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# Future Development in the Automotive Industry and its Markets

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Barcelona, 10 September 2010



MANAGEMENT ENGINEERS  
Consulting to Completion

## Current Situation in the Automotive Industry (1 of 2)

The crisis has been overcome, but the automotive industry is facing major changes

### The Crisis in the Automotive Industry is starting to be overcome

- The **global automotive market** will **grow to 66 million passenger vehicles** in 2010 as a whole
- The **Chinese automotive market** has **grown by more than half** in the first five months of 2010
- In **India**, **automotive sales increased by almost a third** in the first five months of 2010

### The Global Vehicle Fleet will double by 2030

- The automotive and automotive supply industry are facing a **phase of immense growth**
- The **number of vehicles** on streets throughout the world will **double** within the next two decades
- The global automotive market remains a **demand market**

## Current Situation in the Automotive Industry (2 of 2)

The crisis has been overcome, but the automotive industry is facing major changes

### The Growth will mostly take place in Asia

- The highly developed **industrial countries** (old triad) are basically **only replacing the vehicles that are registered today**
- The **BRIC countries** are becoming the regions with the **highest growth dynamics**
- Followers of the BRIC countries are the economies of the **ASEAN countries** and – in the distant future – those in **Africa**

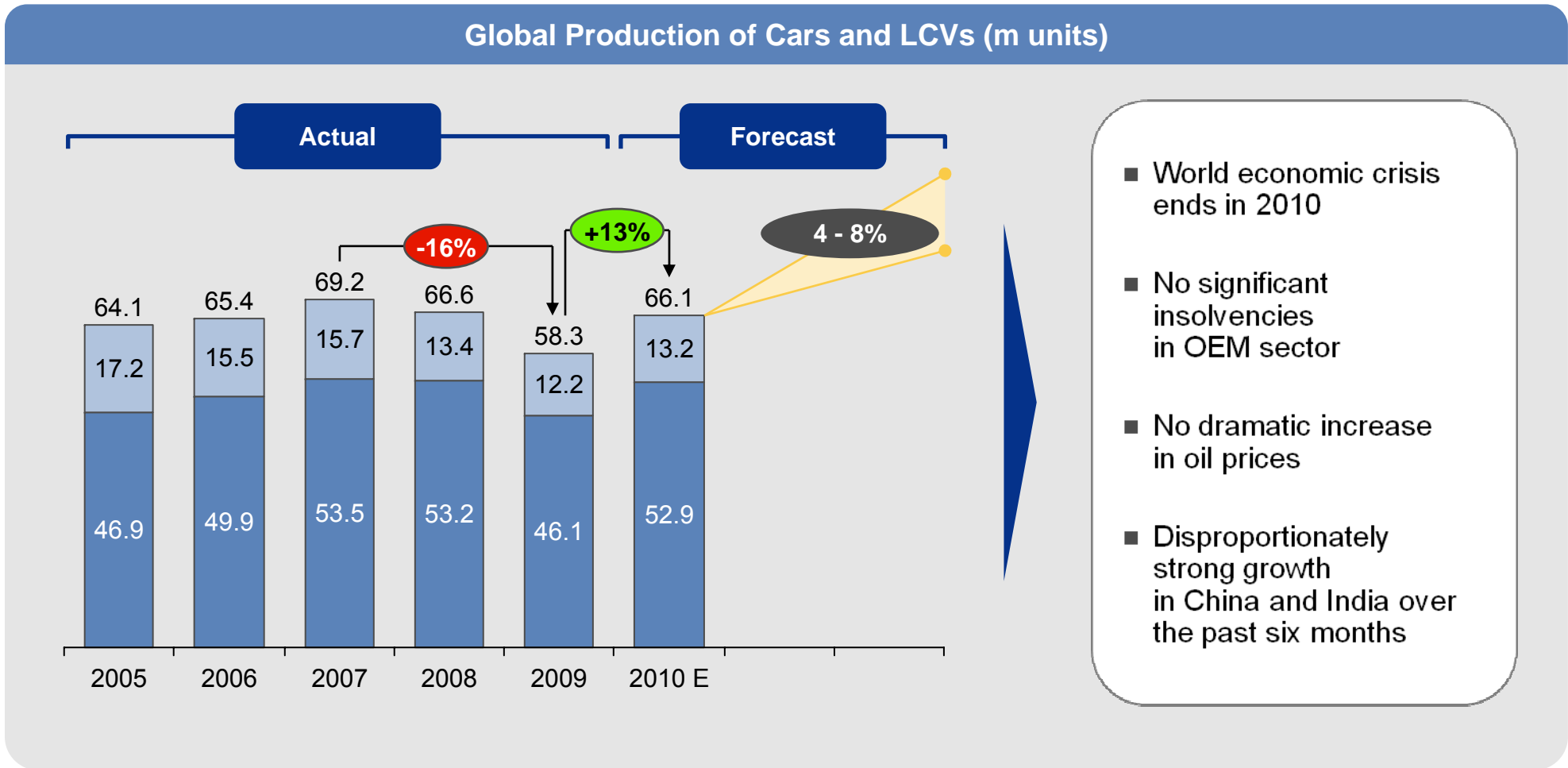
### The Automobile is being reinvented from a technical point of view

- The **automobile** must be **reinvented** over the next fifteen years
- **New challenges** result from the limitation of **emissions** and the increasing demand for **mobility**
- The challenges are different for the markets of the **triad**, the **emerging markets**, and the **megacities**

ASEAN: Association of South East Asian Nations    BRIC: Brazil, Russia, India, China

# The Crisis in the Automotive Industry has been overcome

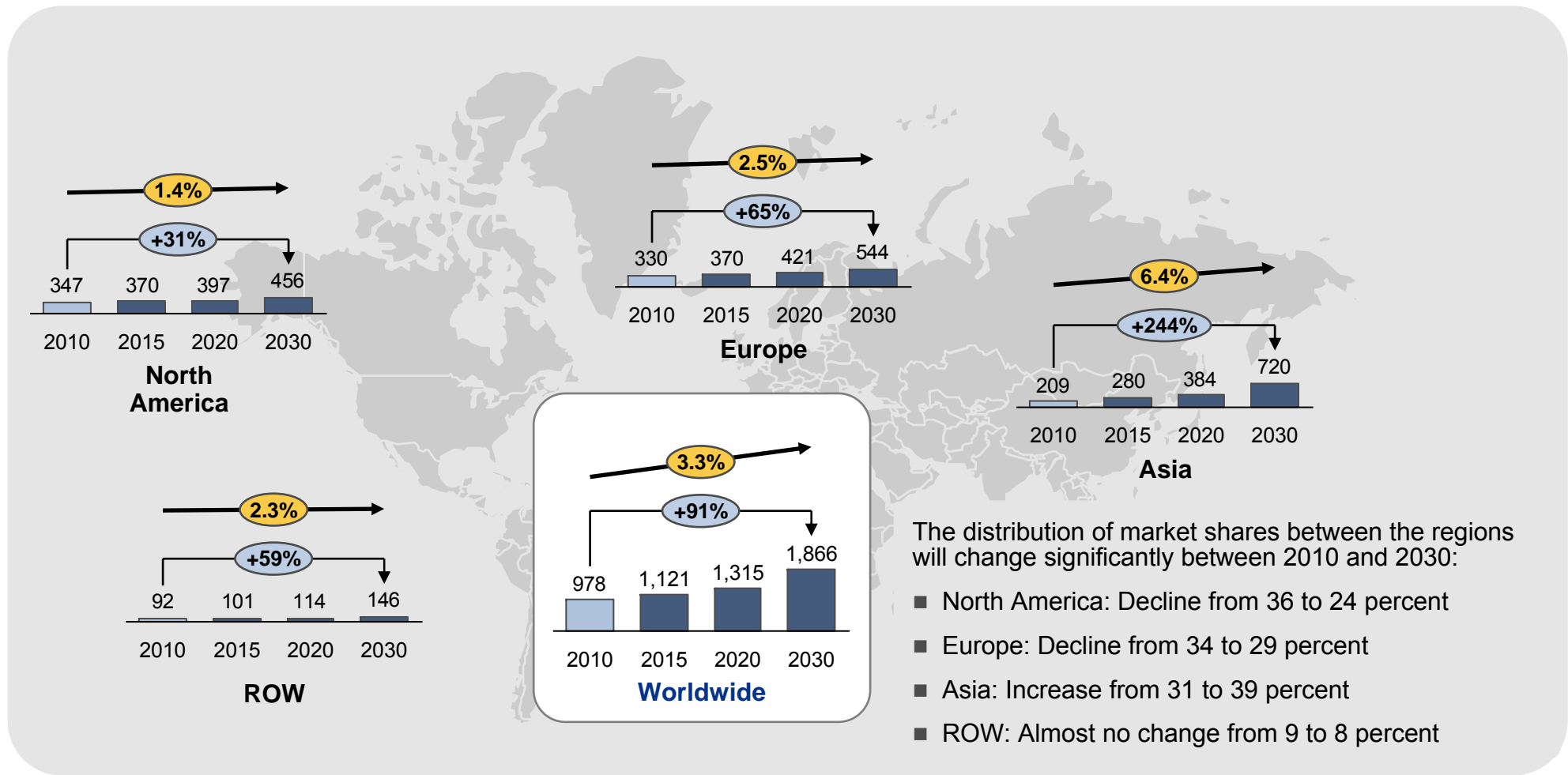
Actual forecasts for 2010 show a significant growth in the automotive industry



\*Compound annual growth rate LCV: Light commercial vehicle Source: ME Research

# The Global Vehicle Fleet will double by 2030

The global vehicle fleet will nearly double between 2010 and 2030, reaching 1.9 billion vehicles



The distribution of market shares between the regions will change significantly between 2010 and 2030:

- North America: Decline from 36 to 24 percent
- Europe: Decline from 34 to 29 percent
- Asia: Increase from 31 to 39 percent
- ROW: Almost no change from 9 to 8 percent

XX : CAGR: Compound annual growth rate    ROW: Rest of the world    Sources: POLK, ME/FHDW research

