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VOLKSWAGEN SHAPING THE FUTURE OF MOBILITY

Driving the German Economy

Index

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"Our dedication has a

Interview with Dr. Ulrich Hackenberg

The automotive industry is growing, especially in the Asia-Pacific region. How is Volkswagen responding to this challenge?

Ulrich Hackenberg: As a global company, we keep a close eye on the markets in which we are active in order to anticipate new developments and trends. An attractive product range, tailored to regional tastes and demands, is required for us to participate in their economic development there. Furthermore, it is also necessary to produce locally in the region. This makes potential customers identify more strongly with the products on offer. We are expanding local production capacities in the short and medium term, in order to satisfy a growing market, such as in China for example. Furthermore, it is important that we develop our product range in advance, in such a way that offers the greatest, swiftest and most adaptable courses of action. We have created the ideal conditions to this end with the introduction of our Modular Transverse Matrix and are able to react to multiple market and customer requirements quickly and with relatively little effort.

> "One needs a product range tailored to regional demands."
> **Dr. Ulrich Hackenberg**

What does that mean for your factories in Europe?

Our engagement in the most varied regions of this world has a positive impact on the factories in Europe: we create new jobs and secure existing ones. Many states levy very high import duties and taxes on imported products. Therefore, if a volume manufacturer tried to supply these markets exclusively with vehicles produced in Europe, it would lose its competitiveness and consequently not generate profits from car sales. For this reason, it makes sense to produce locally in our own plants or obtain components from local suppliers. In addition, the parts developed within our modular component system strategy are also used by our subsidiary brands and joint-venture partners. For example, in China this means that we select, qualify and commission the delivery of components or parts from local suppliers. The component testing and approval processes, as well as the building of our plants, construction of our cars and quality management is fastidiously overseen by our engineers in Germany. This creates a win-win situation.

Into which areas of business is Volkswagen going to invest in the future?

As a company with many brands, we have to be active in all possible fields of technology. This is why we will keep on working intensively on reducing

POSITIVE IMPACT"

CO_2 emissions. This work also includes sustainable production processes for our cars and components as well as lightweight production, the refinement of our combustion engines and alternative drive systems – just about everything that helps us to meet or surpass legal requirements globally. But also new fields of technology, such as car-to-car and car-to-x communication, mobile online services, or driver assistance and safety systems, are also important areas which we are working on intensively. The XL1 gives a little insight into our diverse activities.

Dr. Ulrich Hackenberg, Board Member for Developement of Audi and Head of Developement coordination for the Volkswagen Group.

Where are your efforts best directed?

We have created solid fundamentals in many areas, and new core competencies in various fields of technology, with the development of the XL1. This is necessary in order to be prepared for future challenges and to be able to react efficiently. This is precisely what matters, if you are in a competitive environment and want to take a leading position.

> "A certain residual entrepreneurial risk always remains."
>
> **Dr. Ulrich Hackenberg**

What are the economic risks in the coming years?

Sadly, this cannot be predicted accurately. Generally, factors such as the availability of resources, social change, the fluctuating economic and legal frameworks within markets but also the unpredictable impact of the energy transition on energy prices, are all relevant in this regard. The development of new technologies in some areas is also very hard to predict. If, to give an example, the range of storage batteries required for electric cars could be multiplied at a reasonable cost and similar size, we would probably have to ask ourselves very quickly whether the fuel cell still has a future. So despite careful planning, a certain residual entrepreneurial risk always remains.

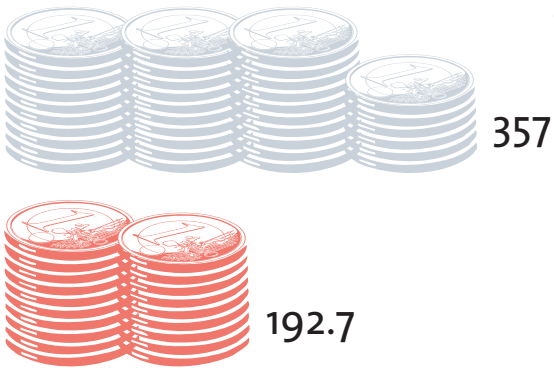
Solid Fundamentals

Key Industry Numbers

The automotive industry has recovered from the economic crisis faster than expected. As early as two years ago, a majority of manufacturers were again able to increase production, the coming years are also expected to bring higher growth rates. The largest increases are expected in the Asia-Pacific region. But in Germany too, the industry is impressive: a good 740,000 jobs were on offer in 2012, on average each of these workers generated a turnover of 481,000 euros.

