Potential Impact of a ‘Green Tire’ Regulation

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Tackling the global climate challenge

Worldwide efforts to reduce CO_2 emissions

Focused country initiatives to reduce energy consumption in key sectors

Construction	Manufacturing	Energy conversion	Mobility
			

Adoption of regulations and establishment of minimum energy efficiency standards

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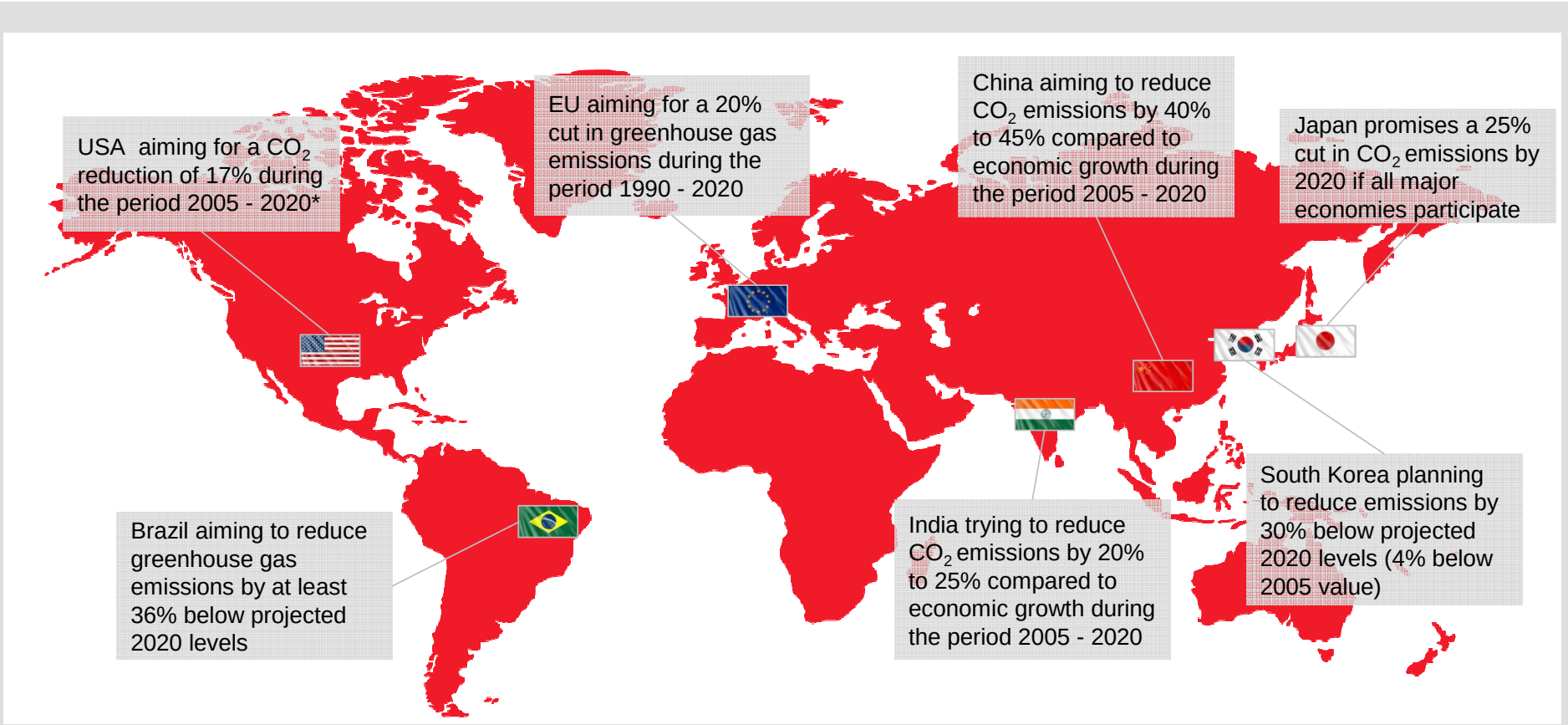
Worldwide initiatives for CO_2 emission reduction



