2019
(in million units)



Number one market by production and sales, accounting for over 25% of all passenger cars produced in Europe

Passenger car registrations in Europe 2019
(in million units)



Increase of passenger car registration numbers in Germany in 2019: **+5%**

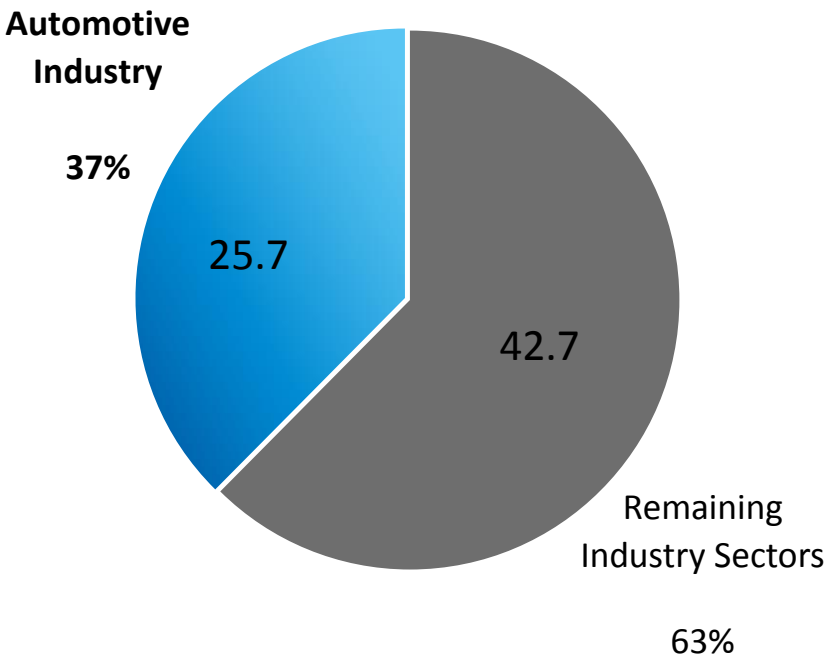
Number one market by car registrations, accounting for over 23% of all newly registered passenger cars in Europe

Sources: VDA & ACEA (2020)

Industry R&D Investments

German automotive industry is the leading innovator

Internal R&D investments in Germany within the industrial sector
(2018, in billion EUR)



R&D expenditures of the German automotive sector account for **36% of industrial R&D spending.**

Germany is world leader in auto industry patents: German OEMs account for more than **1/3rd of the world´s auto R&D**

126,400 highly skilled engineers work on automotive-related R&D-topics in Germany (+6 % increase to 2017)

Sources: GTAI Research (2019), VDA (2019), Stifterverband (2019)

Automotive OEM

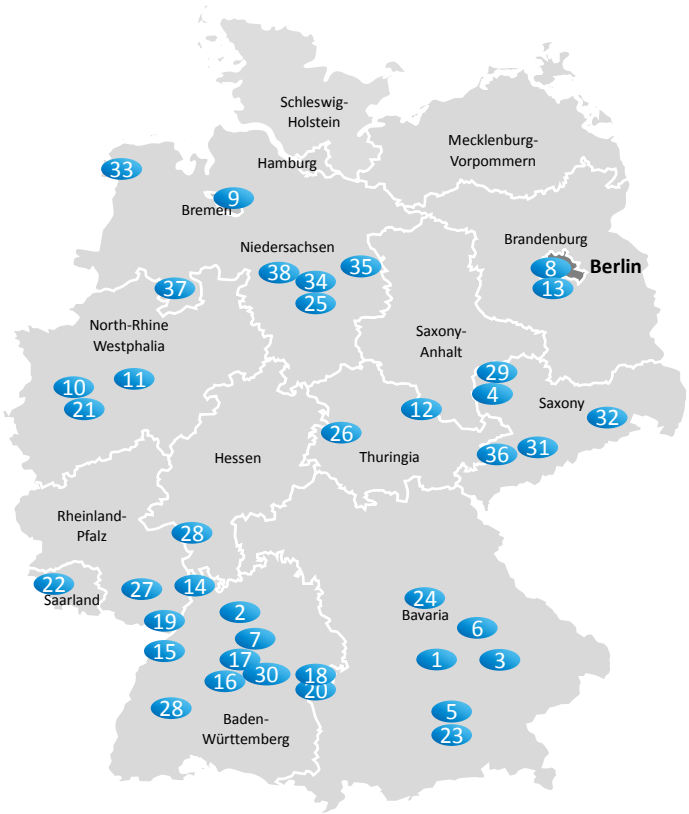
37 production sites of major OEM form a high-quality market

AUDI		
1	Ingolstadt	A3, A4, A5, Q2, TT
2	Neckarsulm	A4,-5,-6,-7,-8, R8, RS

BMW		
3	Dingolfing	3-, 4-, 5-, 6-, 7-, 8-Series, M5, M6, RR
4	Leipzig	X1, 1-, 2 Series, i3, i8
5	Munich	3 and 4 Series
6	Regensburg	1, 3, 4 Series, X1, X2, Gran Tourer

MERCEDES		
7	Affalterbach	AMG
8	Berlin	Engines
9	Bremen	C-, E-Class, GLC, SLC ,SL, EQC
10	Düsseldorf	Sprinter
11	Dortmund	EVoBus
12	Kölleda	Engines
13	Ludwigsfelde	Sprinter, Vario
14	Mannheim	Engines, Buses
15	Rastatt	A-, B-Class, GLA
16	Sindelfingen	E-, S-,CLS-Class, AMG, Maybach
17	Stuttgart	Engines
18	Ulm	Buses and coaches
19	Wörth	Heavy trucks