Global turnover of the German automotive industry:

(in billion euros)

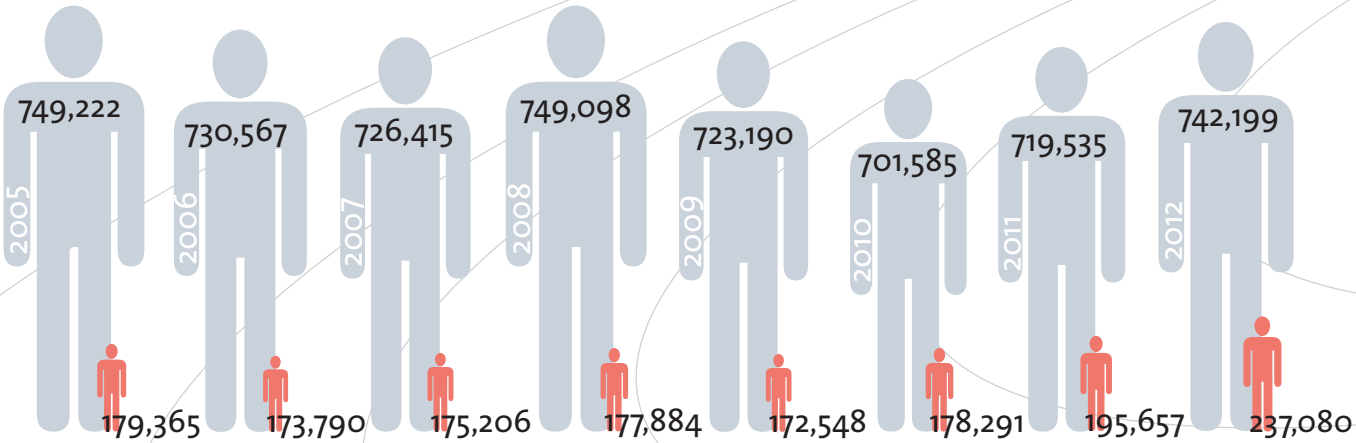


German automobile producers
Volkswagen Group

The automotive industry is the biggest industrial sector in Germany, with a global turnover of 357 billion euros. More than half of that is generated by the Volkswagen Group.

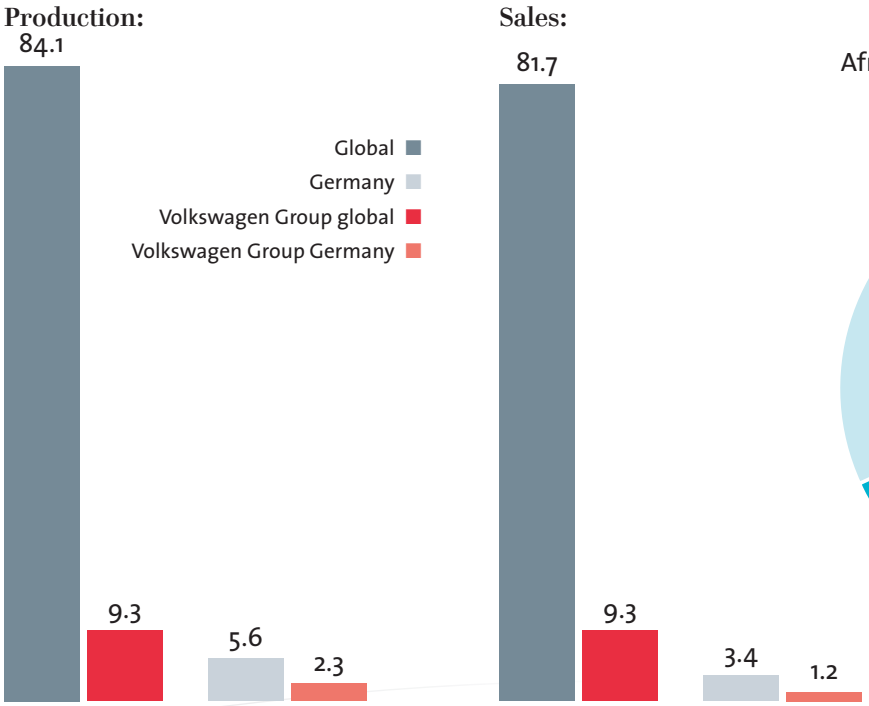
Employees of the German automobile industry:

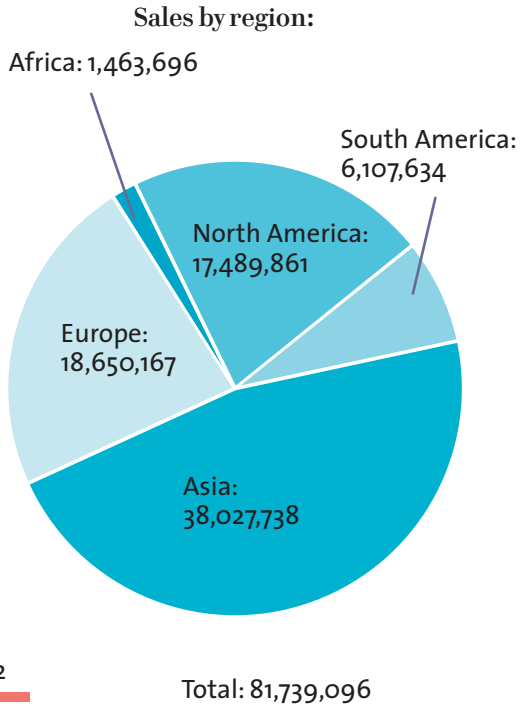
German Automobile Producers
Volkswagen Group Germany



While the number of employees within the German automobile industry is nearly constant, the number of employees in the global automobile industry will increase significantly over the coming years, especially in the growing markets of the BRIC states. This increase is based primarily on the rising level of prosperity as a consequence of the economic growth in these countries, and the associated rise in demand for cars. As a consequence of this demand, local production capacities for vehicles and components will adapt in these countries.

Commercial vehicles and cars in figures:





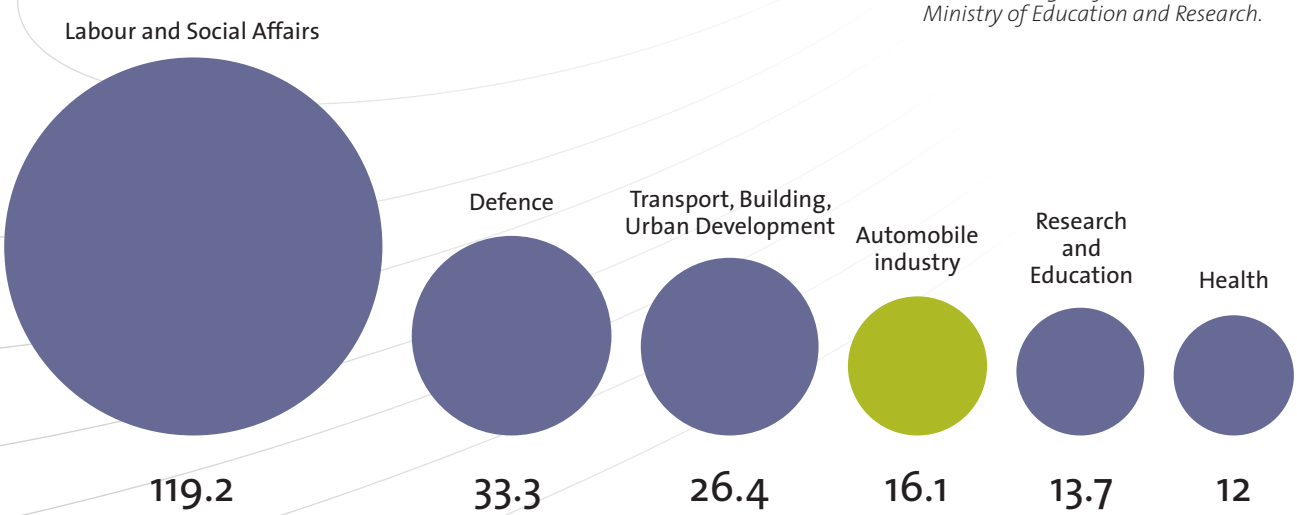
84.1 million vehicles were produced globally in 2012, including both commercial vehicles and cars. The global sales of these vehicles were almost as high. 5.6 million of these cars were produced in Germany, 3.4 million were sold. Volkswagen played a major role in the success of the German automobile industry: a good ten percent of global sales in 2012 went into the account of the company from Wolfsburg, whose share of German car sales was more than a third.

Almost half of all cars were sold on the Asian continent, followed by the Americas. The remaining quarter of car sales is spread across Europe and Africa.