Source: United Nations Framework Convention on Climate Change (UNFCCC)

* Provided that the awaited law on climate control comes into effect as scheduled

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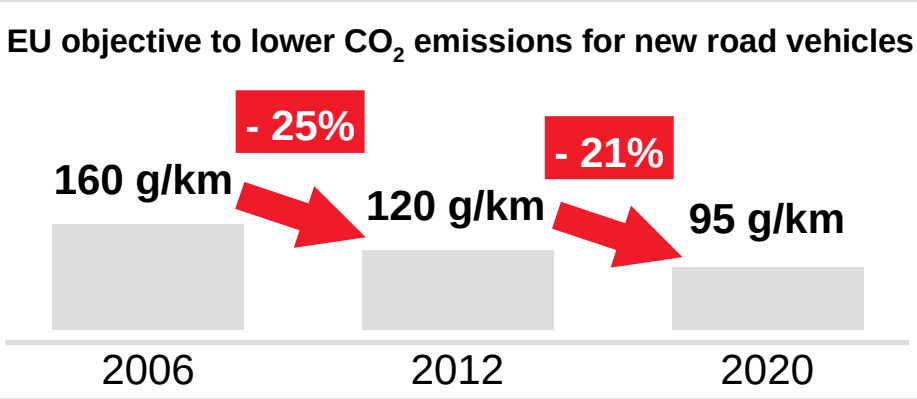
e.g. road traffic forms a substantial part of the EU Efficiency Plan

Key Facts

- 18% of global CO_2 emissions are related to road traffic
- In the EU, transport is the only economic sector whose CO_2 emissions are constantly increasing, especially in those segments involved in road transportation



Source: Regulation (EC) No 443/2009 of the European Parliament and of the Council of 23 April 2009 setting emission performance standards for new passenger cars, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0001:0015:EN:PDF

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Modern tires improve energy efficiency in road traffic

Key Facts

- 20% to 30% of a vehicle's fuel consumption is related to tires
- 24% of road vehicle's CO_2 emissions are related to tires

Sources: BMW, Der Reifen im Spannungsfeld zwischen hohen technischen Anforderungen und immer schärfer werdenden gesetzlichen Auflagen, 2008
Michelin, CO_2 Reduzierung – Ein Beitrag der Reifenindustrie, 2008

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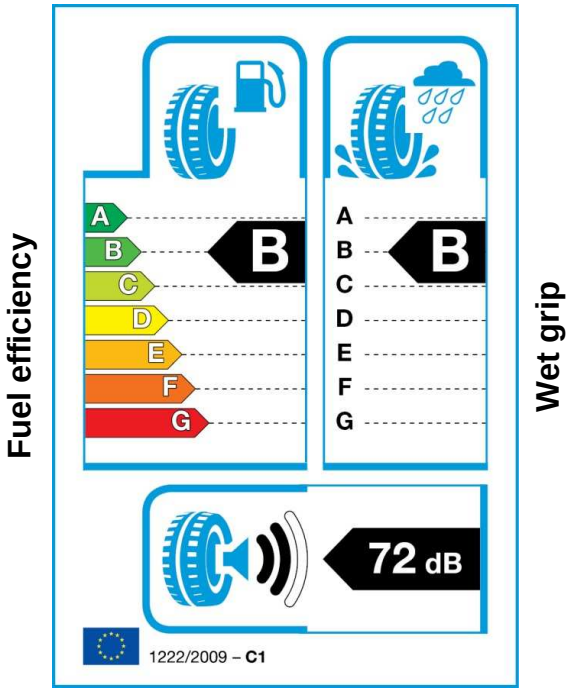
EU tire labeling – enabling consumers to make informed buying decisions

Regulation 1222/2009/EG

- Tire labeling aims to increase the safety as well as the ecological and economical efficiency of road traffic
- The label informs consumers about key tire performance parameters
  - impact on fuel efficiency associated with rolling resistance
  - impact on safety associated with wet grip
  - external noise level
- Tire labeling becomes mandatory from November 2012, meaning that all tires* produced as of July 2012 must have the label