IVECO		
20	Ulm	Fire fighting trucks



FORD		
21	Cologne	Fiesta
22	Saarlouis	Focus

MAN		
23	Munich	Heavy duty trucks
24	Nuremberg	Engines
25	Salzgitter	Components

OPEL		
26	Eisenach	Grandland X
27	Kaiserslautern	Engine, Components
28	Rüsselsheim	Insignia, Zafira

PORSCHE		
29	Leipzig	Panamera, Macan, Cayenne
30	Stuttgart	911-, 918 Series, 718 Boxster, Cayman,

VOLKSWAGEN		
31	Chemnitz	Engines
32	Dresden	e-Golf
33	Emden	Passat, GTE, Alltrack, Arteon
34	Salzgitter	Engines
35	Wolfsburg	Golf, Sportsvan, Golf GTE, e-Golf, Tiguan, Touran
36	Zwickau	Golf, Golf Variant, EV ID 3
37	Osnabrück	Cabriolet, Roadster
38	Hannover	T- Series, Tiguan, e-crafter, subsidiary

Source: MarkLines (2019); 3 plants excluded: Binz plant, Wiesmann and AC Automotive

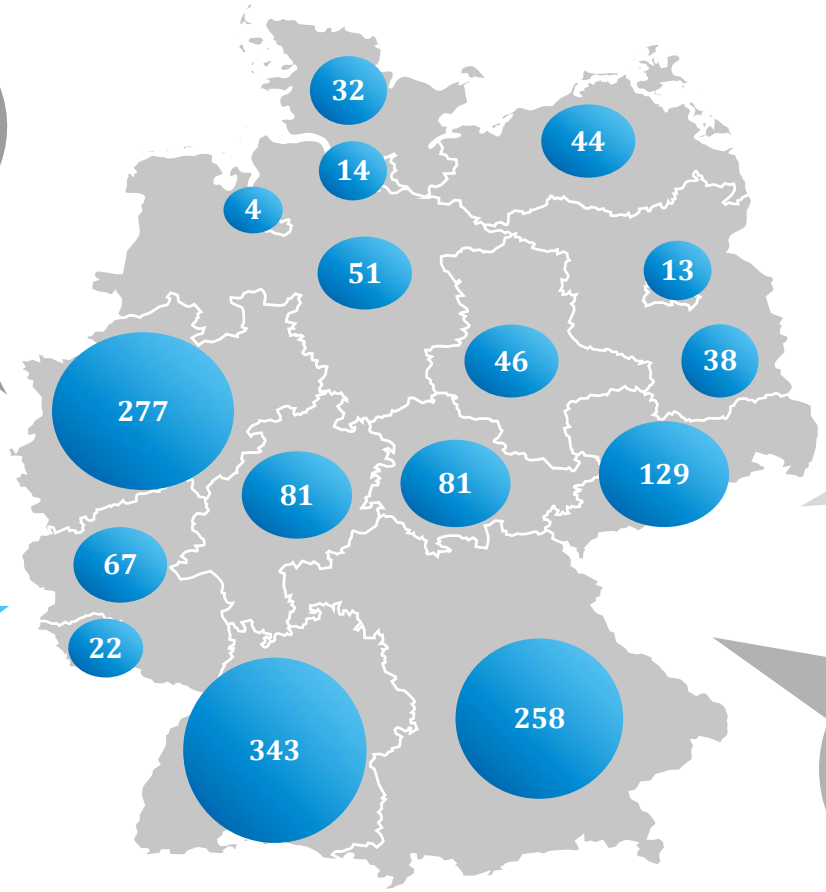
Automotive Suppliers

The high density of OEM guarantees short delivery channels

Number of suppliers in Germany by state (in 2019)

MOTOR VEHICLE AND PARTS MANUFACTURING

TOTAL 3301



BATTERIES AND ACCUMULATORS

VEHICLE CONSTRUCTION

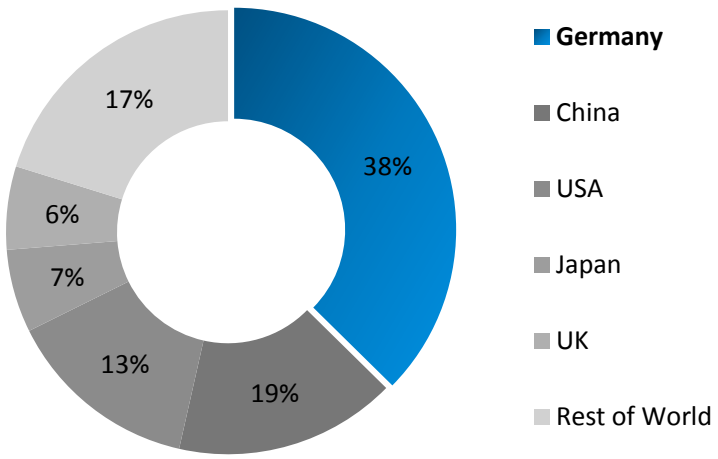
PRODUCTION OF ELECTRICAL EQUIPMENT

Sources: Berylls Strategy (2018); MARKUS database (2019); VDA (2019)

The Premium Segment

Germany: World´s premium car production and innovation hub

Premium car production by country 2019



Germany produces **36%** of all premium vehicles globally

53% of all premium vehicles are manufactured in Europe

67% of all premium vehicles are manufactured by German OEM

The country's **strong industrial base**, its **value chain density**, its **R&D power** and particular **strength in the automotive premium business**, **enables investors** to **develop cutting edge automotive technologies** for today's automotive needs. […]"

