



Automotive Industry

# AUTOMOTIVE INDUSTRY AND SUSTAINABILITY

INDUSTRY MEETING FOR SUSTAINABILITY



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— **CNI** —

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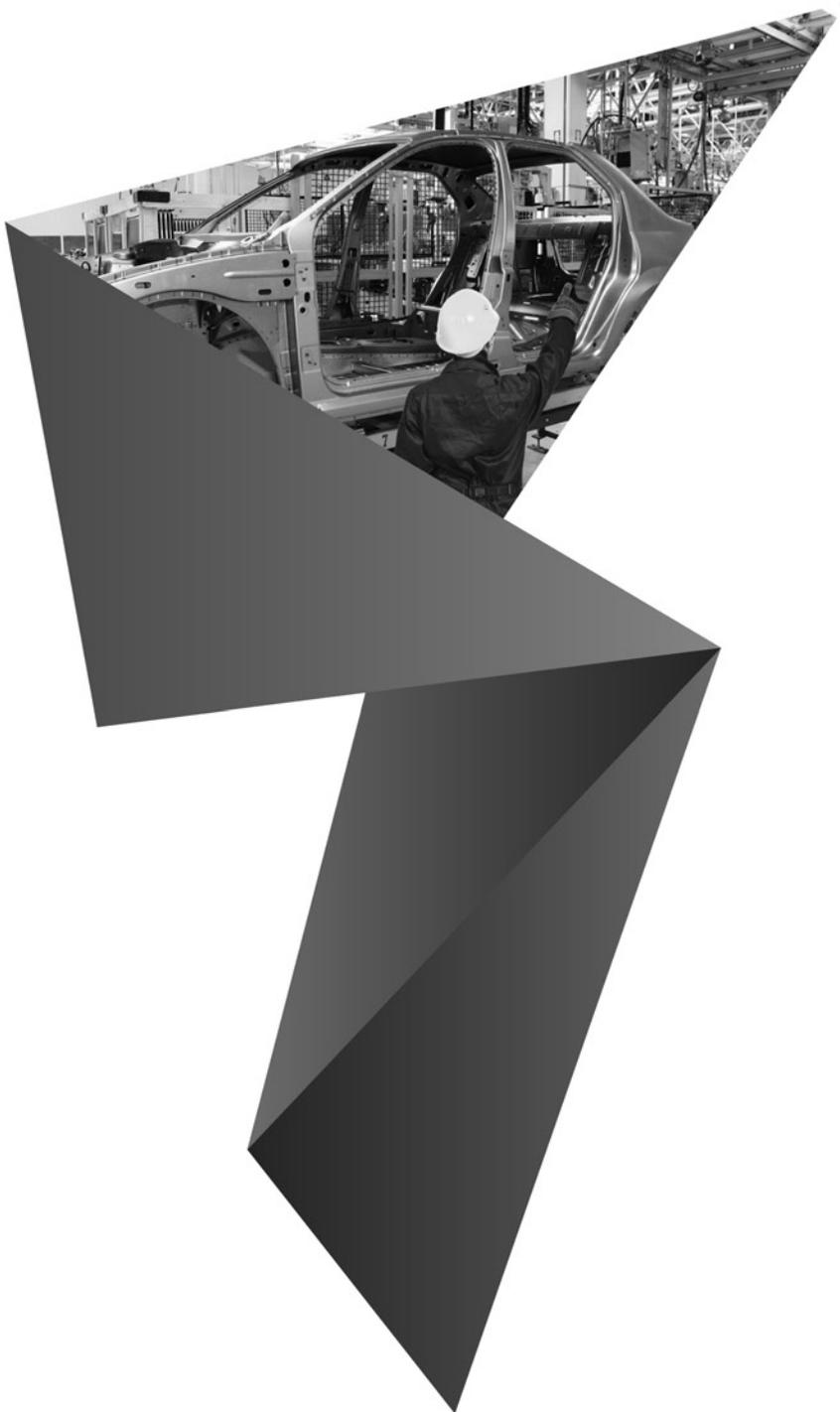
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National Confederation of Industry  
Brazil