Indicating three key parameters of tires



Source: Regulation (EC) No 1222/2009 of the European Parliament and of the Council of 25 November 2009 on the labeling of tires with respect to fuel efficiency and other essential parameters: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:342:0046:0058:EN:PDF

* passenger car, light truck and heavy duty vehicle tires

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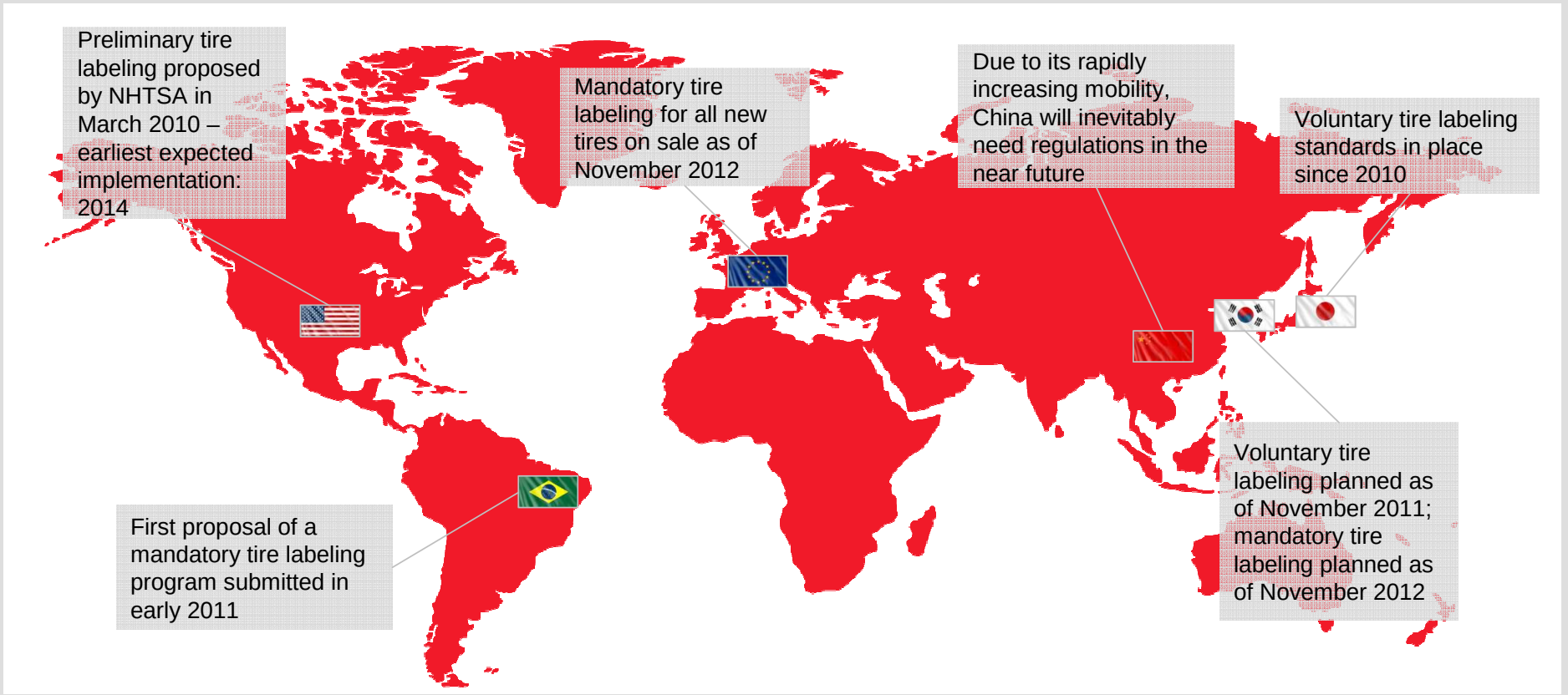
Worldwide adoption of tire regulations and implementation of tire labeling is emerging