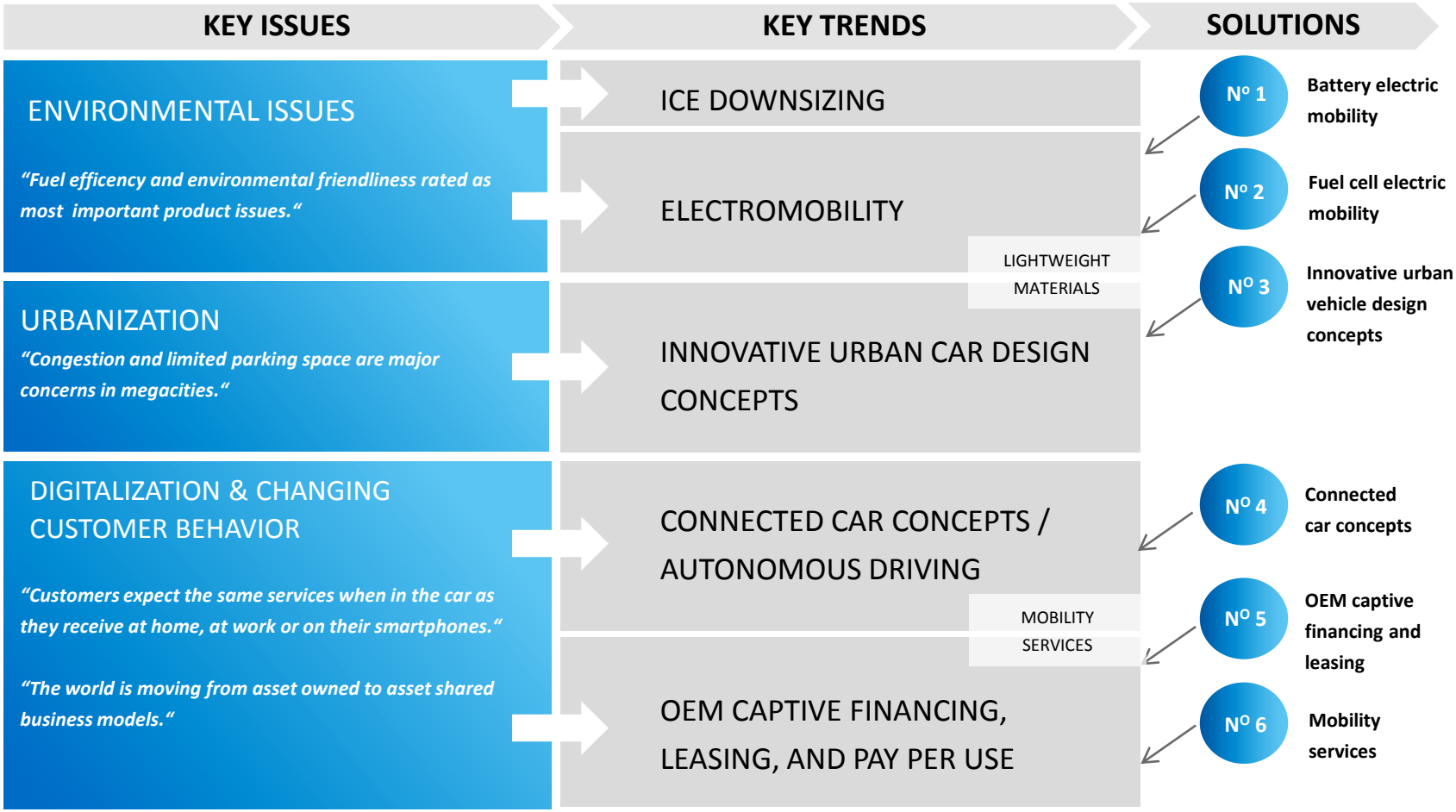
Sources: GTAI Research (2019); MarkLines database (2019)

3. MARKET TRENDS

- GREEN TRANSPORTATION

Mega trends in the automotive industry

Efficient and connected cars



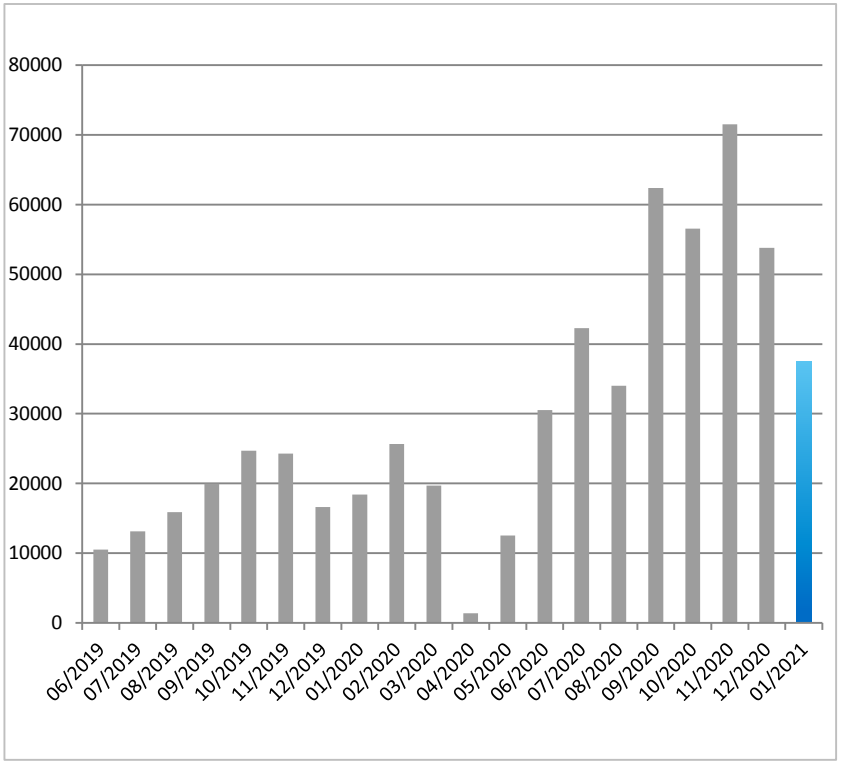
Source: KPMG's Global Auto Executive Survey (2012); GTAI Research (2016)