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CNI presentation

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## CNI PRESENTATION

The diversity of the national industry and the significant availability of natural resources reveal excellent opportunities for the sustainable development of Brazil, combining economic growth, social inclusion and environmental conservation. The materialization of concerns related to sustainability in the strategic agenda of enterprises and governments is a reality. Apart from isolated cases of success, the consequences of this attitude are felt in entire sectors of the economy. Further advances are still needed, but the path has already been identified and going back is impossible.

After coordinating an unprecedented critical thinking process on sustainability with 16 industry associations, the National Industry Confederation (CNI) delivers to the Brazilian society a wide range of information on progress, challenges and opportunities yet to come. The results presented here may not portray the significance of the discussion process experienced by the industry in preparing these documents. Developments on the process will be beyond the Rio +20 Conference, and are definitely incorporated on the daily lives of companies.

The subject of sustainability is inserted differently in each of the industrial sectors. However, some elements are common to all. The continuous pursuit for efficiency in use of resources and the need to increase industrial competitiveness are on the agenda of all the sectors. Encouraging innovation and scientific and technological development is strategic on the transition to more sustainable patterns of production.

Strategies to intensify actions coordinated internally in the industrial sectors and with governments and civil society organizations are no less important. The dissemination of sustainable practices by means of the supply chain and incentives for companies to undertake the role of integrated management of the territories are powerful tools.

The sectorial volumes developed by industry associations are valuable contributions to addressing subjects such as sustainability and competitiveness of domestic industry. One of the most representative results of this process will certainly be the strengthening of structured programs of action with a focus on promoting sustainability in the

production. These initiatives will act as raw materials so that the industries involved and CNI are able to systematically publish documents presenting the national industry's developments towards the goals of sustainable production.

The documents presented here are intended to be a valuable contribution to enhance the debate on sustainability. Each of the sectorial associations is to be congratulated for their efforts.

**Robson Braga de Andrade**

President of the National Confederation of Industry – Brazil



## SECTORIAL PRESENTATION

In addition to the business philosophy, and more than an issue of individual principle, the issue of sustainability becomes an imposition of a global society, of socioeconomic and environmental balance, of preserving the future of humanity.

With an extensive economic chain, the automotive sector is a structuring industry, an inducer of new technologies and generator of new economies, with consequences in a vast field of activities. From raw materials and inputs to the sectors of suppliers and assembly lines and, subsequently, to the distribution network and on to the final consumer, the automotive industry and its products have profound impacts on sustainability, reflecting the social, economic, and natural environments.

Complying with the legislation or having initiatives ahead of the laws, the automotive industry searches for sustainable action models, both regarding its industrial activities and with regard to performance and use of its products, as well as their social economic effects on communities where they are located.

The automotive industry understands that sustainability is systemic. A comprehensive and seamless process of action, with future vision. A necessarily imposing and priority issue, which should be treated in all its extent and effects on society, public, and private policies. The automotive industry is a relevant part in the equation development with sustainability.

**Cledorvino Belini**

President  
ANFAVEA





## 1 BRAZILIAN AUTOMOTIVE INDUSTRY

The automotive industry and the Brazilian automotive market are ranked among the largest in the world. Globally, Brazil is the 4th largest market and 6<sup>th</sup> largest producer (2010).

The most important automotive groups present in the global sector are established in the country. There are 19 vehicle manufacturers (cars, light commercials, trucks and buses) and 7 producers of agricultural machinery (tractors, harvesters and other products).