Investment volumes compared:

(German Federal Ministries' budgets and research budget of the automobile industry, in billion euros)

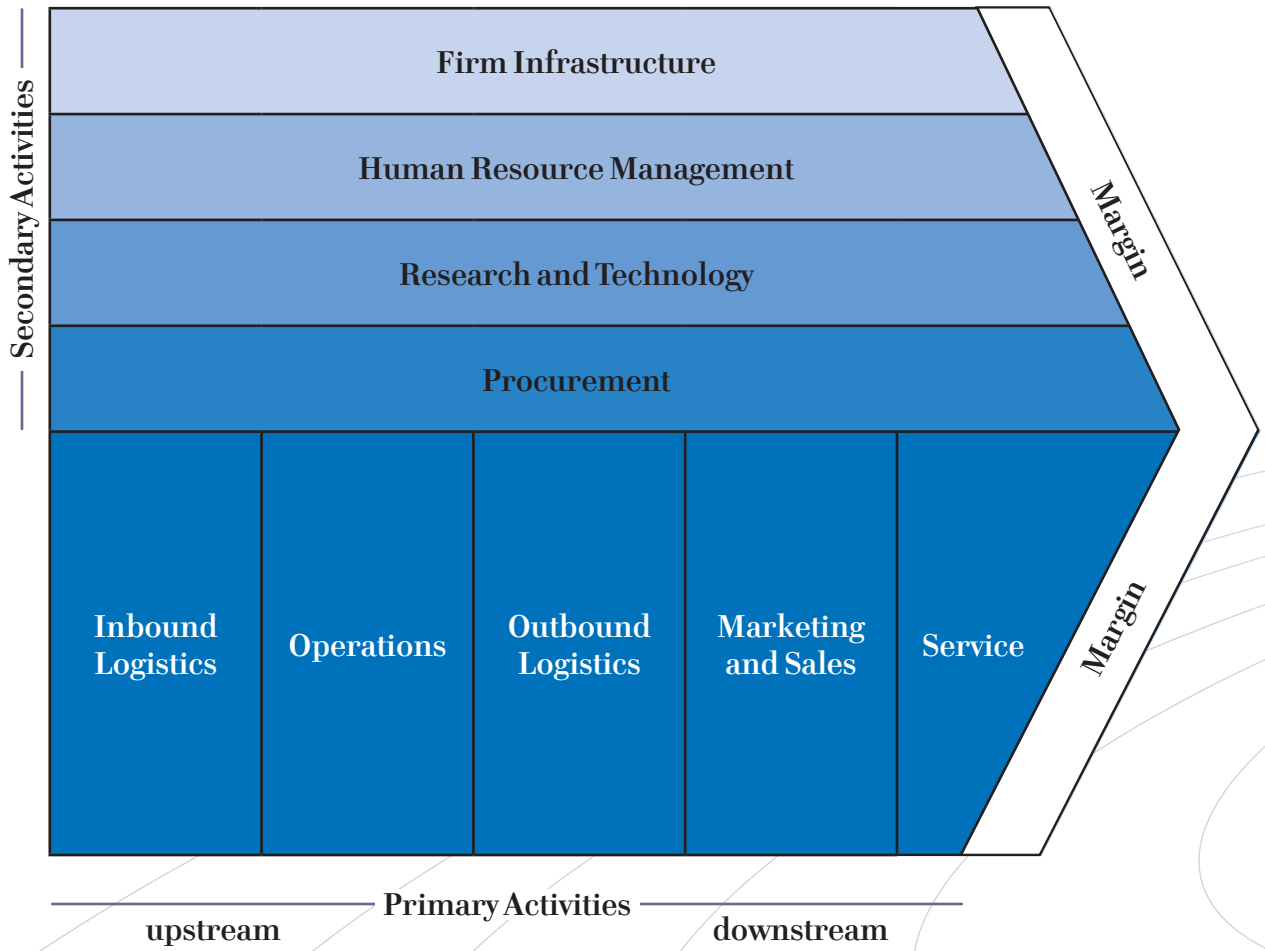
At 16.1 billion euros in 2013, the automobile industry has a larger research budget than, for example, the total budget of the German Ministry of Education and Research.



The Value Chain

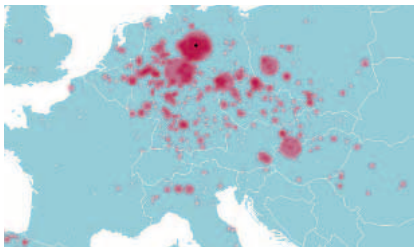
From Warehouse to Showroom

Perfect timing and well-organised logistics play a decisive role in producing cars efficiently and economically feasibly. The work of 30,000 engineers in the areas of research and development, a well developed company infrastructure, and the support from human resource management and procurement, all make this smooth process possible.