Electric Vehicle Production

Germany´s automotive electrification is entering the mass market

Production of Electric Vehicles in Germany

(by month)



In 2020 the share of **electric vehicles** of total production was **13,1%**

High **share of new car registration** in Germany: In December 2020, over **50%** were **purely electric** (43.671)

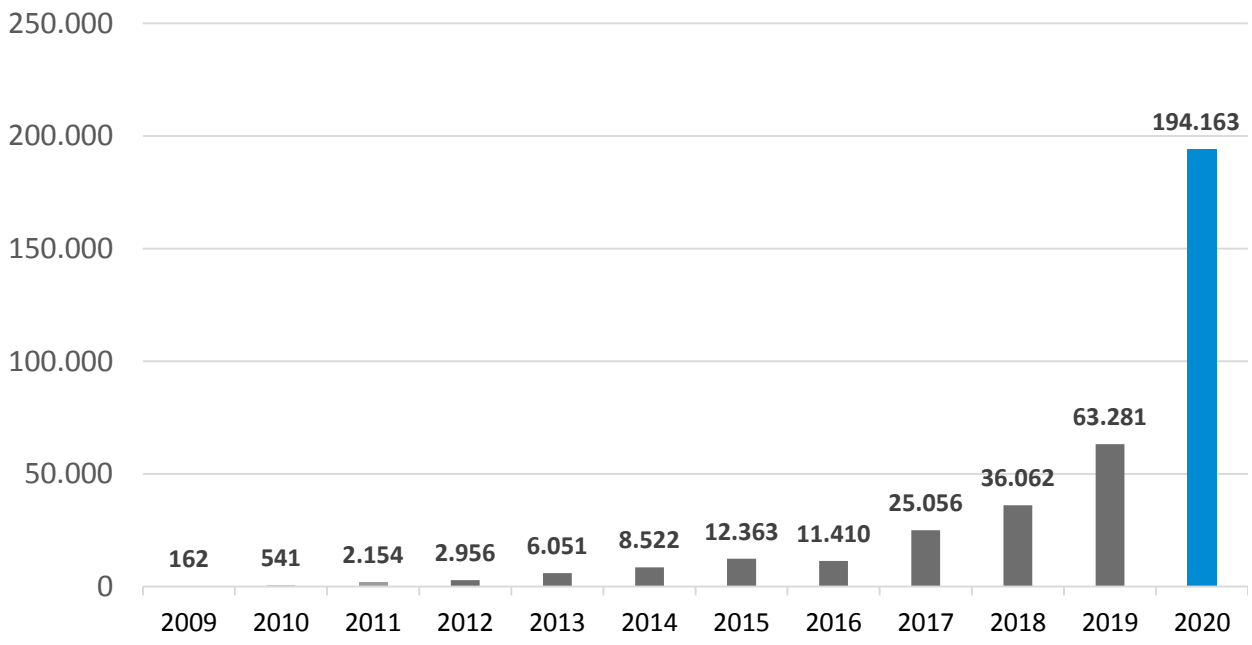
One reason is the German **cash incentive** of up to EUR 9000 per purchase (58.365 applications in December 2022 alone)

Source: VDA (2021)

EV Car Registration in Germany

Number of pure EV Car Registrations by Year in Germany

2009-2020



A total of 309.100 pure EVs are already on the German roads by January 1st of 2021. Including PHEVs, the number rises to over 700.000 electric vehicles.

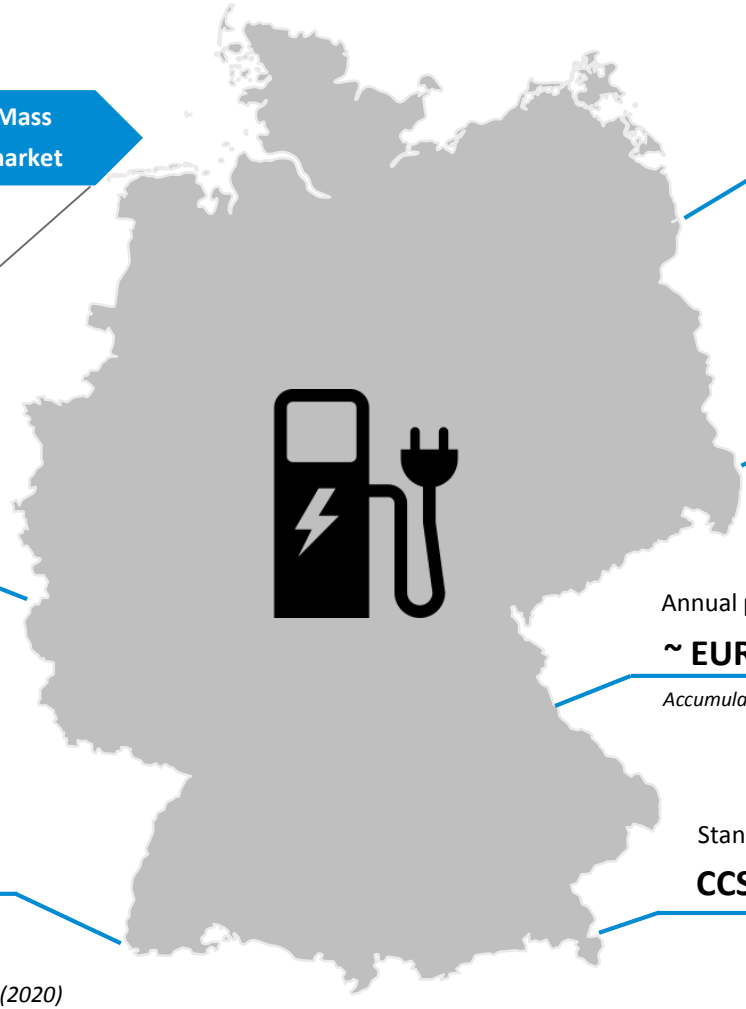
Sources: KBA (2021)