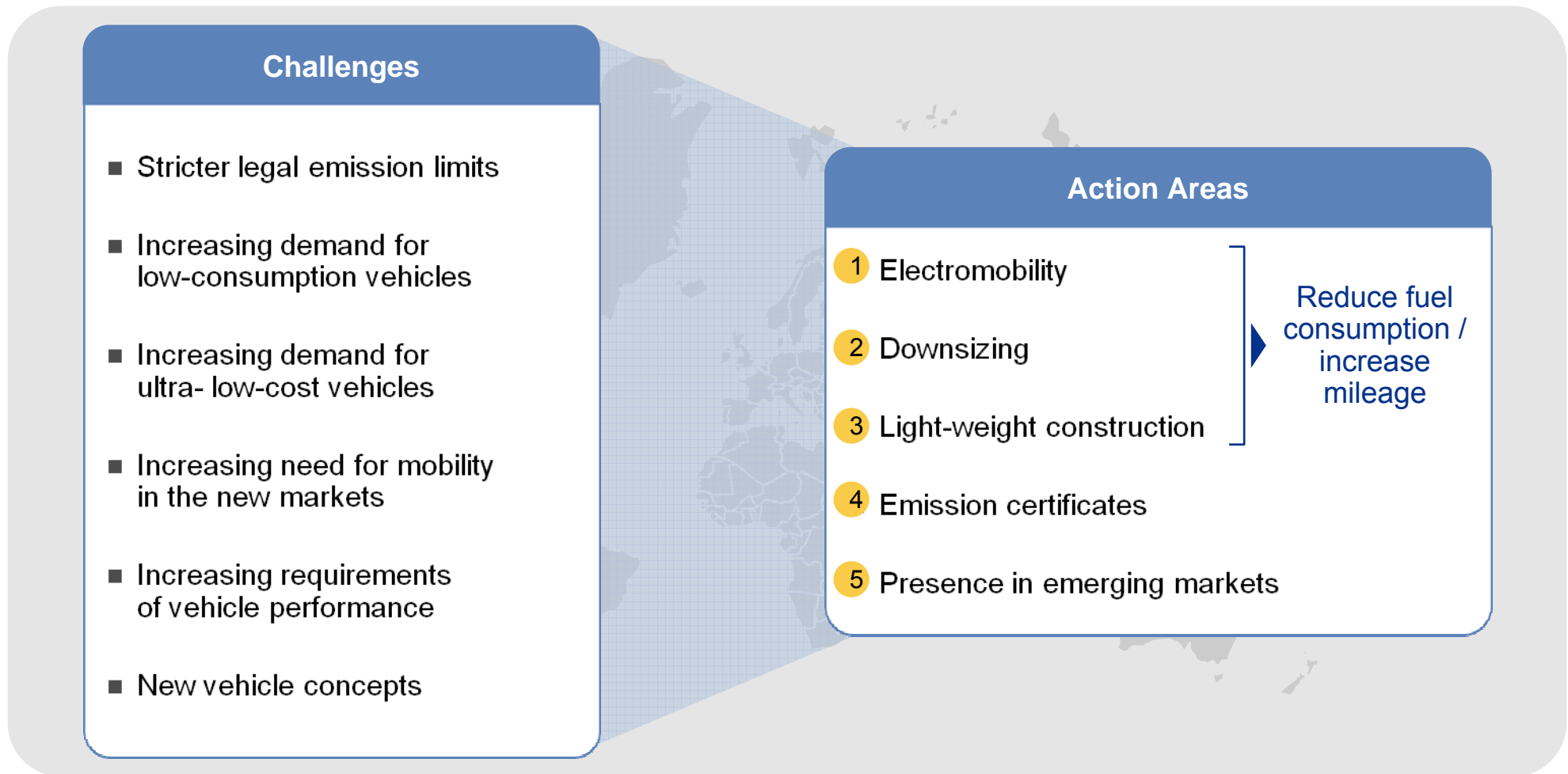
## The Car is being reinvented from a technical point of view

Changed requirements in the triad markets, as well as individual trends for emerging markets and megacities pose new challenges for the automotive industry

	Legal Emission Limits	Fuel Consumption	Vehicle Performance	New Vehicle Concepts	Vehicle Sales Price	Need for Mobility	Local Content
North America	↓	↘	↗				
Western Europe	↓	↓					
Japan	↘	↘					
South America					↘	↗	↗
Russia					↘	↗	
India					↓	↑	↗
China	↘	↘			↘	↑	↑
Megacities	↓			↗			

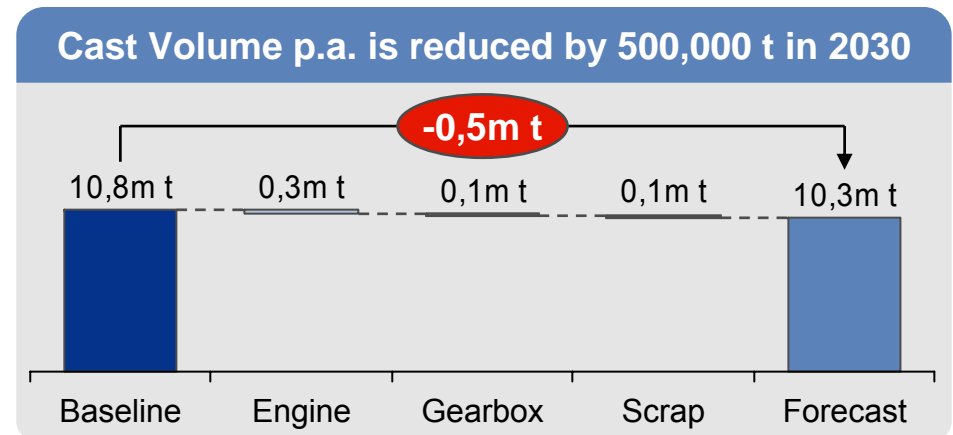
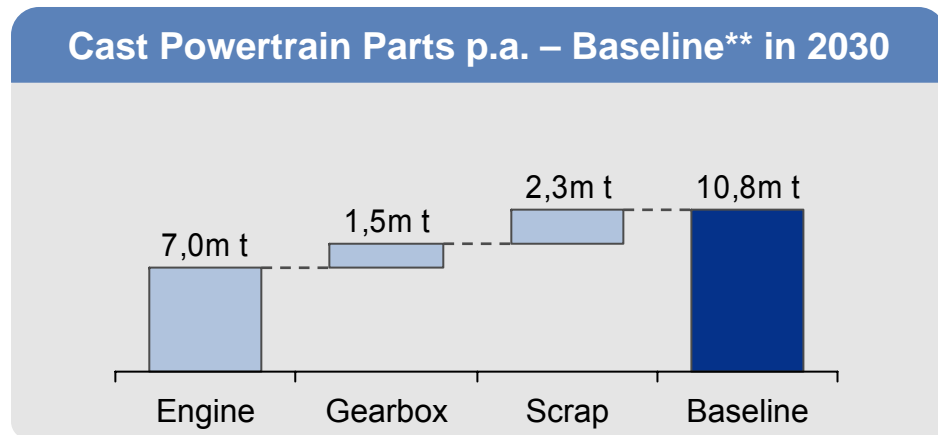
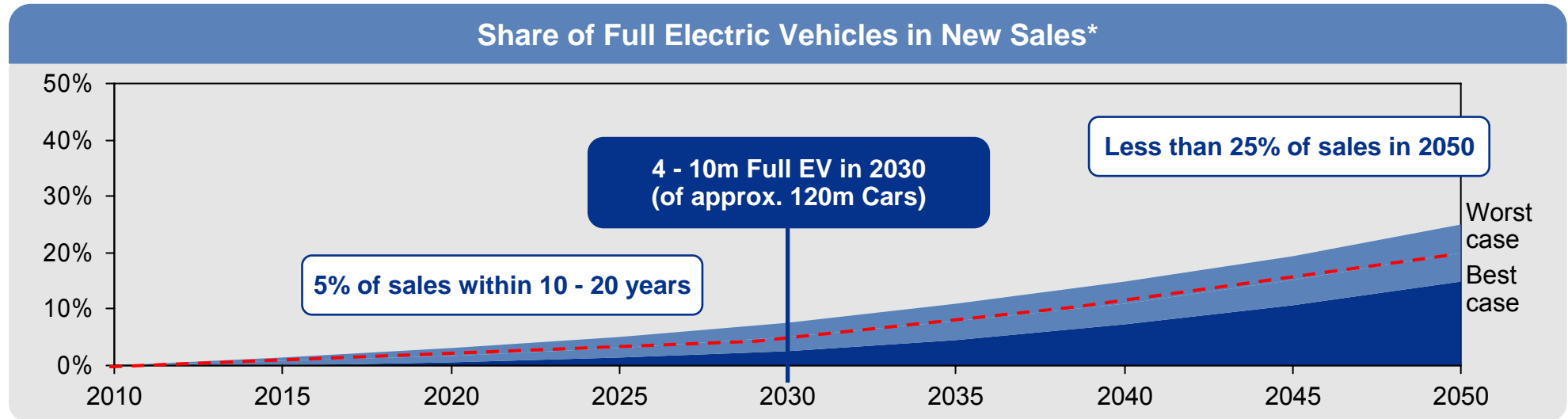
# Main Action Areas in the Automotive Industry

The global challenges result in five major action areas



# 1 Electromobility – Influence on Cast Powertrain Parts

In the short or mid term, full electrical vehicles will only make up a small share of vehicle production and have little influence on the market for cast powertrain parts