The Value Chain is a theoretical concept developed by the American economist Michael Porter, that describes the individual stages of production within a company as successive and interdependent activities ordered sequentially. The aim of all these operations is to create value. To this end resources are spent and activities conducted. The margin at the end of the value chain is the difference between the sales revenue of the manufactured product and the cost of resources used. The activities within a company can be divided into primary and secondary activities. While primary activities actively contribute to the value added, secondary activities create the conditions necessary for doing so. The task of the secondary activities is to support the primary activities in generating value. They thus contribute to increasing the overall efficiency of the company. The development of new vehicles and innovations in research and development (secondary activities) also serve the maintenance of the primary activities. In combination, primary and secondary activities form the value chain, a description of an economically interlocked system.

Inbound logistics



Inbound logistics includes all tasks and processes that deal with the supply of the plant by its suppliers. It is primarily about production materials, parts and components, which are received upon arrival and sent to the installation location directly or via a warehouse.

Around 2,000 contractors supply the plant in Wolfsburg, where the Golf – among others – is produced, with parts and components. The steering wheels for the Golf come from Romania, air-conditioning compressors from Great Britain, Mexico or the Netherlands and radios from Germany or Portugal. Some 65 percent of the components installed are bought parts, commissioned from external suppliers. The remaining 35 percent are manufacturer parts, such as engines, gearboxes and cardan shafts, produced in our component plants and installed in Wolfsburg.

Operations

Operations encompasses the production of products and goods. The supplied resources are processed and, along with delivered components and parts, manufactured into the final product. Operations also include the equipment's maintenance and quality control.

Three large processes run simultaneously in the production of the Golf: the production of engine components and subsequent engine assembly; the pressing of car body parts, the construction and painting of the car body; as well as the production of all other components. At the end of the production chain is the assembly of the cars.

Outbound logistics

Outbound logistics primarily entails the collection and storage of the finished products. It also includes distribution, which proceeds via air, sea, road or rail. To do so, appropriate concepts have to be planned and acquired, and schedules and CO_2 emissions taken into account.

The Golfs built in Wolfsburg are delivered to around 2,200 car dealers across Germany via freight train and truck. They are exported worldwide to more than 150 countries.

Marketing and sales

The areas of marketing and sales encompasses all activities which generate sales. Its remit includes sales promotion, the choice of distribution channels, as well as the positioning of the company and its' products.

Onething.com was part of the marketing strategy for the launch of the new Golf last year. On this website customers and Golf aficionados can vote on what is unique in their life.

Service

Service includes all customer services aimed at conserving or increasing the use of a product. One commonly speaks of after sales service. The work of the service department ranges from the installation of a telephone helpline to the delivery of replacement parts.

Prosperity Indicator

Higher Standard of Living, More Cars

It is very obvious in Germany: the number of cars licensed increases with economic prosperity. While in 1955 there were around 1.74 million licensed cars, given a gross national income of 1,868 euros per capita, 30 years later these values were at 25.8 million cars and 16,234 euros per capita. By 2012, the number of cars on German roads had increased by almost 25 times compared to 1955, while the gross national income was 17.6 times that of 58 years before. But can this thesis be applied worldwide? Does the number of car owners provide information about a country's prosperity?

Glossary

Gross national income: The Gross National Income (GNI) consists of the value of all goods and services that have been produced or provided by the population of a state or area. This makes the gross national income equivalent to all income as well as assets of that population. It therefore represents a key income measure of a national economy.

Gross national product: The Gross National Product (GNP) is the market value of all products and services that have been produced in one year in a state or area. It measures a country's productive capacity. In contrast to the GNI, it also includes the income from non-residents, as long as it was generated in the country.