E-Mobility in Germany – Status quo

E-Mobility in Numbers (Q1/2021)

E-Mobility Roadmap

Market preparation	Market ramp-up	Mass market
2014	2017	2020



Electric Vehicles
over **700,000**
Plan 2030: 10,000,000

Number of E-models of German OEMs
60
Plan: See next slide

Public Charging Infrastructure

Charging Points
over **37,000**

Fast Charging Points
7,456

Plan 2030: 1,000,000

Annual public R&D funding
~ EUR 250 m
Accumulated by 2015: ~ EUR 2.5 bn.

E-Mobility Showcase Regions (2012-2016)

Regions
4

Invested funds
~ EUR 300 m

Standardized charging system
CCS

Source: GTAI Transportation Technologies Research; BMVI (2020)

Li-Ion Battery Production in Europe

Cell manufacturer seem to move closer to the German OEMs

Public support for E-Mobility in Germany

Overview of public measures and incentives

Cash incentives

- Vehicle price BEV up to EUR 40,000 EUR 9,000
- Vehicle price BEV over EUR 40,000 EUR 7,500
- Vehicle price PHEV up to EUR 40,000 EUR 6,750
- Vehicle price PHEV over EUR 40,000 EUR 5,625

Charging Infrastructure

- Investment of EUR 300 m for expansion of public charging infrastructure until 2021
- Private wallbox installation grant of EUR 900 per unit (EUR 400 m public investment)

Government spending

- Provision of EUR 100 m for public procurement of e-vehicles (until 2020)
- Goal: 10 million e-vehicles in public fleet by 2030

Tax incentive

- All BEVs are exempt from motor vehicle tax for 10 years
- Employees, who are allowed to charge their vehicles at workplaces without cost are exempted from income tax for the benefit

R&D funding

- Around EUR 250 m annually
- Since 2009 over EUR 3 bn of public R&D funding
- Plan to set up a new R&D program for battery cell production *(Resolution in May 2016)*

Road traffic measures

- Authorized Use of Bus Lanes for Electric Vehicles
- Special Parking Places for Electric Vehicles
- Suspension of restricted entry access for electric vehicles

☐ Recently resolved by German government (Nov. 2020)

Source: GTAI Transportation Technologies Research (2019); BAFA (2020)

H2 Mobility action plan until 2023

Construction of a hydrogen refueling network in Germany until 2023

Targets:

400 HRS until 2023

350 mio. € investment

Max. 90 km distance between two HRS at the motorway

10 HRS in each metropolitan area

Status:

92 Opened

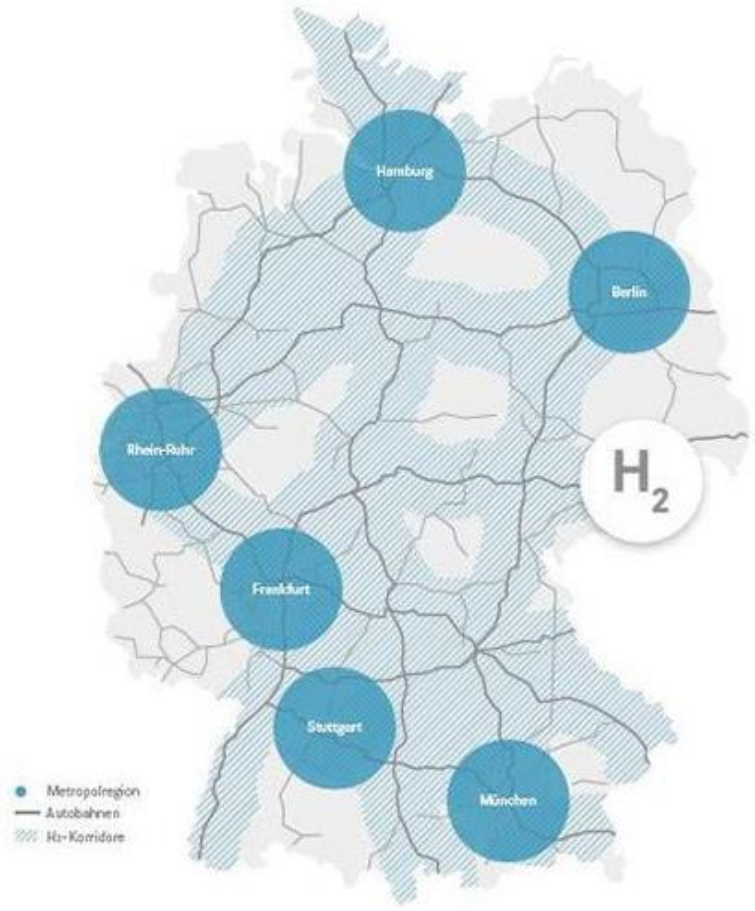
15 Execution phase

Partner:

DAIMLER, TOTAL, AIR LIQUIDE, OMV, Linde, Shell

Associated Partner:

NISSAN, BMW GROUP, HYUNDAI, KIA MOTORS, Volkswagen, TOYOTA, HONDA, Intelligent Energy, NOW

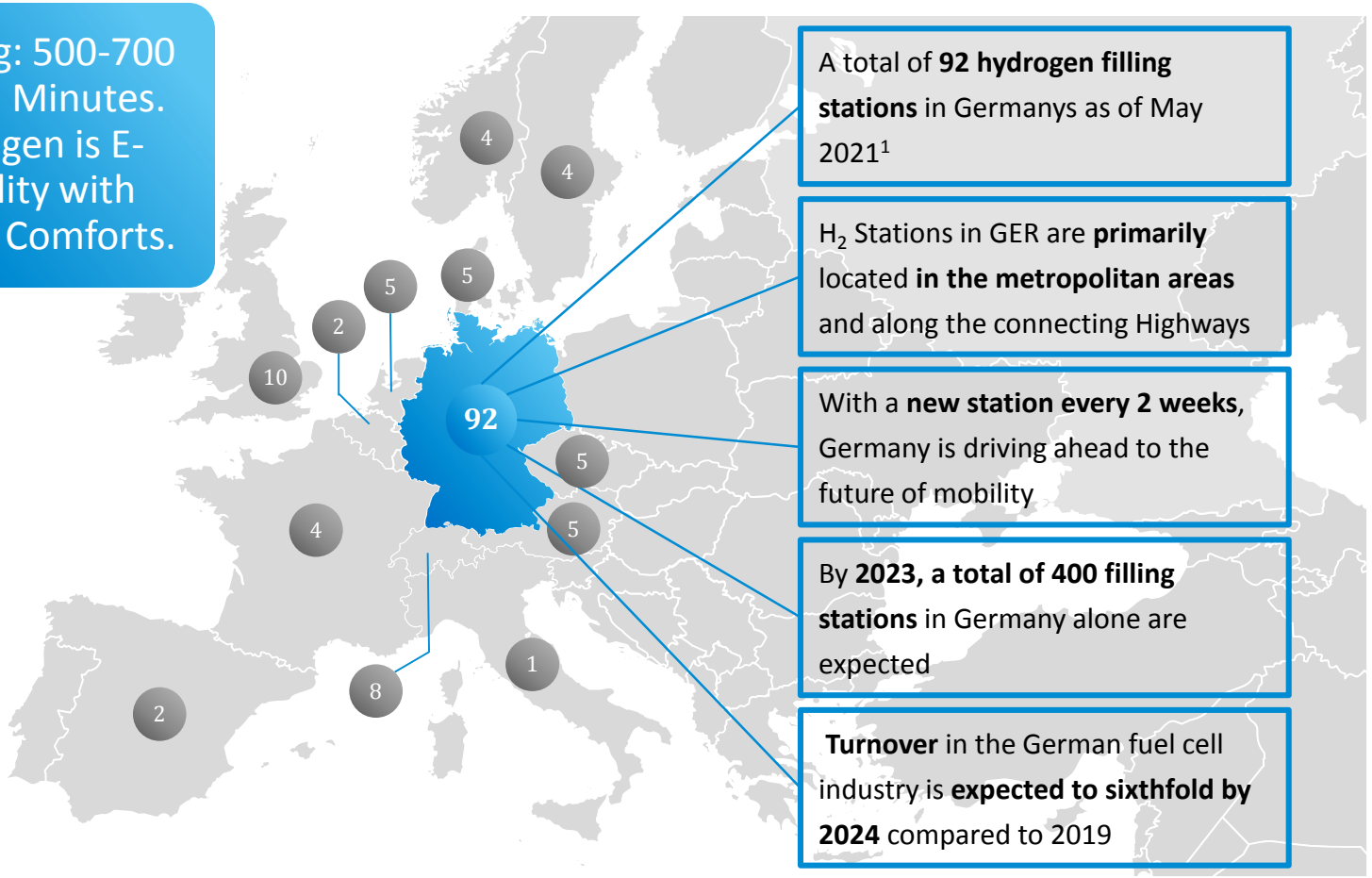


Source: NOW

H_2 Filling Infrastructure in Europe

Germany prepares for the Future in Mobility and Energy

H_2 filling: 500-700 km in 3 Minutes. Hydrogen is E-Mobility with familiar Comforts.



A total of **92 hydrogen filling stations** in Germanys as of May 2021[1]

H_2 Stations in GER are **primarily** located **in the metropolitan areas** and along the connecting Highways

With a **new station every 2 weeks**, Germany is driving ahead to the future of mobility

By **2023, a total of 400 filling stations** in Germany alone are expected

Turnover in the German fuel cell industry is **expected to sixthfold by 2024** compared to 2019