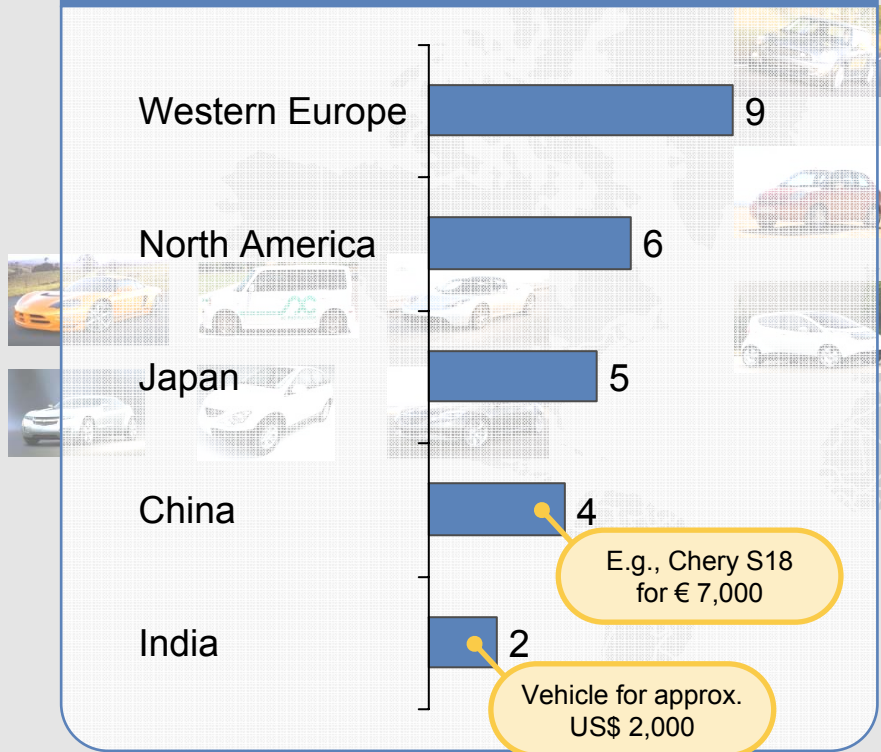


EV: Electric vehicle \*ME forecast \*\*0% share of full EVs

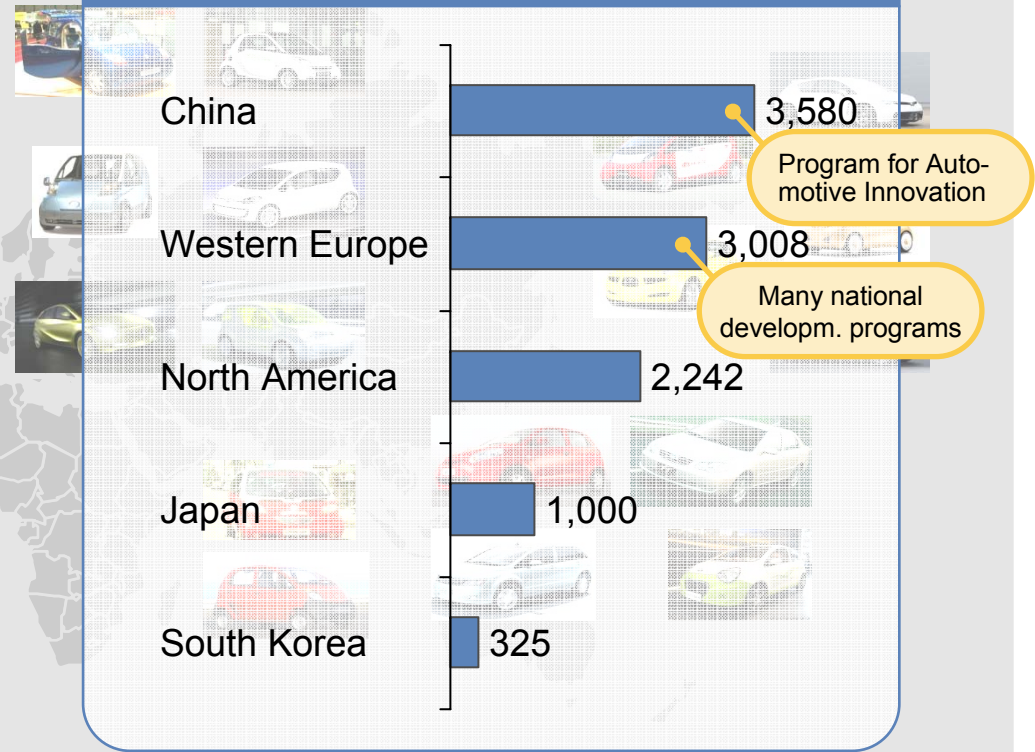
# 1 Electromobility – Initial Situation

China significantly subsidizes the electric drive train and corners the low-cost segment together with India

Number of Full EV Models 2008 to 2012



Government Development Program (m €)



EV: Electric Vehicle Source: ME, Status: 2009

## 1 Electromobility – Key Findings

1

Electromobility will reach 5% of sales within the next 10 - 20 years

2

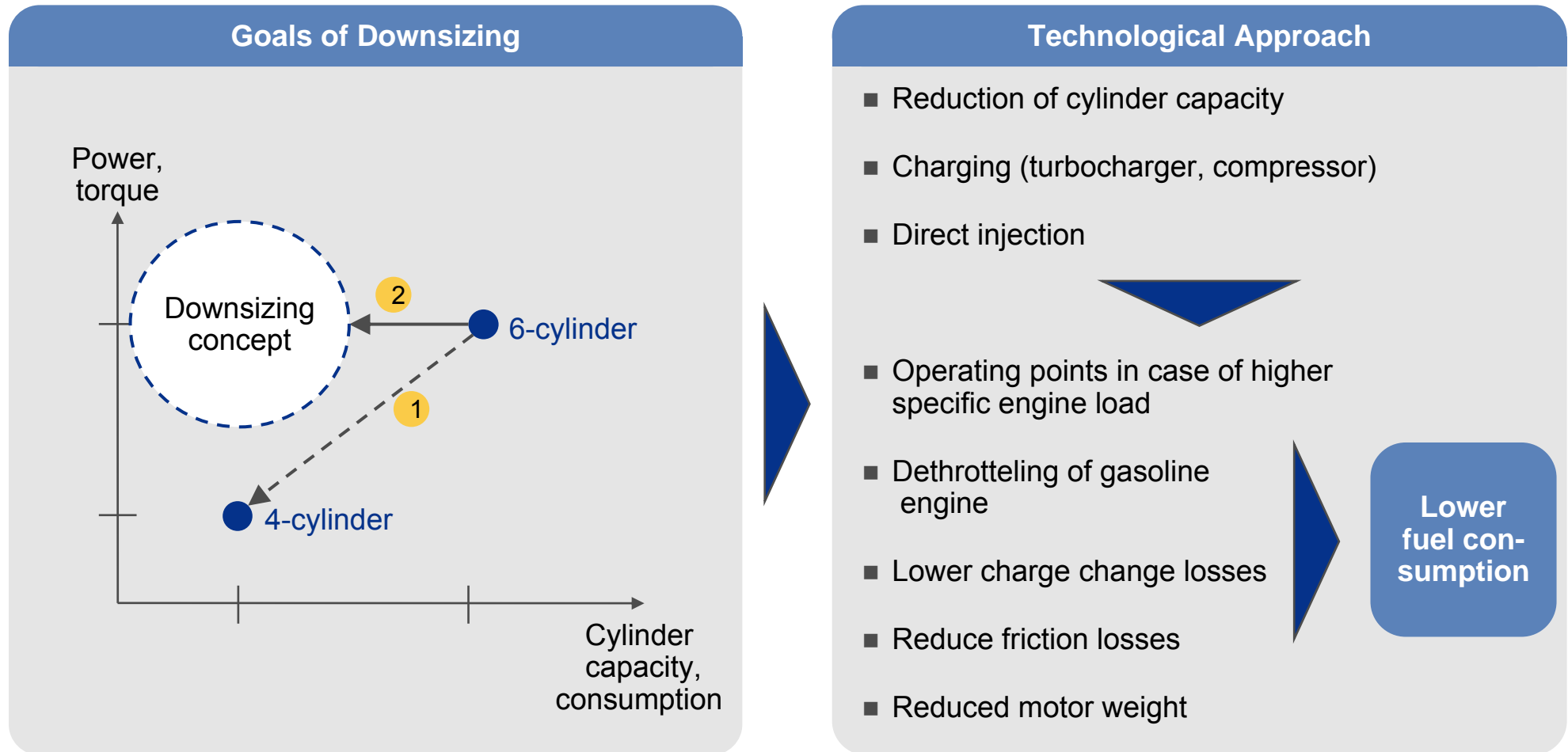
Electromobility reduces the cast part volume of powertrain parts by about 500,000 t p.a. by 2030 without replacement and is thus no significant threat

3

Until 2050, less than 25% of the new vehicle sales will be vehicles powered by electricity exclusively

## 2 Downsizing – Technological Approach

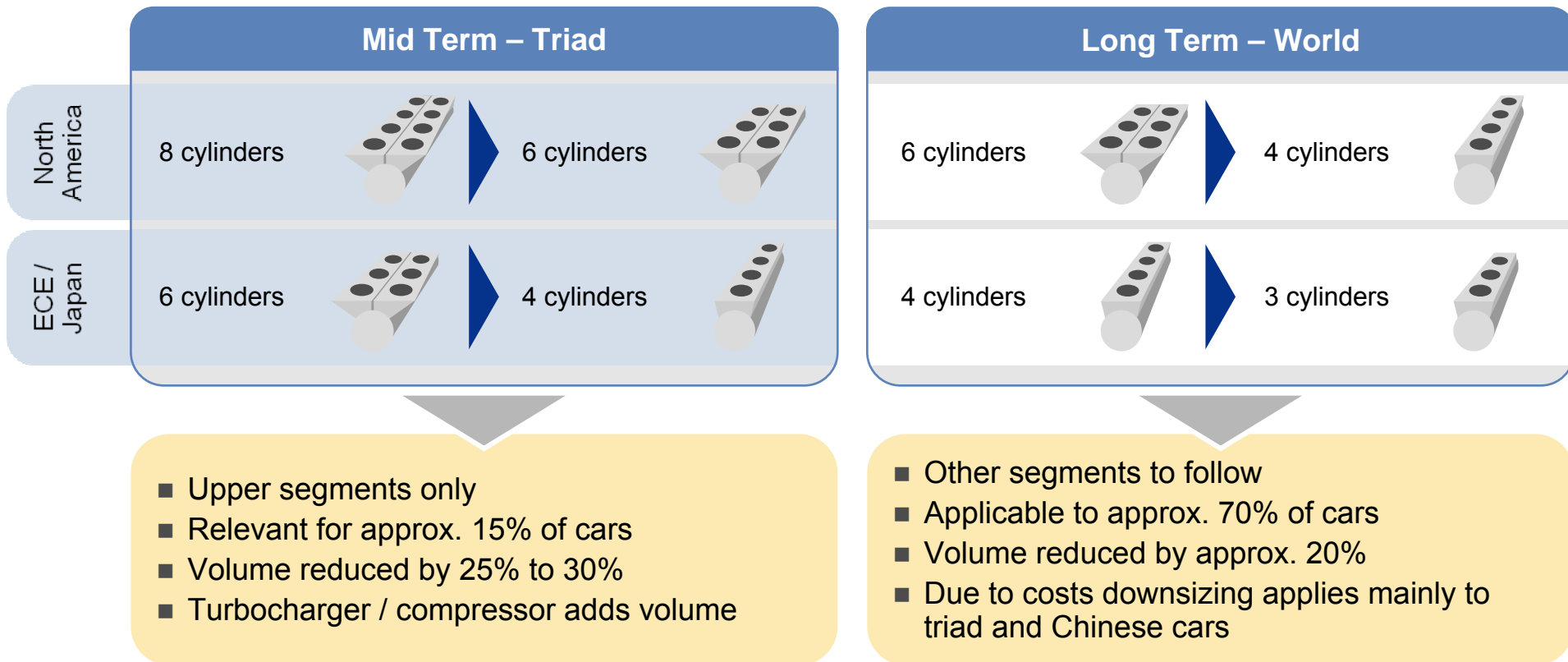
Downsizing reduces the average fuel consumption of combustion engines