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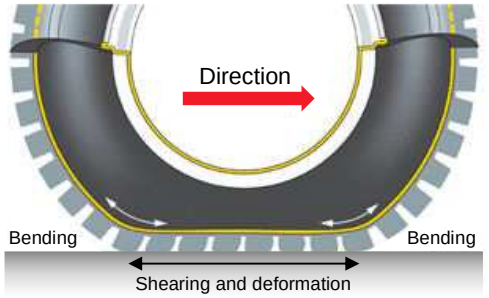
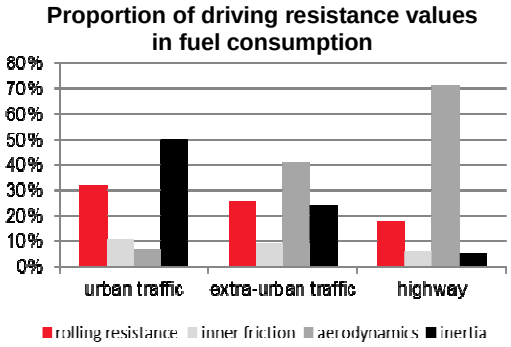
Impact of rolling resistance on engine performance

Fuel consumption | **CO_2 emission**

- During travel, the tire deforms to absorb road surface irregularities – it is because it can change shape that it provides grip and comfort
- As the rubber compounds are being deformed, they heat up and dissipate part of the energy transmitted by the engine – a phenomenon known as rolling resistance
- On average, 20% to 30% of fuel consumption is used to overcome rolling resistance, while the rest of the fuel consumed serves to counter air resistance, inertia and inner friction (e.g. in the engine or transmission)

'Green Tires' with lower rolling resistance help to reduce fuel consumption





Sources: BMW, Der Reifen im Spannungsfeld zwischen hohen technischen Anforderungen und immer schärfer werdenden gesetzlichen Auflagen, 2008
Michelin Fact Book 2003
www.adac.de/infotestrat/reifen/rollwiderstand.aspx

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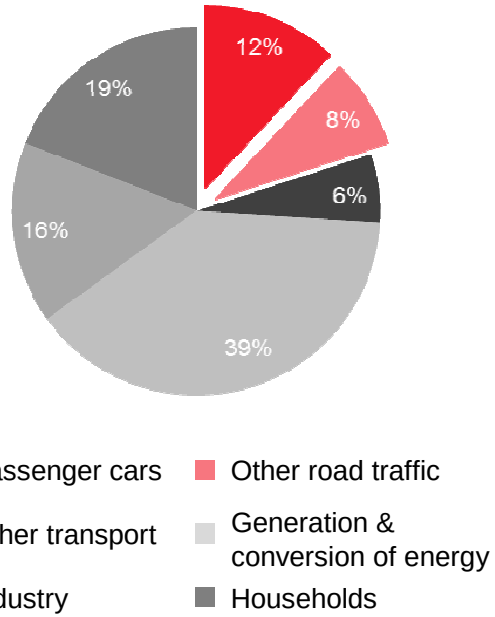
The interrelationship of CO_2 emissions and tires

Fuel consumption | **CO_2 emission**

- Passenger cars are responsible for
  - around 12% of total CO_2 emissions in the EU
  - around 5% of man-made CO_2 globally – and rising
- A reduction of road traffic emissions – especially in developed countries – would have a significant effect on the overall CO_2 balance
- Rolling resistance and fuel consumption have an immediate impact on CO_2 emission

Fuel-efficient 'Green Tires' help to reduce road-traffic-related CO_2 emissions

Road transport accounts for about one fifth of the EU's total CO_2 emissions



Sources: ec.europa.eu/clima/policies/transport/vehicles/cars_en.htm
www.acea.be/index.php/news/news_detail/sources_of_co2_emissions_in_the_eu