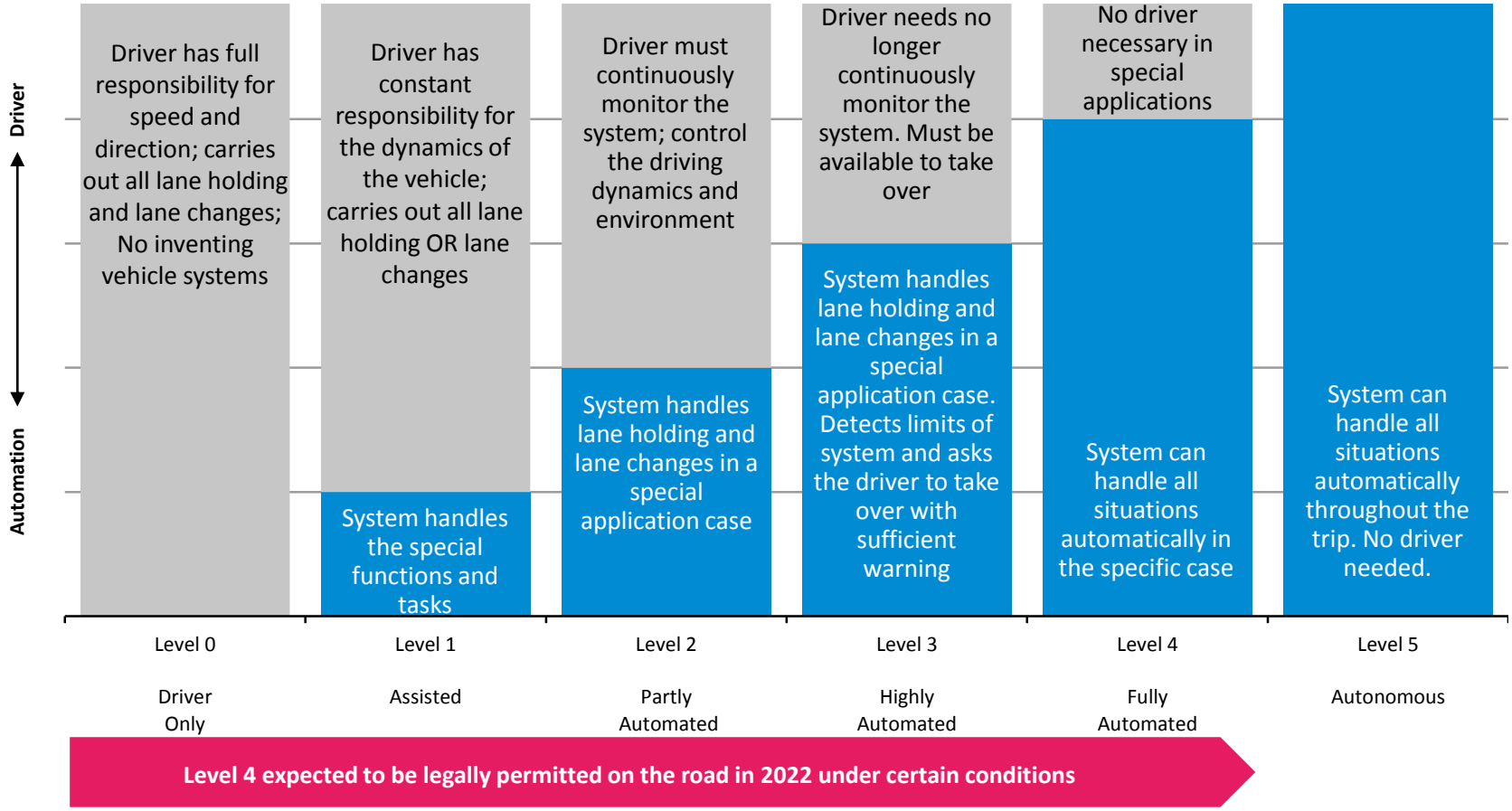
Source: H2 Mobility (2020), VDMA (2019), BMWi (2020)

Note: [1]Island with 3 charging stations not on the map

4. BUSINESS OPPORTUNITIES

Automated Drive Roadmap

Unified agreement about the process towards the autonomous car



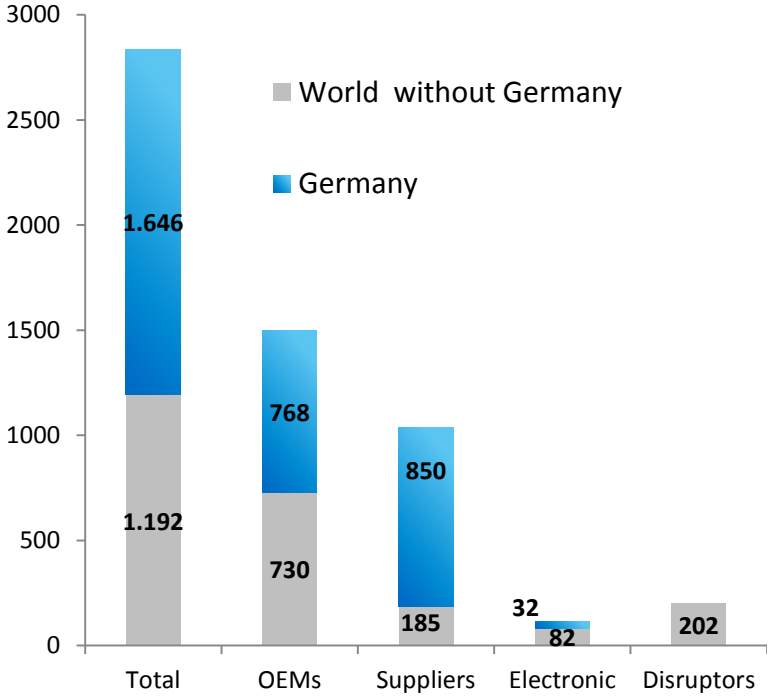
Source: Federal Highway Research Institute; German Association of the Automotive Industry (VDA) 2015, GTAI German Electrical and Electronic Manufacturers' Association (ZVEI) (2019)