Source: MAHLE

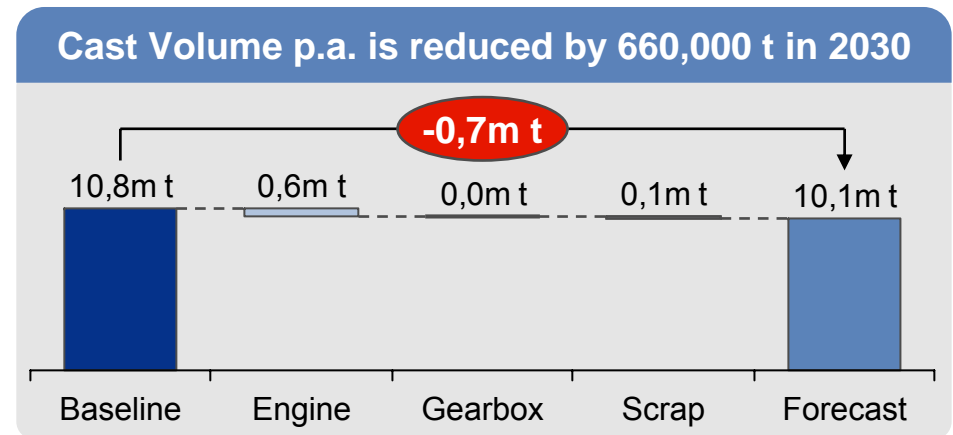
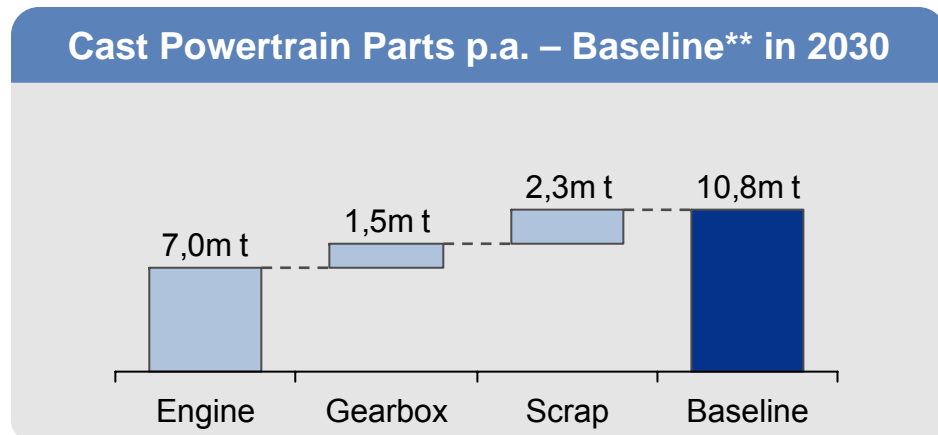
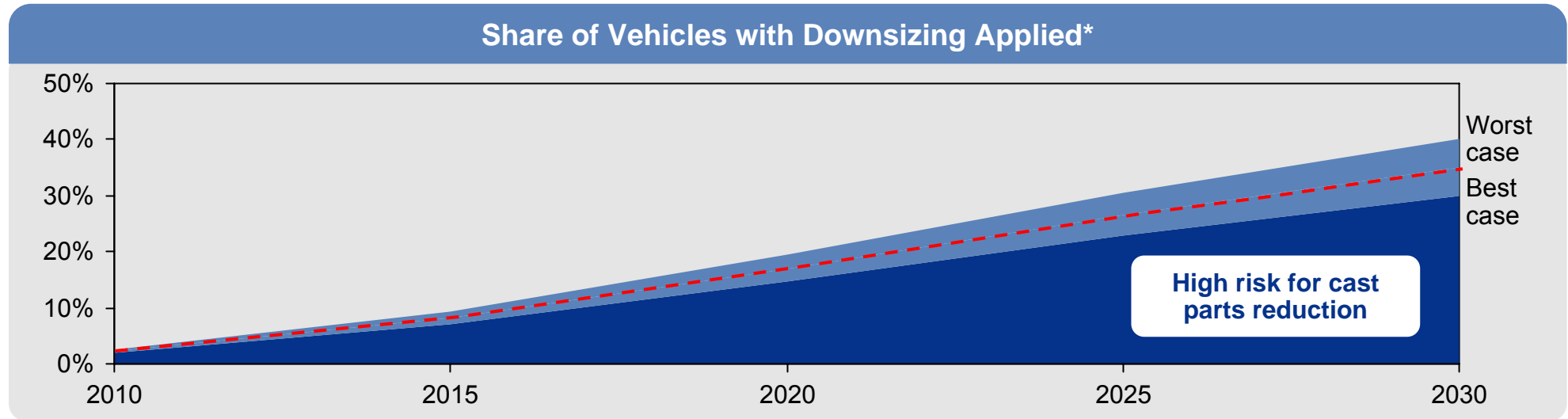
## 2 Downsizing – Concepts

In downsizing concepts, the number of cylinders and therefore the engine size are reduced



# 1 Downsizing – Influence on the Market Volume

The share of vehicles with downsizing concepts applied will rise, sustainably reducing the market volume for cast engine parts



EV: Electric vehicle \*ME forecast \*\*0% Share of downsizing

## 2 Downsizing – Key Findings

1

First, large volume motors in the upper vehicle segment are replaced by smaller motors. In the long term, the other segments will follow

2

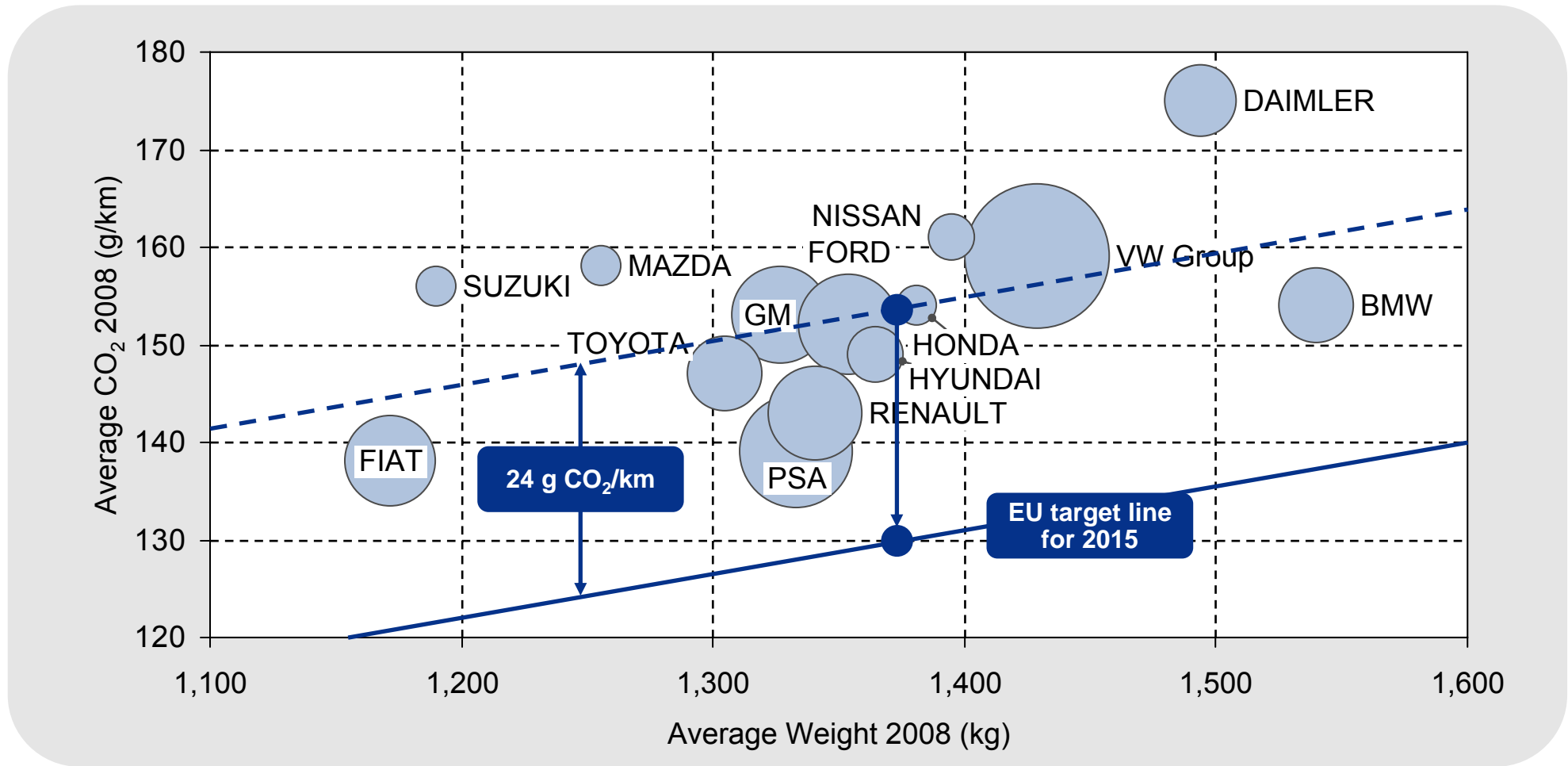
Downsizing reduces the casting volume of a single motor by approximately 20%

3

By 2030, the casting volume for cast motor parts lost due to downsizing sums up to approximately 660,000 t p.a.

### 3 Light Construction – Fleet Average and EU Target

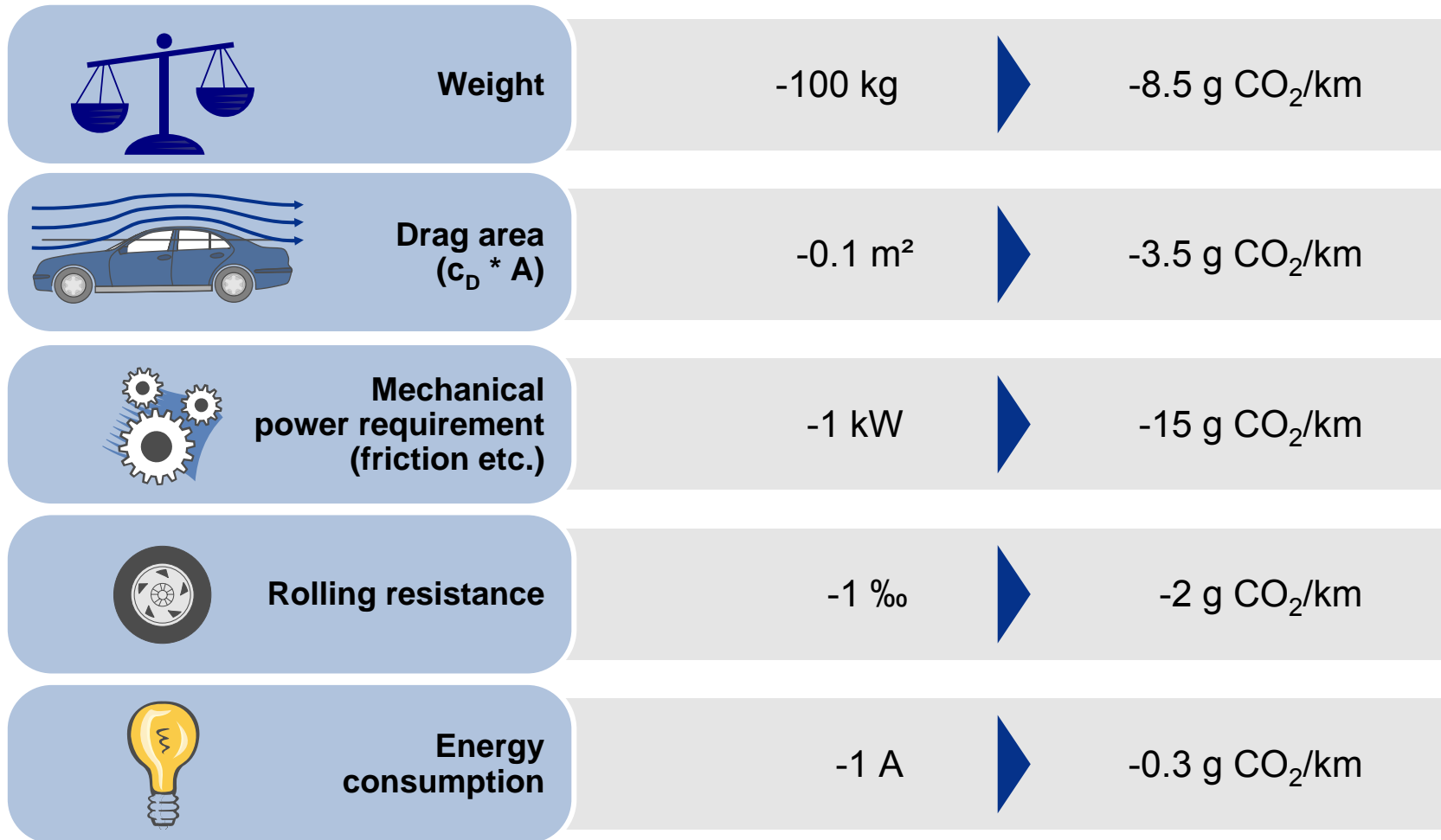
No carmaker except PSA is close to the EU target line for 2015