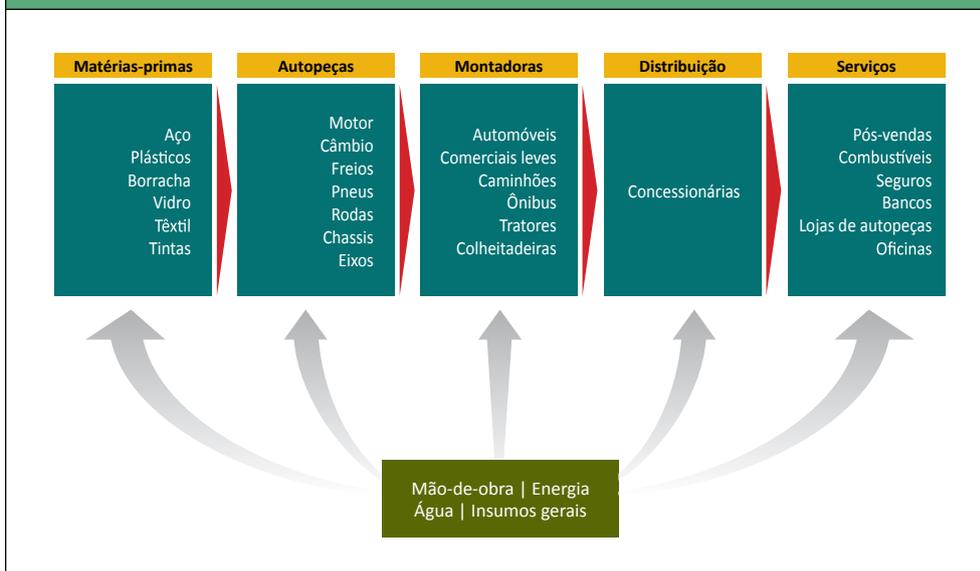
The automotive industrial complex consists of auto part supply industry and agricultural machinery manufacturers, in addition to a fully developed domestic automotive engineering and a highly qualified staff. At the end of the market, marketing and services sectors cover the whole country.

ANFAVEA – Brazilian Association of Vehicle Manufacturers is the automotive industry's representative entity.

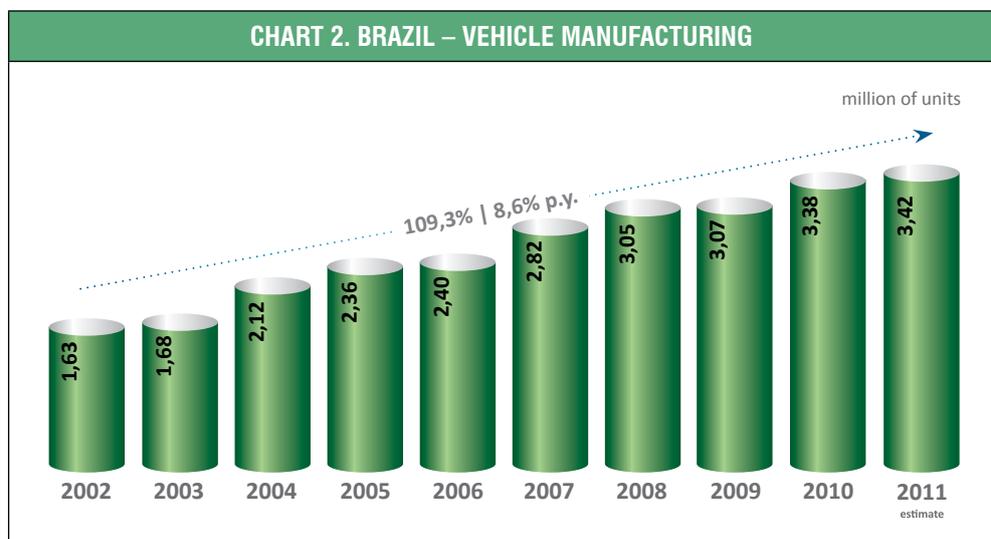
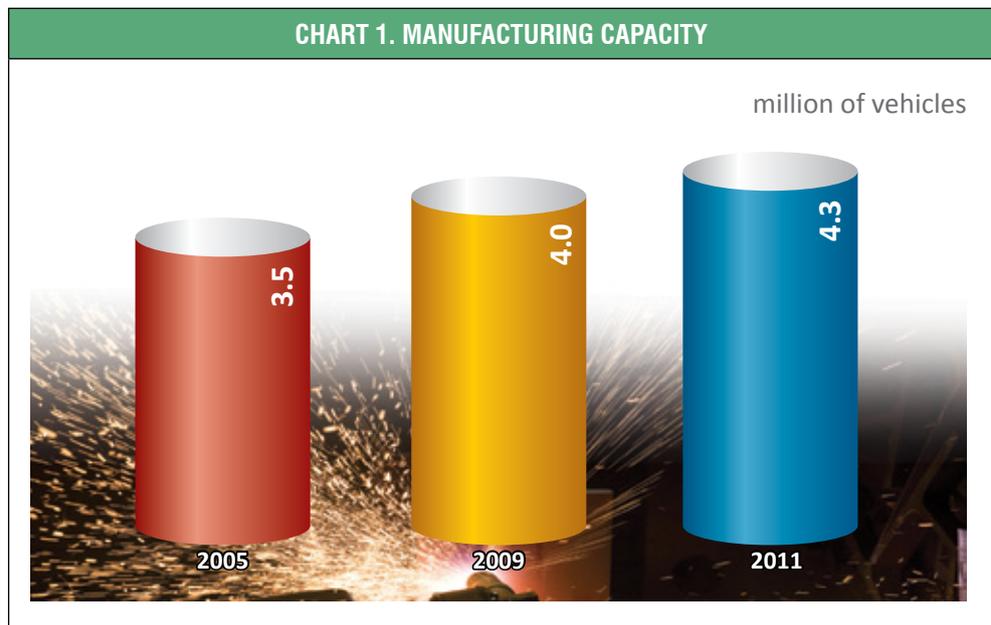
**FIGURE 1. BRAZILIAN AUTOMOTIVE COMPLEX**