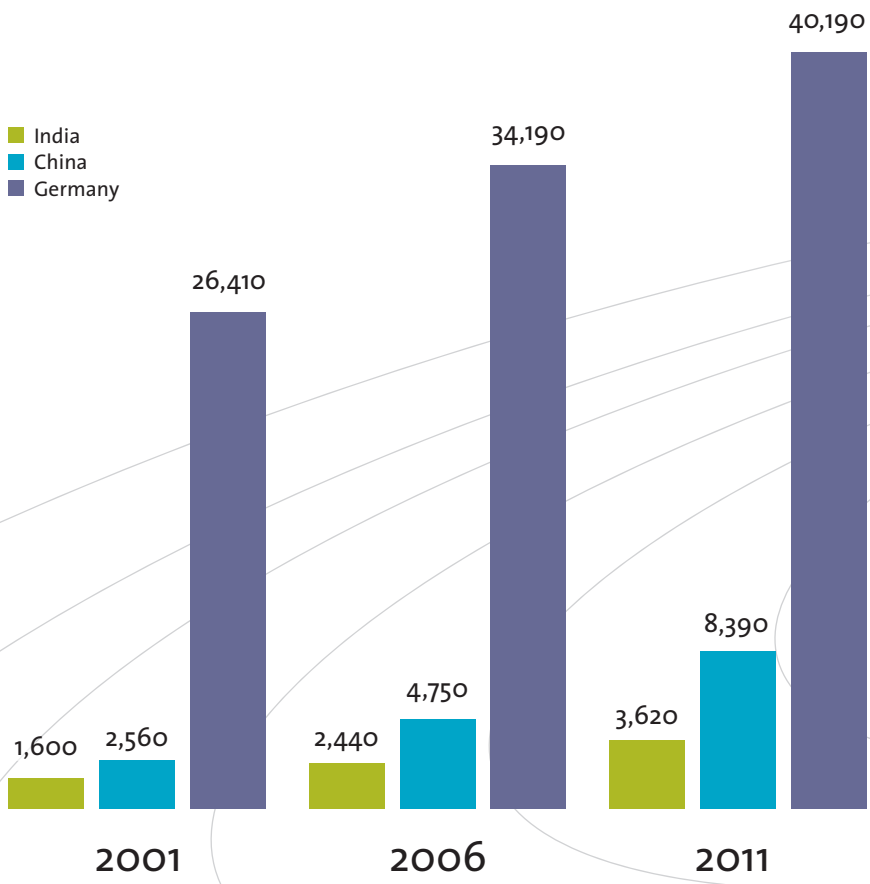
Purchasing power parity: Purchasing Power Parity (PPP) is an artificial currency that allows the comparison of purchasing power in different countries. This is necessary because the price of the same good can differ substantially in different countries. A litre of milk, for example, can cost 1.29 euros in Germany, while in India it only costs the equivalent of 29 cents.

Sales: Sales is the amount of goods sold by a producer or seller over a fixed amount of time.

Revenue: Revenue is the amount of money a producer or seller has received for his sales.

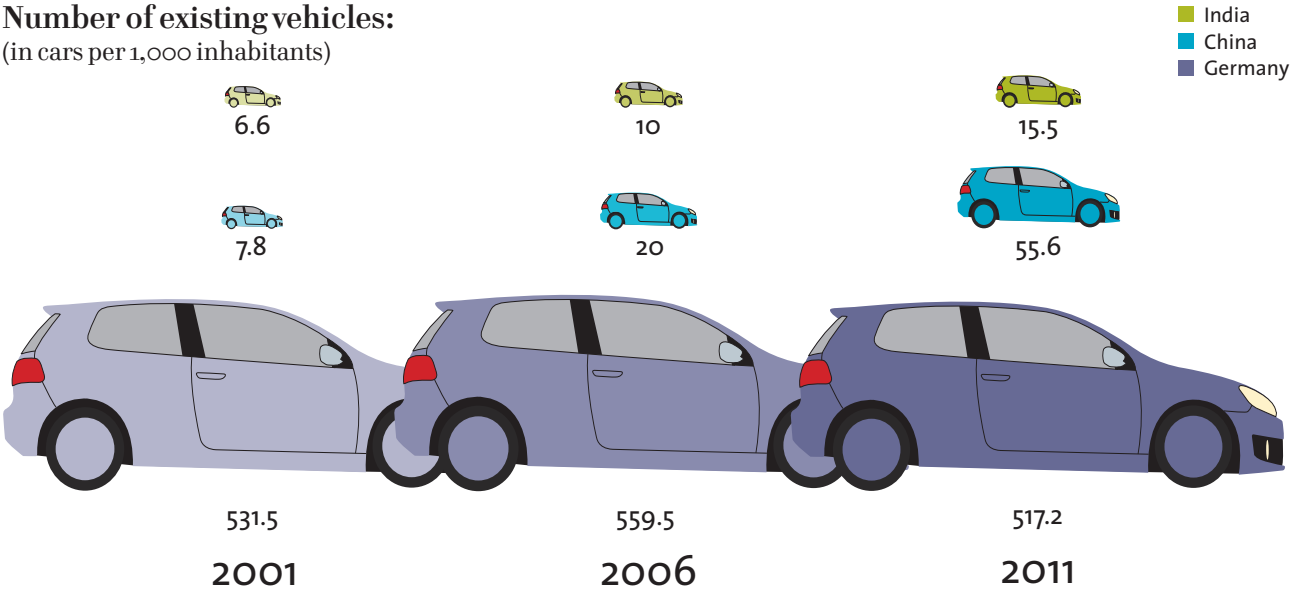
Income compared:

(Gross national income per capita in PPP dollars)



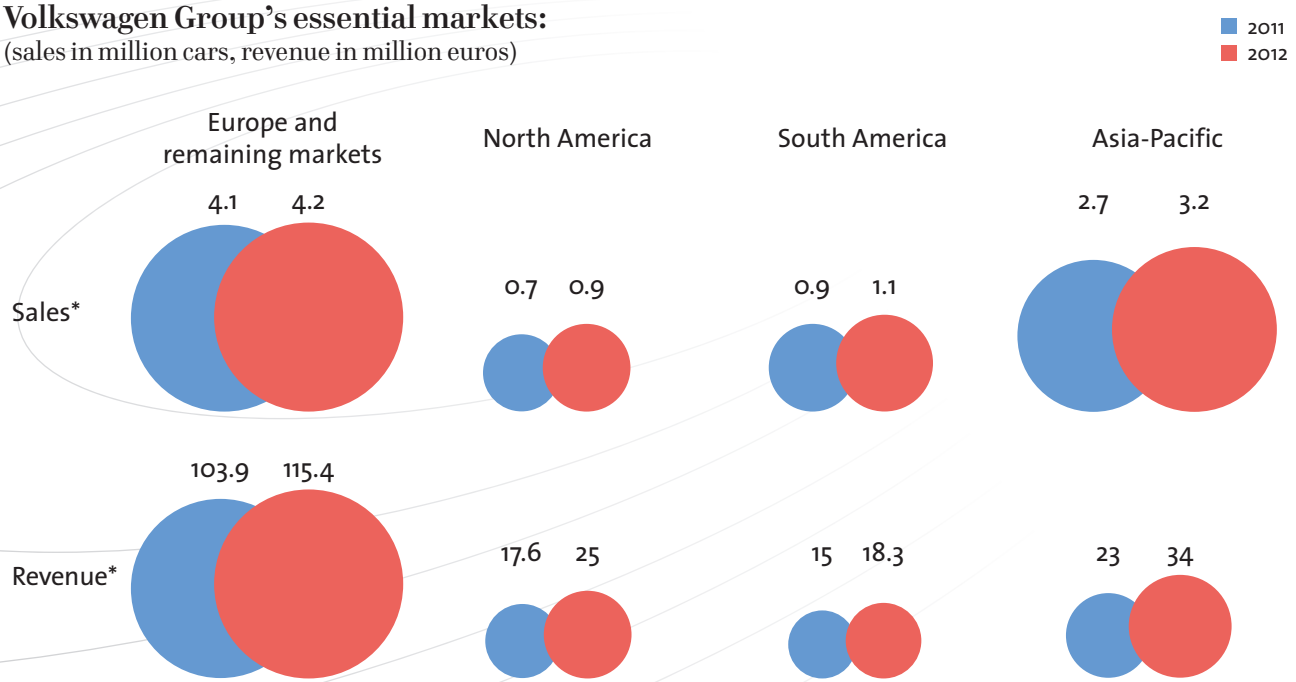
In 2011, German gross national product per capita was 32,293 euros in real currency. While German incomes, at this high level, only increase moderately, Chinese GNI per capita has more than tripled in the last ten years, and, in India, is has at least doubled. This graphic shows the GNI per capita of the respective countries in the artificial PPP dollar currency (see Glossary), as used by the World Bank. The 2013 exchange rate is used.

Number of existing vehicles:
(in cars per 1,000 inhabitants)



The number of vehicles in China and India will keep growing rapidly in the coming years. In 2011 more than seven times the number of cars were licensed in China, compared to 2001. In India, car numbers have doubled over the same period of time. The number of cars licensed in Germany per 1,000 inhabitants appears to decrease despite rising levels of prosperity. The reason for this is a change in the counting method used by the German Federal Motor Transport Authority in 2008. Since then, decommissioned cars are not included in the statistics.

Volkswagen Group's essential markets:
(sales in million cars, revenue in million euros)



Car sales have increased most dramatically in the North American market, followed by the Asia-Pacific market. The market in Europe is growing least, probably due to its high level of saturation.

* The numbers of sales have been rounded-up individually, thus if added up a slight discrepancy may appear. Joint-venture companies in China are not accounted for in the revenue proceeds of the Asia-Pacific region.