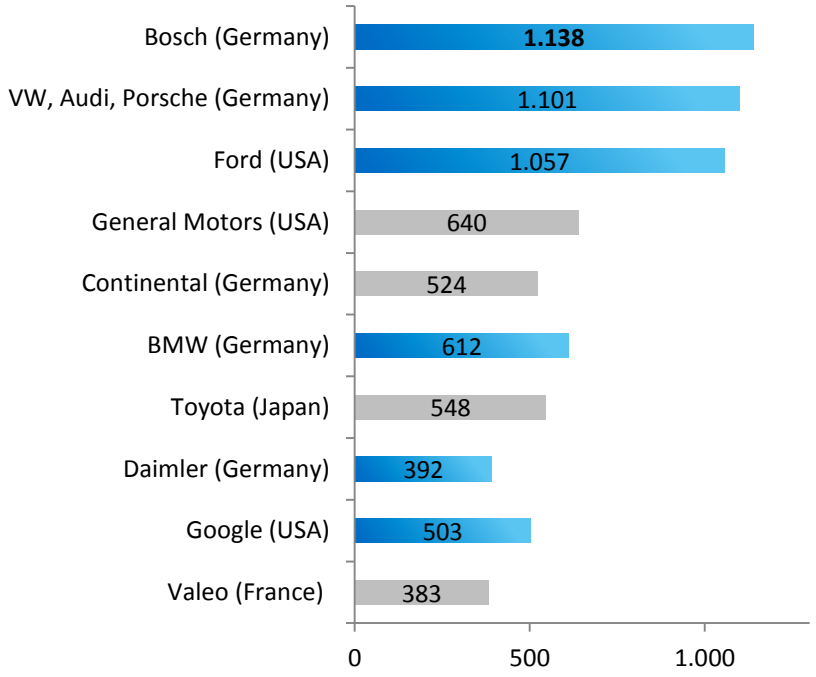
Autonomous drive in Germany

German OEM and suppliers are dominating autonomous drive innovations

Amount of patents related to autonomous drive technologies

(By different company groups and Top-10 patenting companies; 2010-2017)



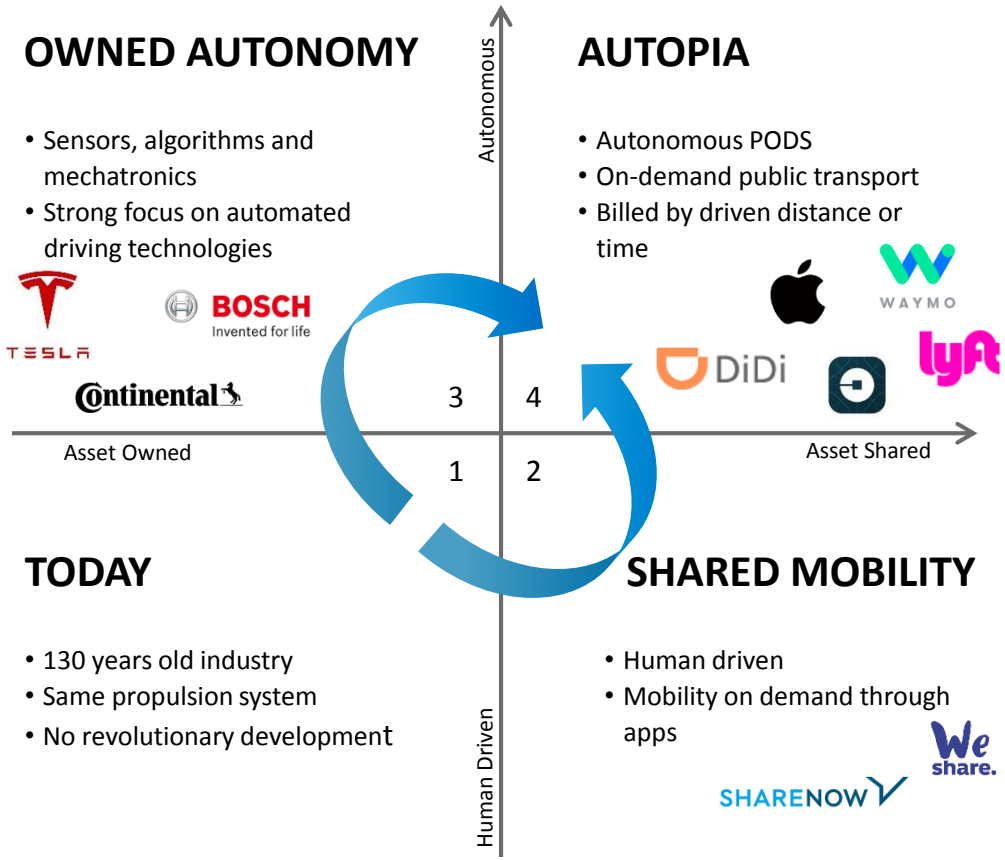


**Disruptors, e.g. Google, Apple*

Sources: EPO (2018); IW, Köln (2019)

Disrupters in the Automotive Industry

From asset owned and human driven to asset shared and autonomous



- New business models emerge
- Earning money without building cars
- Pay per mile or minute
- On-demand service
- Questioning individual ownership
- Change of customer behavior „ millennials“
- Environmental friendliness

Sources: A . Jonas, Morgan Stanley (2016); GTAI Research (2016)

Miles will Matter in the Future

New definition of the business model

Traditional business model

2 percent of global GDP

Silicon Valley approach

10 percent of global GDP

Sources: A . Jonas, Morgan Stanley (2016); GTAI Research (2016)

Paradigm Shift of Digital Transformation

Worldwide revolutionary change in the automotive industry

German OEM and suppliers aware and well prepared for significant change

The Auto Industry will change more in the next 20 years than it has in the previous 130 years

Thank you!

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