● EU fleet average Source: Transport and Environment

### 3 Light Construction – Technical CO<sub>2</sub> Metrics of Vehicles

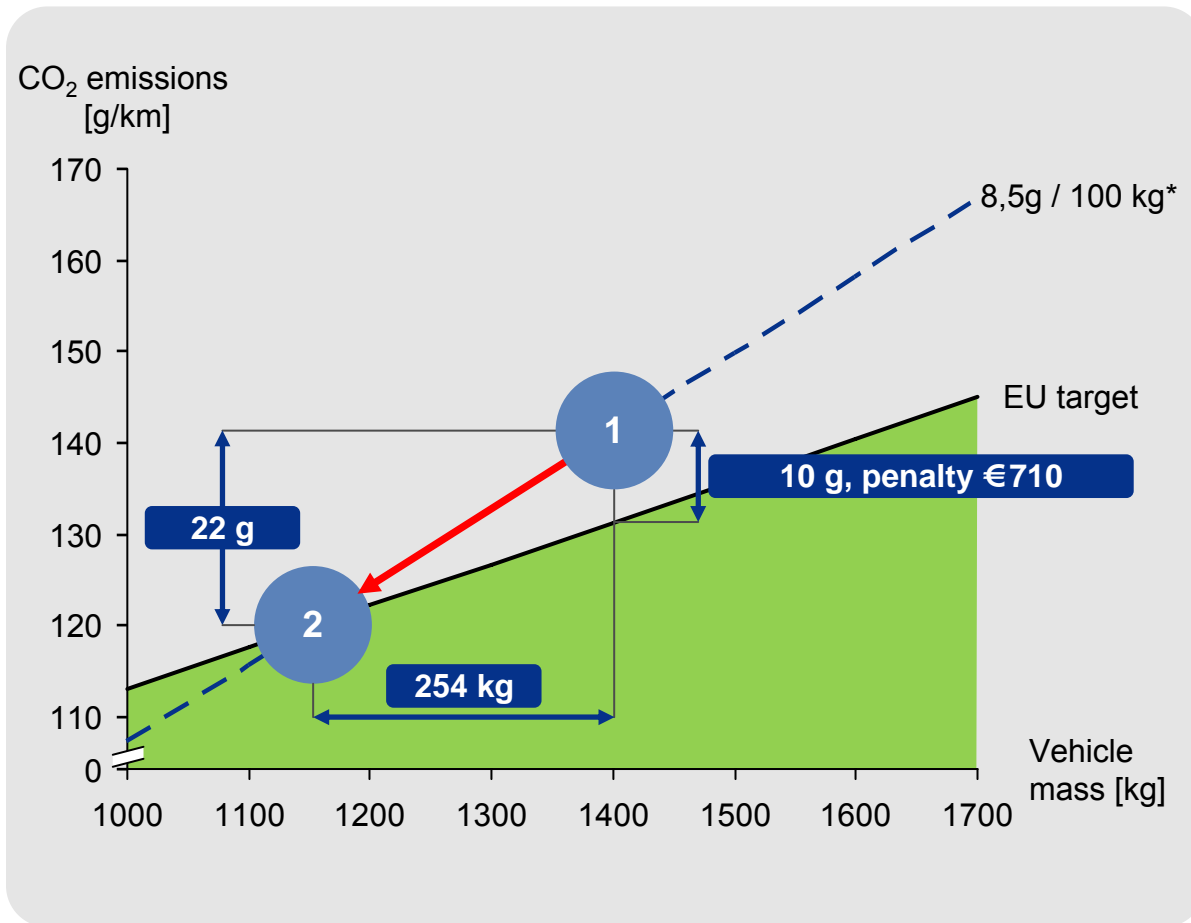
Influence of driving-resistance forces on consumption in new vehicles



Source: VOLKSWAGEN

### 3 Light Construction – Example of an Automotive Premium Manufacturer 2015

Due to disproportionately high penalties for failing to meet the CO<sub>2</sub> target, light construction investments will increase



- 1
- Produced vehicles: 1m
  - Thereof registered in EU: 0.5m
  - Ø vehicle weight: 1,400 kg
  - Fleet consumption 6,0 l/100km
  - CO<sub>2</sub> emissions 141 g CO<sub>2</sub>/km
  - CO<sub>2</sub> target 131 g CO<sub>2</sub>/km
  - Penalty € 355m

- 2
- Weight reduction by 254 kg/vehicle to reach target
  - Acceptable add. costs per veh.: € 355
  - Acceptable add. costs for weight reduction: 1.4 €/kg

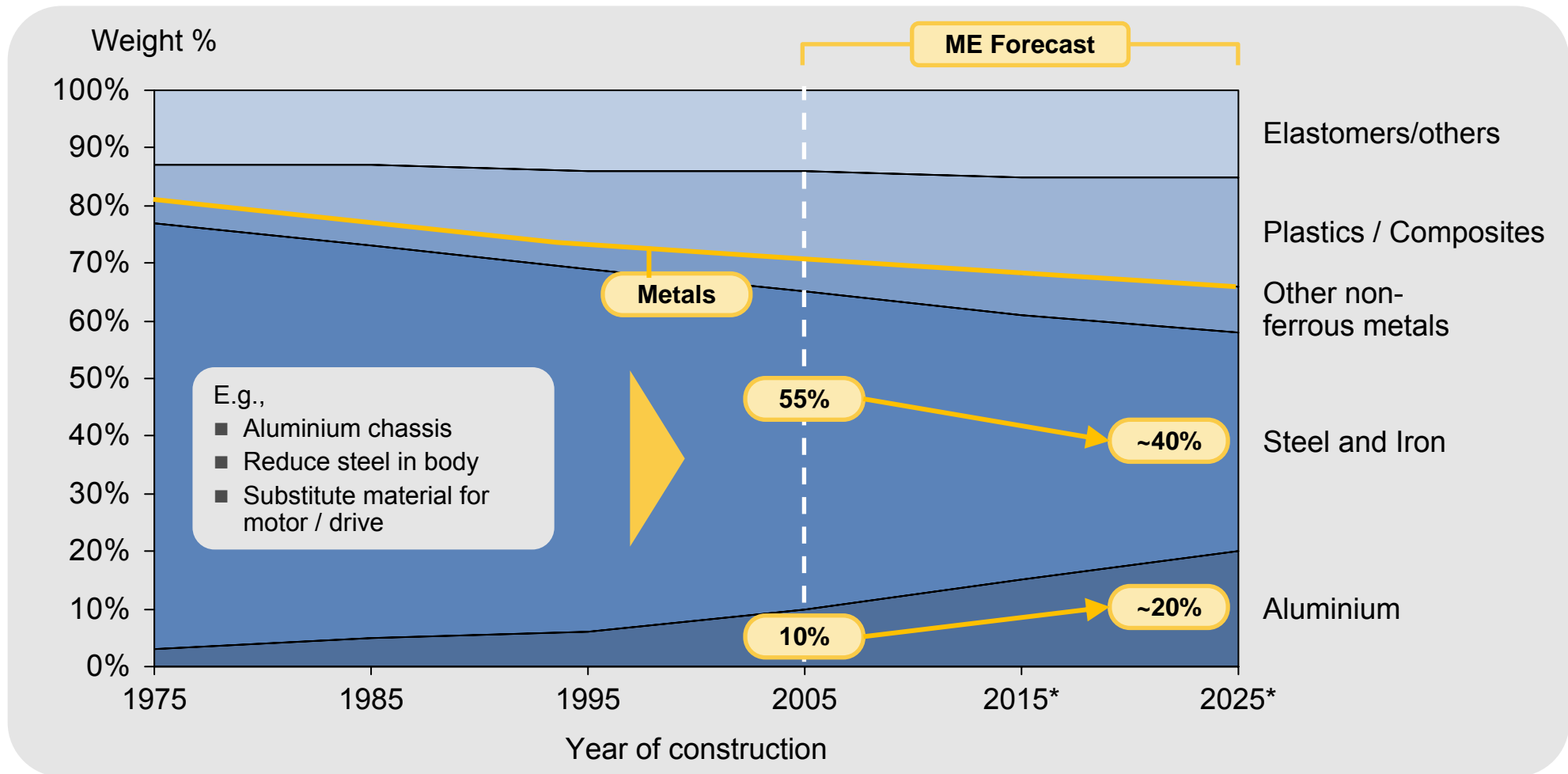
The **additional costs** for weight reduction accepted by the OEM will **increase by approximately 1.4 €/kg** in this example

**Investments in light construction will increase**

\*Assumption 100 kg weight reduction corresponds to -8.5 g CO<sub>2</sub>/km

### 3 Light Construction – Suitable Material Mix for a Light Passenger Vehicle

The weight share of steel in a vehicle will be reduced from 55% down to approximately 40%. The aluminium share, however, will be doubled from 10% to approximately 20%

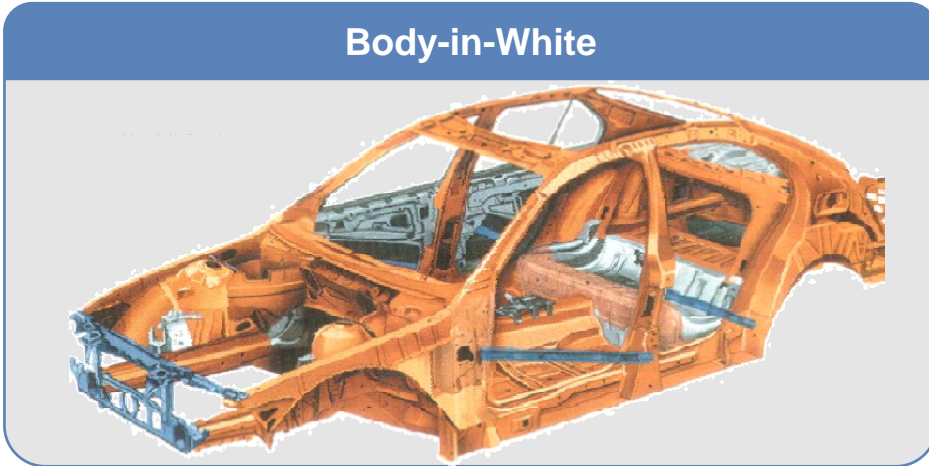


Source: VDI \*ME Forecast

### 3 Light Construction – Body-in-Black

Carbon fibre composites will continue to be used in a small premium segment and will have no significant influence of casting capacities in the foreseeable future

Body-in-White



Body-in-Black



- CFC substitutes mostly sheet metal shell construction
- Additional costs compared to steel currently approx. 25 €/kg
- Not suitable for large series yet
- Construction principle requires large-area force transmission
- Transmission of forces via casting nodes (e.g., front vehicle to CFC Monocoque)