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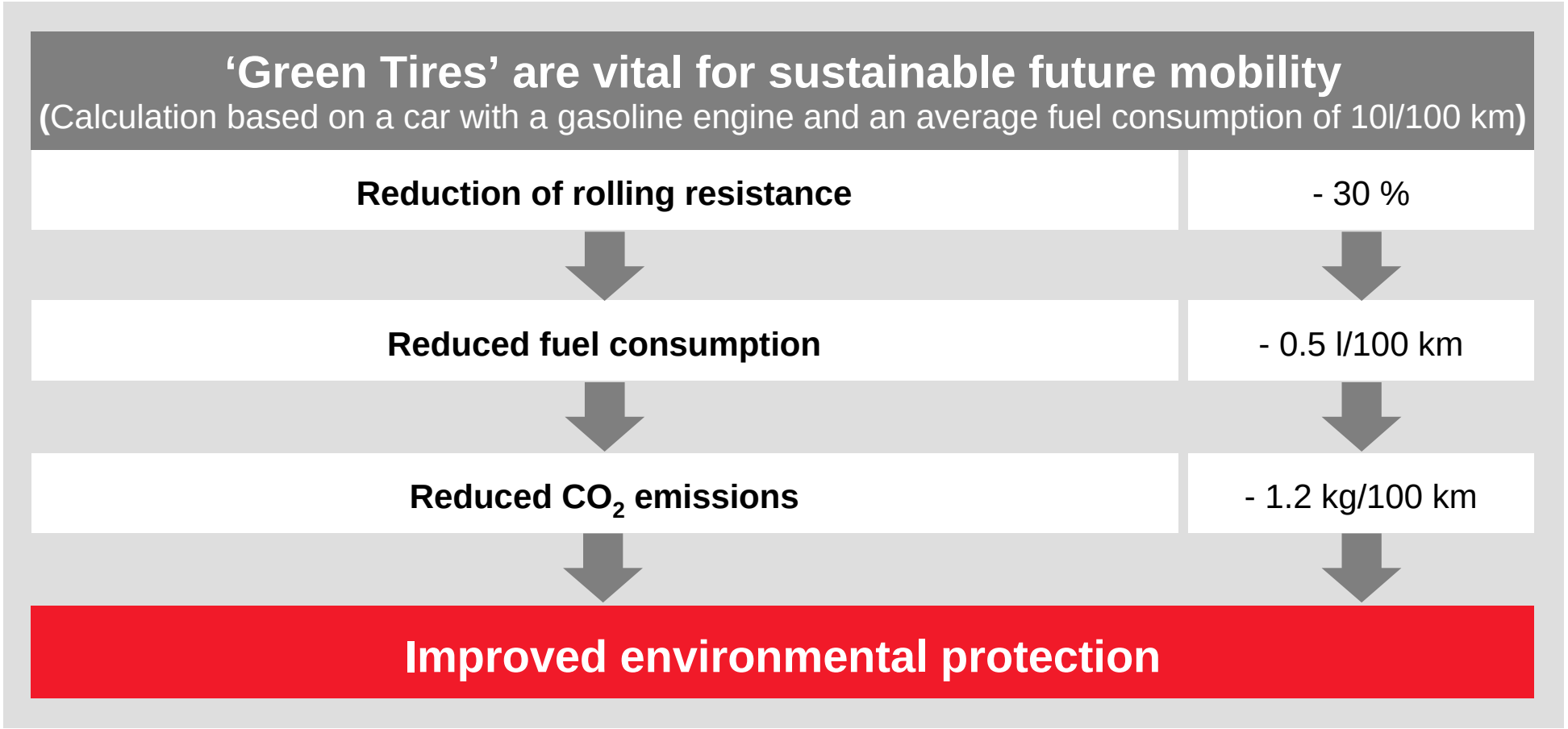
Ecological interaction of tires



Source: www.auto-motor-und-sport.de/eco/verbrauchsreduzierung-rollwiderstandsoptimierte-reifen-alles-ueber-den-reifen-rollwiderstand-1899808.html