Seamless Mobility – Expec

Futurologist Wolfgang Müller-Pietralla on the outlook

How will we drive in the future and what role will the car play from an overall societal standpoint? Wolfgang Müller-Pietralla deals with these and other questions. As a futurologist, he includes different indicators such as the observation of trends, external studies and own research, in order to answer these questions.

How will the creation of value have changed in the automobile industry in 2020?

Wolfgang Müller-Pietralla: We face big changes in global mobility. The drivers are manifold: regulations in the area of climate and the environment, very high volatility of prices within the natural resources sector and an increase in competition from emerging market manufacturers. While there will be an increase in factory production by automobile producers and suppliers in China and India, further reductions in the USA and Europe are to be expected. New drive systems and progress in IT, integrating cars with their associated infrastructure, will have a large impact on the structure of value creation. Among these are, for example, electromobility, automatic driving, but also the intermodal connection between different modes of transportation. On the whole, interconnection in the mobility sector will progress. Seamless Mobility is the demand, in order to ensure the safe, efficient, and sustainable transportation of passengers and goods. From this, interaction with other industries such as the energy or IT sector results. Automobile manufacturers will either increasingly orientate towards creating their own IT competence, or cooperate more closely with partners in that sector. Customers will continue to expect more environmentally-friendly and fuel-efficient, individual mobility. Concerning drive systems, a move towards electromobility is to be expected; here, the battery and the charging infrastructure will play a major role in value creation. Automobile producers are currently intensifying their capacities in battery research and development, as well as in production, with a focus on long-distance mobility. In light of increasing urbanisation, metropolitan public transport will also play an increasingly important role.

Wolfgang Müller-Pietralla, Head of Future Research and Trend Transfer.

> "It is going to be crucial that individual mobility runs like clockwork."
>
> **Wolfgang Müller-Pietralla**

What are the consequences of this for the automobile industry?

The consequences are, at the same time, opportunities. Let's take the example of Seamless Mobility. Automobile companies can, for example, provide car fleets, infrastructure and information services at the same time. This enables the planning of the whole route,

TATIONS FOR THE FUTURE OF MOBILITY
for the industry

switching modes of transportation via real-time traffic information, traffic control technology, mobility cards, access technology and ticketing, all from a single source. The term 'drive-in customer' will establish itself in the context of automatic mobility. Different service providers (e.g. gastronomic) send their offers to the car, while the driver is sitting relaxed in the car and looking for a good restaurant along the route. All in all, the automobile industry will meet customers' social and technological expectations, even more precisely and more closely aligned to demand with their product portfolio. We operate Group brands such as MAN and Scania, which will assume a key position in public transport.

> "Customers will continue to expect more environmentally-friendly and fuel-efficient, individual mobility."
>
> **Wolfgang Müller-Pietralla**

Why will there be less cars in the cities in the future?

Through urbanisation more and more people move into cities, which makes space a very valuable commodity. This can be seen even today, by the high parking fees in megacities. The upkeep of a car in large cities is becoming increasingly expensive. We know from talks with those responsible for cities, that in some cities a future is pictured in which the centre is a greener area with more car-free areas. This corresponds to a steady reduction in parking space. This way, driving into the city centre is made as uncomfortable as possible for drivers. New concepts for stationary traffic are important here. These concepts have to facilitate switches between modes of transportation as effectively as possible, from car to local public transport, or to micro-mobility such as bicycles or Segways, also with regards to payment transactions and information on the connections desired. It is going to be crucial for today's – as well as future – customers that individual mobility runs like clockwork.

The future of mobility will be all about constant innovations in engine and environmental technologies.

Will the combustion engine be completely replaced by the electric motor, as more and more natural gas cars are launched on the market?

There will be a mix of different vehicle concepts over the next twenty to thirty years. The combustion engine is continuously being optimised, it will be with us for a long time. Electromobility will have a significantly higher status. Natural gas, mainly because of newly discovered reserves globally, offers diverse potential – also with regard to storage possibilities for renewable energies. In the medium term, the combustion engine will have a right to exist in plug-in hybrids because no long-distance battery is in sight in the coming years. Solutions to this problem that will be suitable for daily use, will not arrive until long after 2020.

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VOLKSWAGEN SHAPING THE FUTURE OF MOBILITY

Driving the German Economy

With global revenues of 357 billion euros, the automobile industry is Germany's biggest-selling industry.

The automobile industry has more money for research and development at its disposal than the corresponding Federal Ministry.