**Used only in a small premium segment,  
no significant influence expected**

CFC: Carbon fibre composites

### 3 Light Construction – Key Findings

1

The share of aluminium in the vehicle will double by 2025

2

The weight share of steel will decline by 30% by 2025

3

*Body-in-Black* has no influence on foundry capacities in the mid term

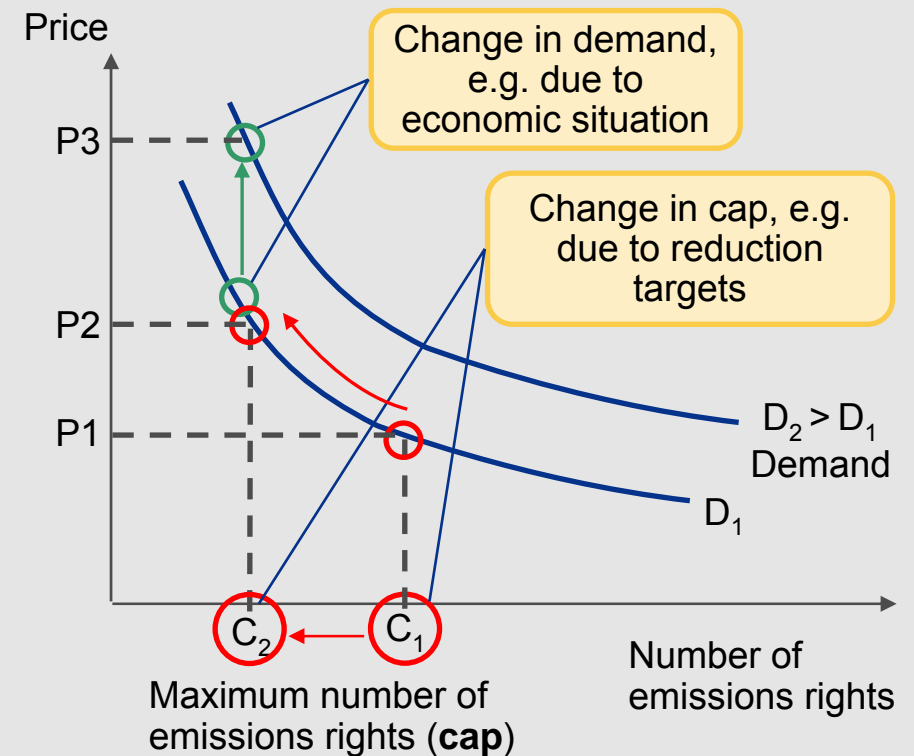
## 4 Emission Certificates – European CO<sub>2</sub> Emissions Trading: *Cap-and-Trade* Concept

Target is to reduce the demand for fossil fuels by price increases due to additional CO<sub>2</sub> costs

### Market-Driven System

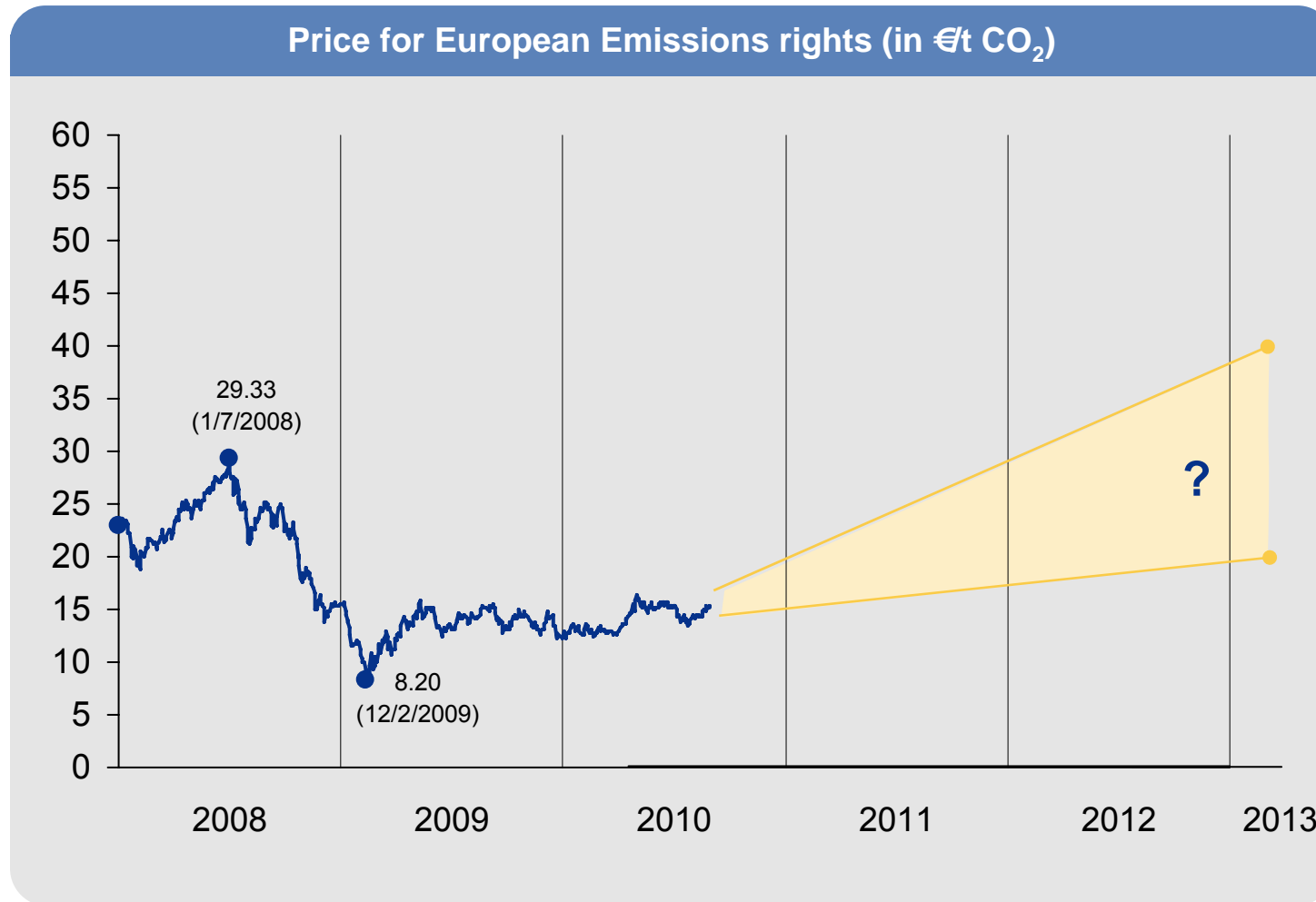
- EU-wide trading with uniform limitation (instead of 27 individual limits)
- Distribution based on per capita BIP
- Reduction of 21% compared to CO<sub>2</sub> emissions in 1999 will take place
- Available CO<sub>2</sub> certificates in 2020: 1,720 mt
- USA and other countries currently not involved
- Energy-intensive, export-oriented industrial companies (>10% sales outside of EU) are excluded

### Price Formation for Emissions Rights



## 4 Emission Certificates – Emissions Price Development

The price for CO<sub>2</sub> certificates is currently very low; by 2013 it could increase to €20 - 40 per tonne CO<sub>2</sub>



Price development depends on

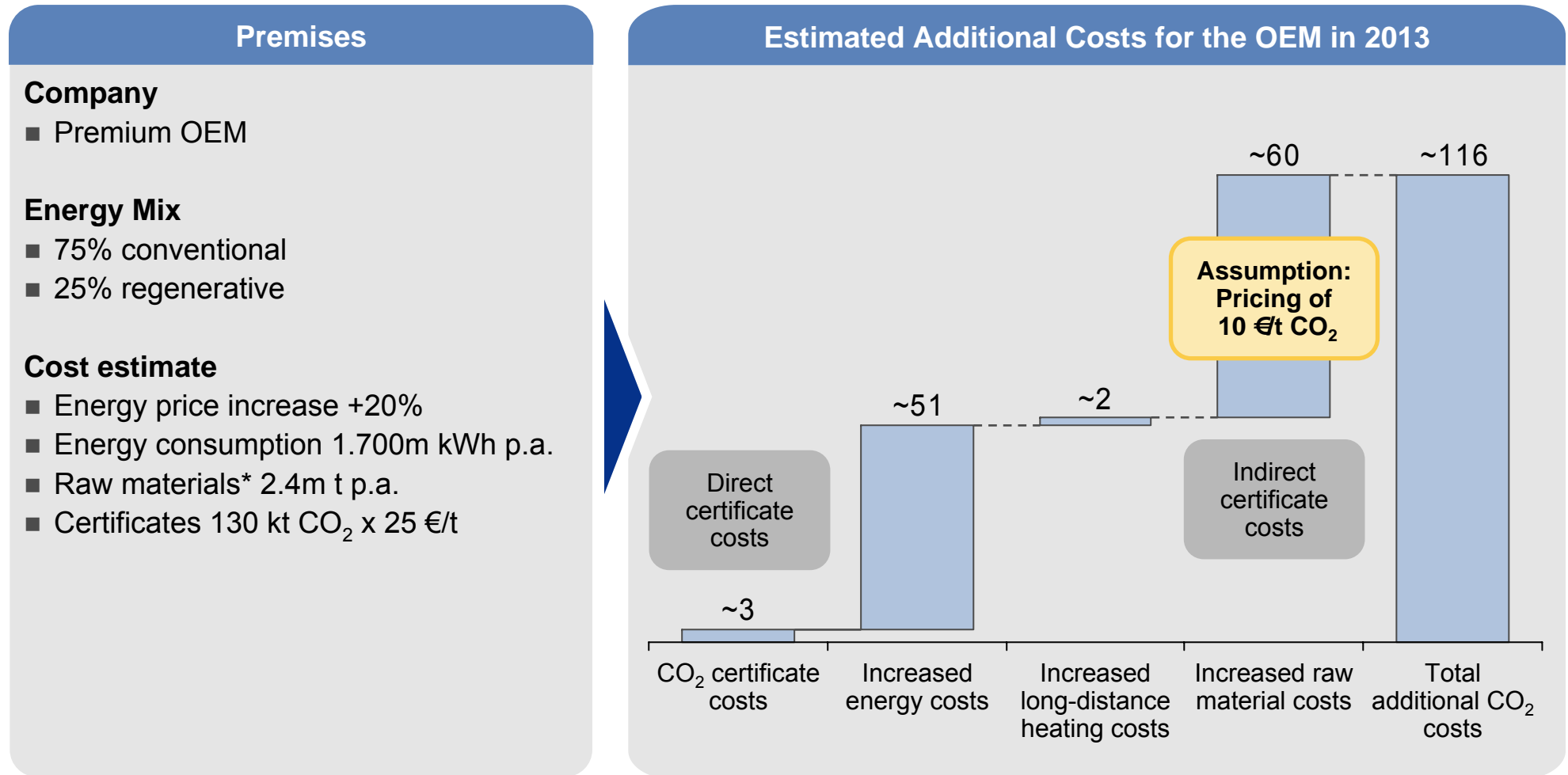
- Climate targets
- Involvement of the USA in certificate trading