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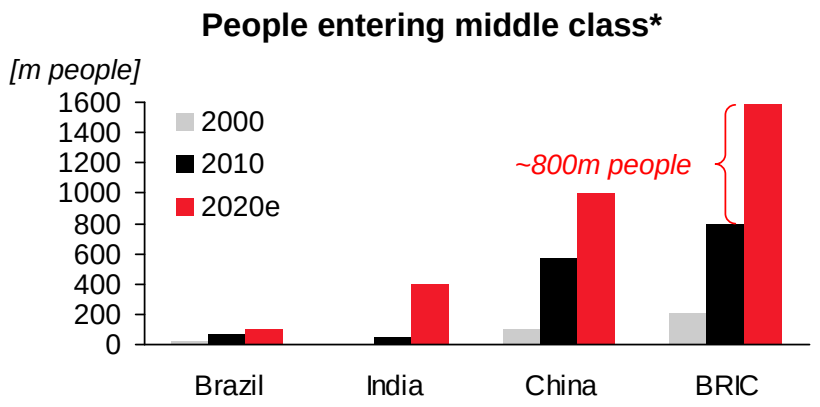
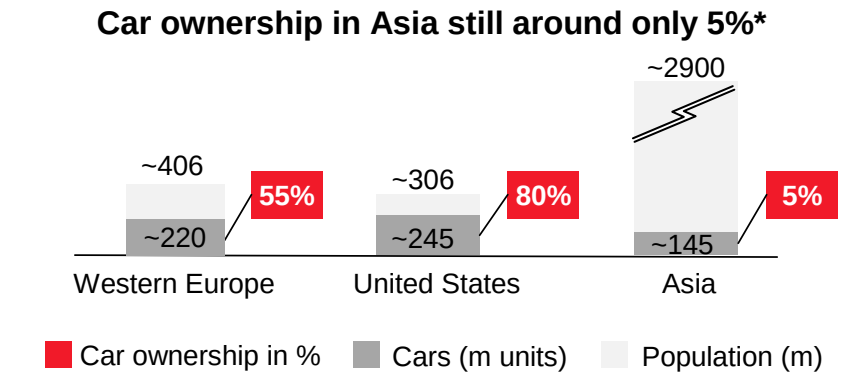
Increasing worldwide demand for mobility

- Rising worldwide prosperity, particularly in China and India
- Enables an increasing number of new middle-class families to achieve personal mobility
- Millions of trade-ups to be realized soon
  - bicycles for mopeds
  - mopeds for cars
- Leading to increased car ownership, especially in Asia

Future mobility demand driven by emerging Asian middle class





Sources: Goldman Sachs Global Economics Group. "Is this the BRICs decade?", 2010
Michelin estimates

* Population with income >$6,000 and <$30,000/capita in BRIC countries

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‘Green Tires’ meet multifaceted consumer demands

High safety standards

Reduced environmental impact

Greater durability

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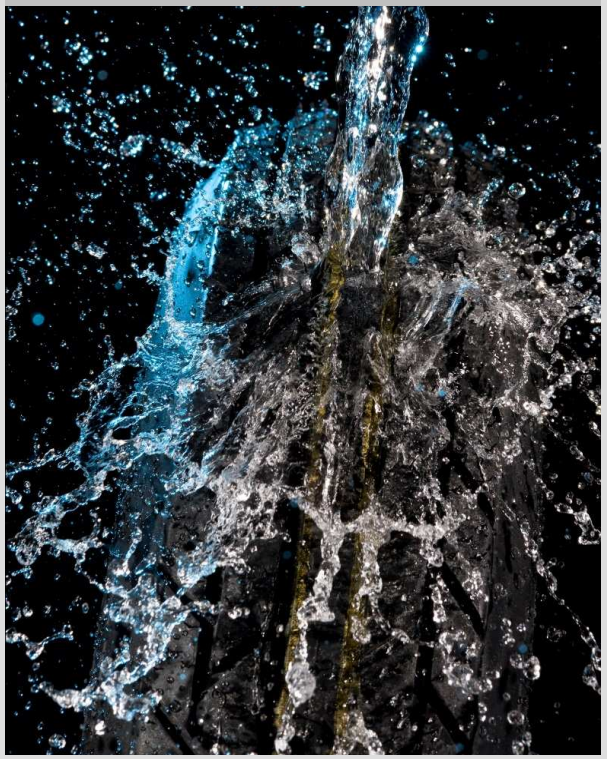
‘Green Tires’ – improving safety standards