Source: ECX EUA daily futures Aug. 2010

## 4 Emission Certificates – Annual Additional Cost for a Premium OEM (in €m)

Rising CO<sub>2</sub> costs will be reflected mostly in energy and raw material costs

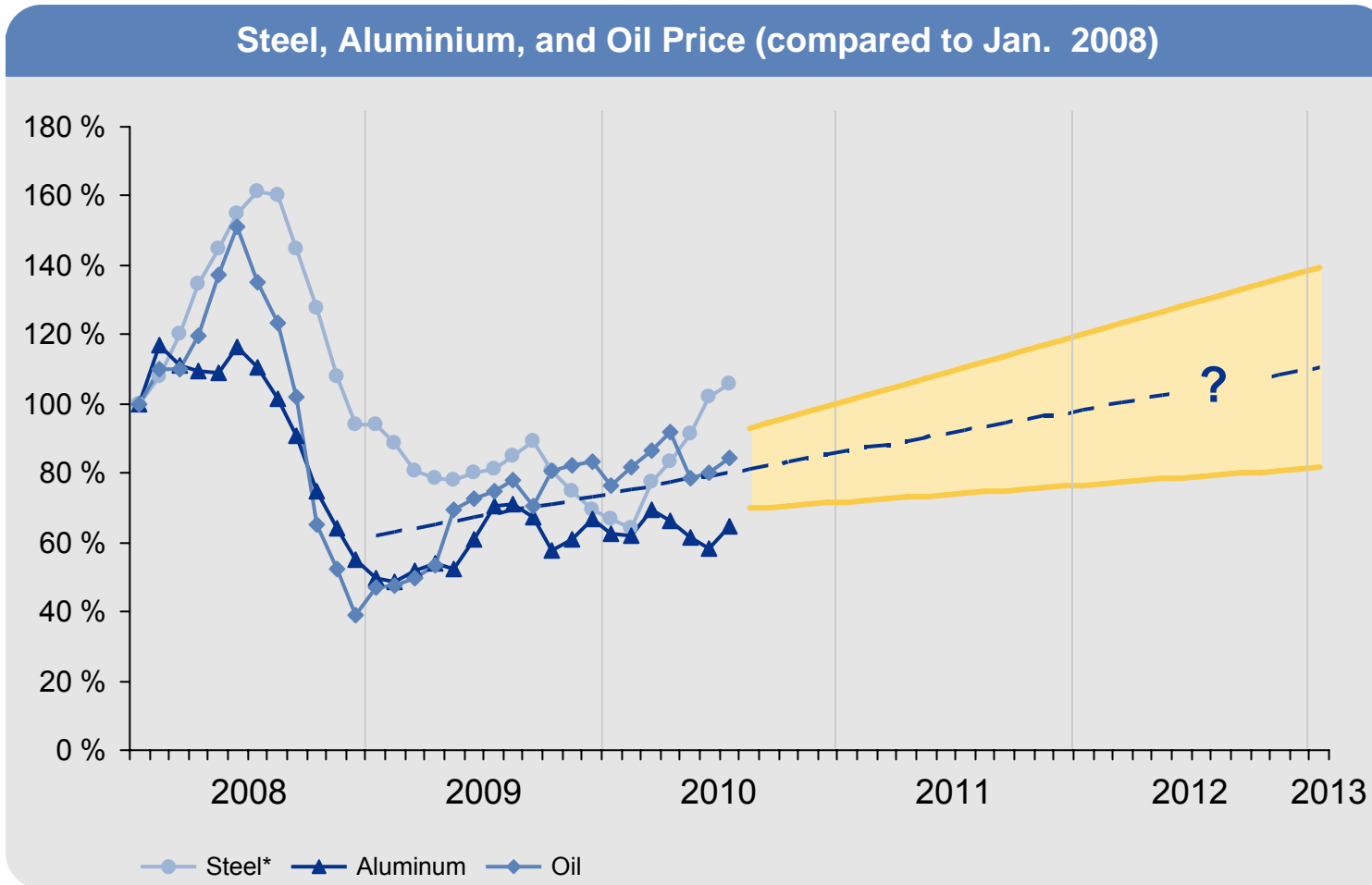
EXAMPLE



\*Steel, plastics, aluminium, magnesium ...

## 4 Emission Certificates – Volatile and Rising Raw Material Costs

Rising CO<sub>2</sub> costs and a reviving economic climate will drive raw material prices up again in the future



- Raw material prices have fallen during the last half of 2008, mainly due to the global economic crisis
- In 2009, prices have started to rise again
- A reviving economic climate and rising CO<sub>2</sub> costs will drive raw material prices up again in the future

\*Hot rolled coil

Source: www.Handelsblatt.com

## 4 Emission Certificates – Key Findings

1

Target is to reduce the demand for fossil fuels by price increases due to additional CO<sub>2</sub> costs

2

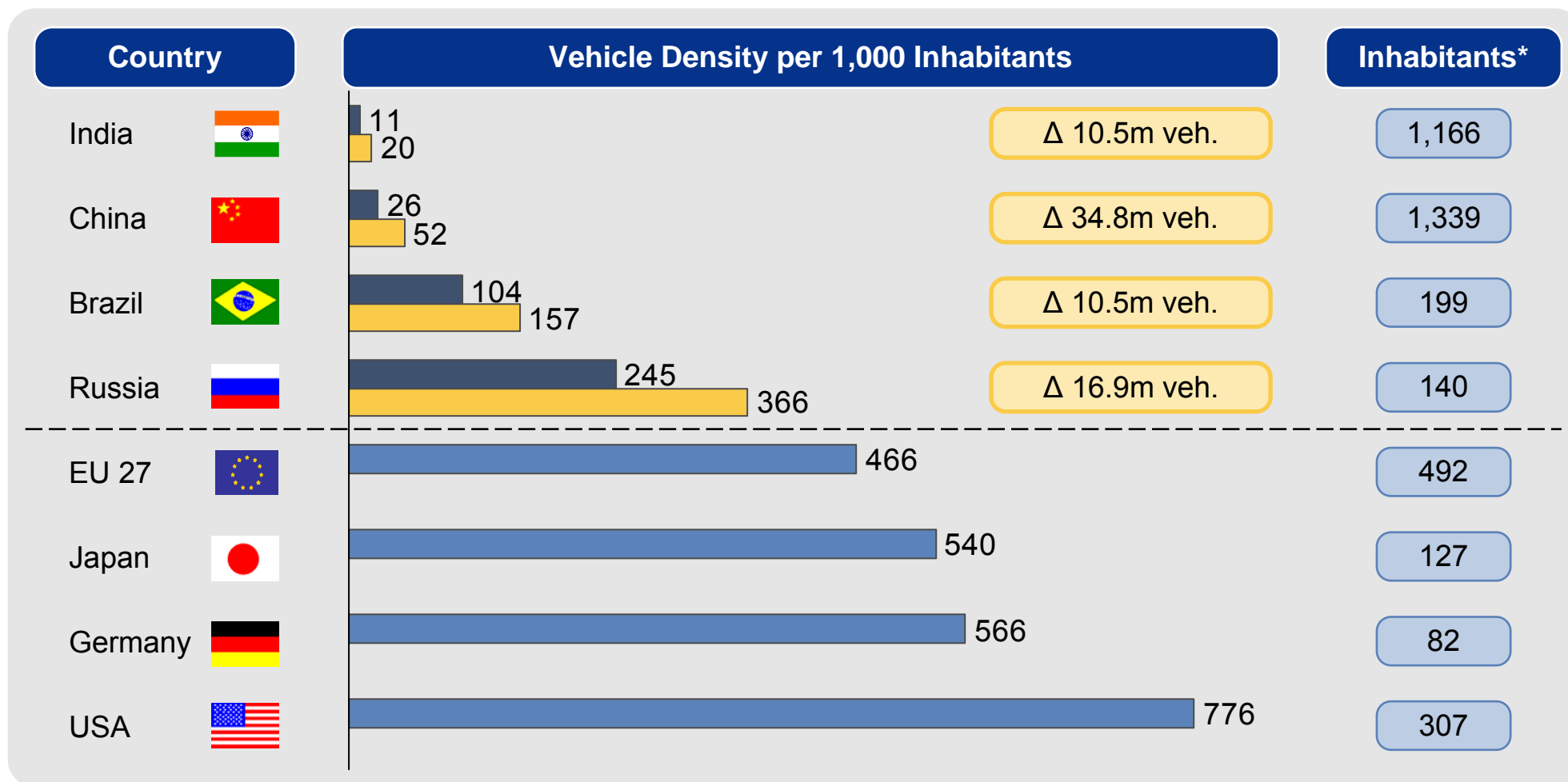
The price for CO<sub>2</sub> certificates is currently very low; by 2013 it could increase to € 20 - 40 per tonne CO<sub>2</sub>

3

Rising CO<sub>2</sub> costs will be reflected mostly in energy and raw material costs

## 5 Emerging Markets – Vehicle Density and Population in International Comparison

Pent-up automotive demand in the emerging, densely populated markets is a major driver for worldwide automotive production

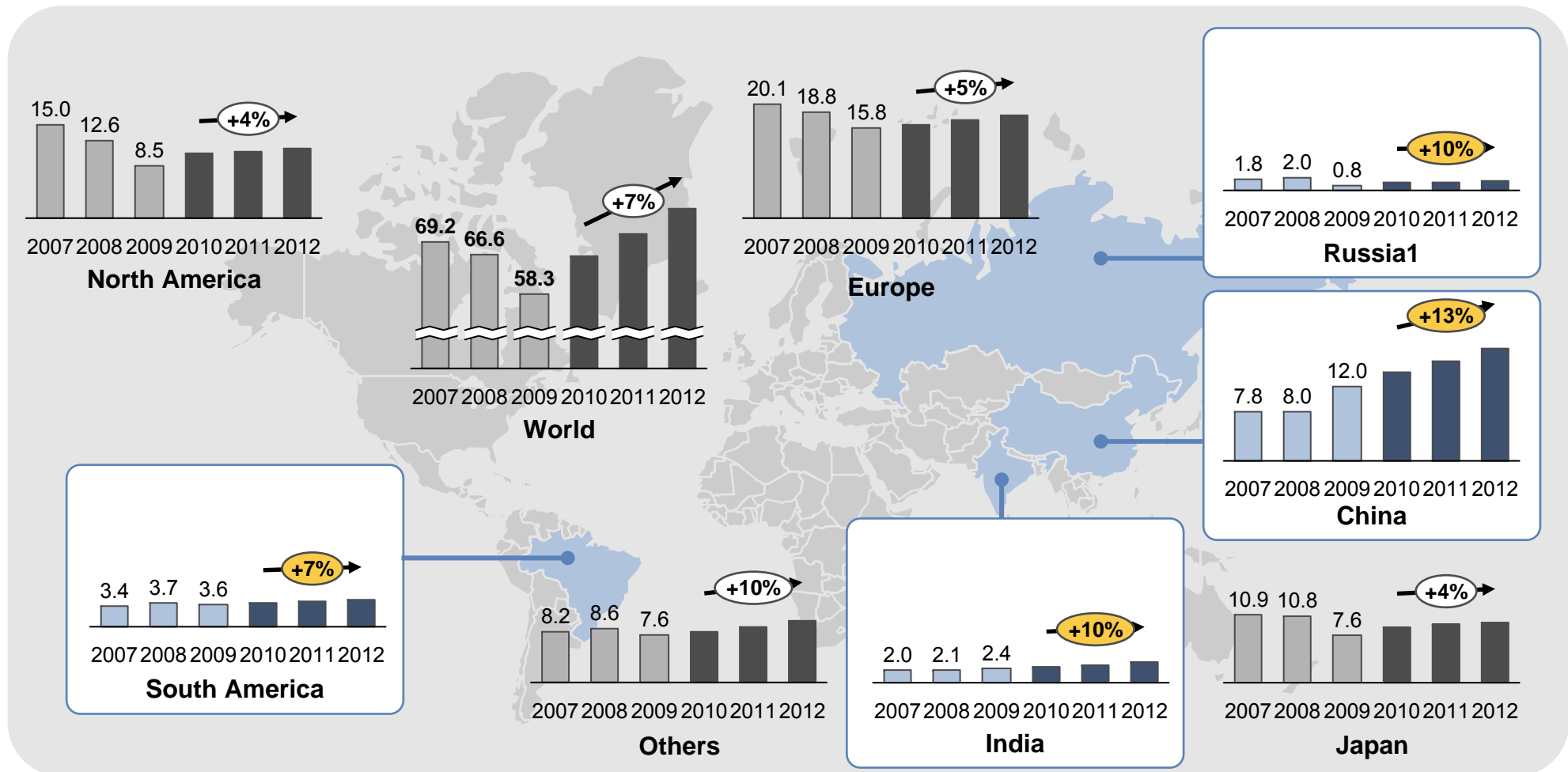


Forecast 2019

Sources: EUROSTAT (as of 2006), ACEA, CIA WORLD FACT BOOK July 2009, IHS GLOBAL INSIGHT \*In millions

## 5 Emerging Markets – Growth in the Emerging Markets

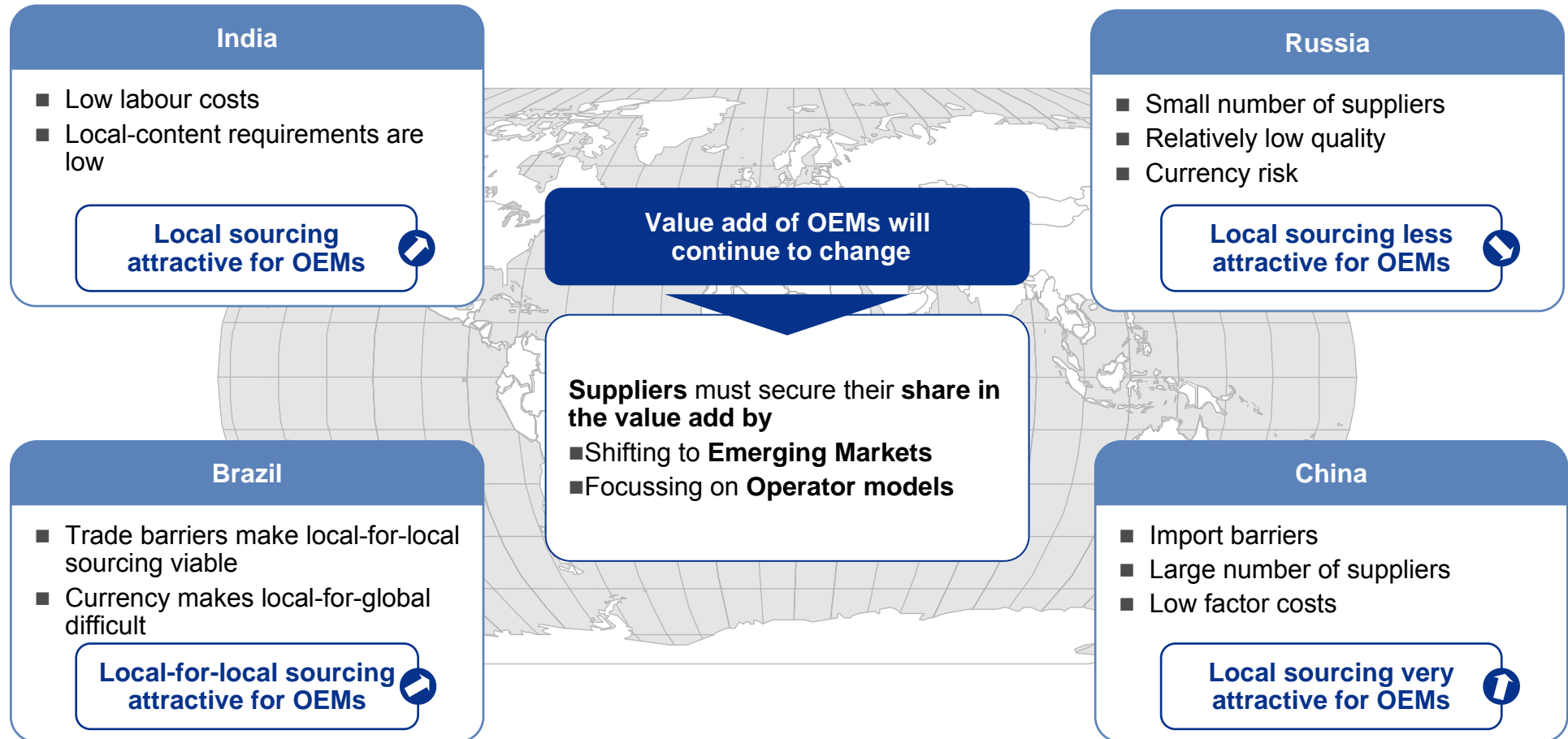
The focus regions for global demand are undergoing a fundamental change. Growth mostly takes place in the BRIC countries



Passenger cars and light commercial vehicles <sup>1)</sup> Together with Ukraine and Uzbekistan Source: OICA, ME analysis

## 5 Emerging Markets – Local Sourcing

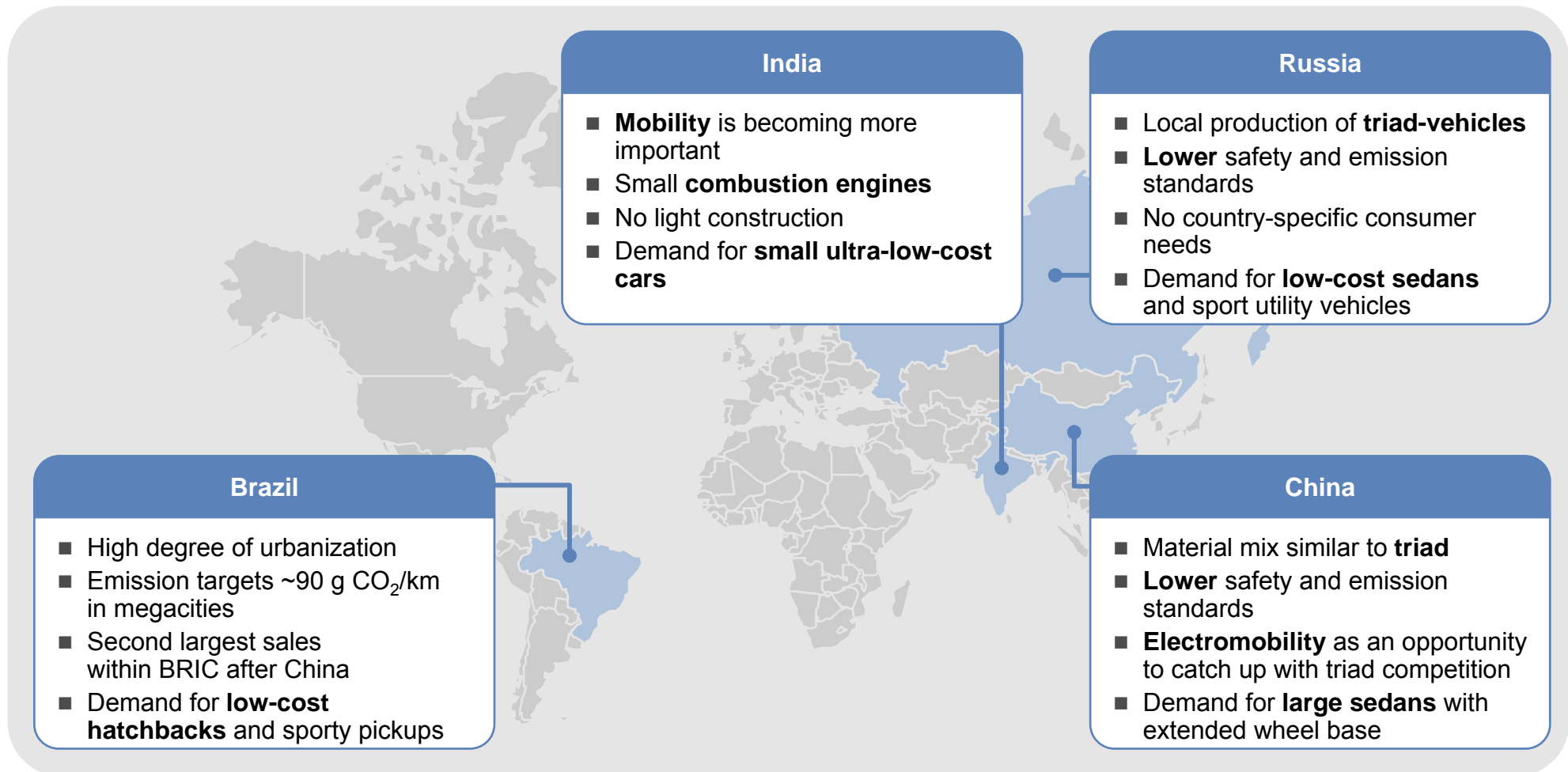
Automotive OEMs will increase the share of local sourcing from emerging markets, especially China and India



Source: ME analysis

## 5 Emerging Markets – Development in the Emerging Markets

The demand for mobility will increase significantly in Brazil, Russia, India, and China; the share of low-cost and ultra-low-cost cars will increase accordingly



Source: ME analysis

## 5 Emerging Markets – Key Findings

1

Growth takes place in Asia; we must share in this growth

2

Automotive OEMs will increase the share of local sourcing from emerging markets, especially China and India

3

The demand for mobility will increase significantly in BRIC countries; the share of low-cost and ultra-low-cost cars will increase accordingly

## Conclusions

The foundries must adapt to the changed general conditions in the automotive industry



**Electromobility** and **downsizing** will **reduce the casting volume** of powertrain parts by up to 1.2 million tons p.a. by 2030



The number of new cars will increase by almost 100%. Therefore there still will be a **significant growth** of up to 85% in powertrain cast parts by 2030



The share of low-cost and **ultra-low-cost vehicles** will increase dramatically, effectively **reducing the profit margin** of cast parts



**Light construction** will increase and offer the highly developed foundries in the triad the opportunity to achieve **technological leadership** and forward integration



A **presence in the emerging markets** is required to cope with the increased share of local sourcing from China and India

# MANAGEMENT ENGINEERS at a Glance

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Belgium	Denmark	India	Poland	South Korea	UK
Brazil	Finland	Iran	Portugal	Spain	USA
Canada	France	Ireland	Romania	Sweden	and others