Safety | Sustainability | Durability

Safety comes first

- Safety ranks as the most important parameter for road users
- ‘Green Tires’ perform excellently in key aspects such as traction, handling and wet grip
- Wet grip of tires is a key factor for safety
  - ‘Green Tires’ guarantee a better wet road grip and thus a shorter braking distance than regular tires
  - new EU tire labeling informs customers about the important safety aspect of wet grip performance and helps set the right priorities in the purchasing process



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‘Green Tires’ – providing better environmental protection

Safety | **Sustainability** | Durability

Growing societal demand for environmental stewardship

- High consumer demand for sustainable mobility driven by
  - increasing traffic volume
  - soaring prices of fossil fuels
  - raising ecological awareness
- ‘Green Tires’ allow every road user to make a personal contribution to improving the energy efficiency of automobiles and to better environmental protection
- Fitting all vehicles worldwide with ‘Green Tires’ could result in annual savings of around 20 billion liters of fuel and some 50 million metric tons of CO_2 emissions

Source: Michelin

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‘Green Tires’ – increasing mileage and service life

Safety | Sustainability | **Durability**

Enhancing ride quality and mileage

- Raising consumer demand for driving comfort and tire durability due to
  - increasing personal mobility
  - longer travel distances and higher mileage
  - growing cost sensitivity
- ‘Green Tires’ provide enhanced mileage and longer service life, resulting in
  - better price-performance ratio
  - saving environmental resources
  - reduced particulate matter from tire abrasion
  - less tire waste

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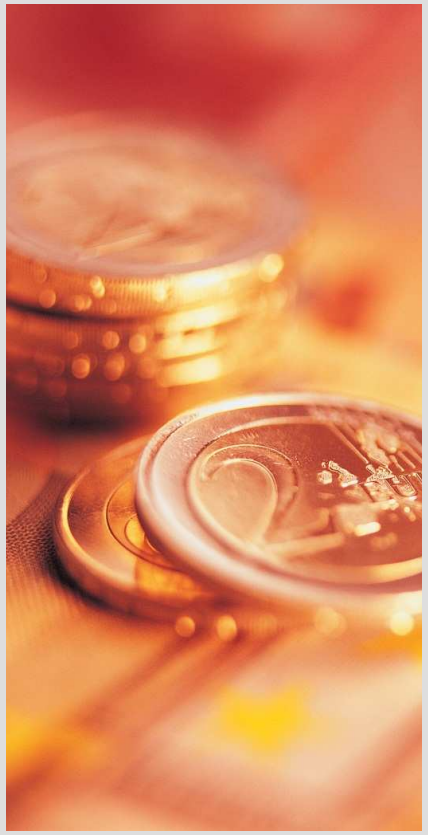
‘Green Tires’ – a worthwhile investment

‘Green Tires’ offer savings potential

- While ‘Green Tires’ may cost a little more up front, they reduce fuel consumption by 5% to 7%
- Consumers will benefit in the long run from better fuel economy, translating into savings at the gas pump
- ***Example:*** A car owner traveling 12,500 km per year could easily save up to €100 of fuel per year. The additional investment of €20 to €50 per tire amortizes within two years



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Tire labeling will drive the market shift towards Green tires resulting in higher demand of specialty chemicals

1. Shift from commodity to specialty Polymers / Chemicals
2. Increased consumption of Specialty chemicals

	Normal Tire	Green Tire
Polymers	ESBR	SSBR
	Ni or Co BR	Nd BR

Chemicals	% consumption	% consumption
Antioxidants	~ 2%	~ 3%
Accelerators	1 to 1.5%	2 to 2.5%
Super specialties	~ 0.5%	~ 3%

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Right incentives and regulations like Tire labeling can have multifold positive effect

State	Reduced energy consumption and thus reduced imports of oil
Environment	Reduced abrasion and CO2 emissions
Consumer	Lower cost because green tires are longer Lasting and safer
Chemical industry	Consumption of high tech polymers and Specialty chemicals will increase

Crude Oil Imports - $106bn
In 1-9' 2011-12

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Energizing Chemistry