**FIGURE 2. AUTOMOTIVE ECONOMIC CHAIN**

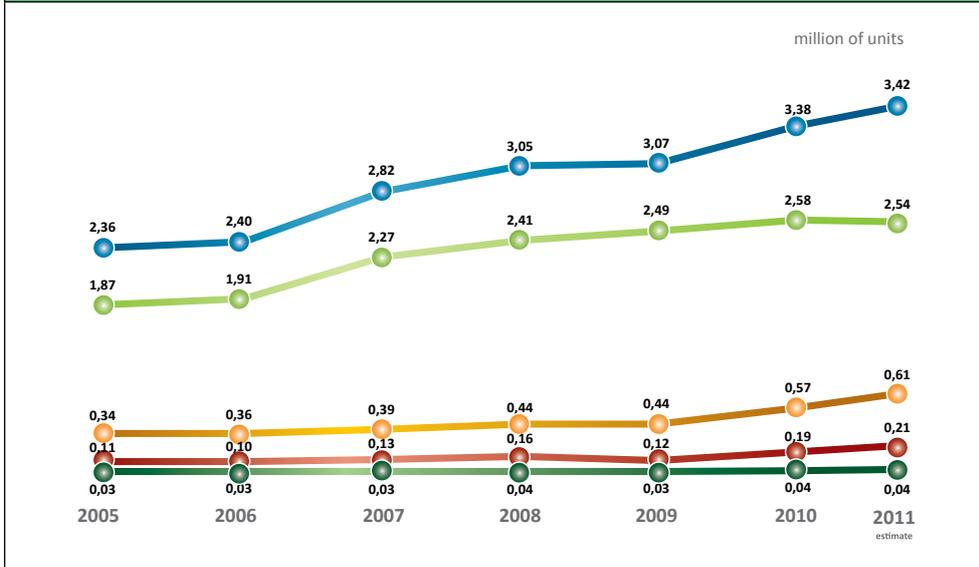


The automotive industry has an impact on many sectors of society. More than 200,000 companies in Brazil have their activities linked to the automotive sector.

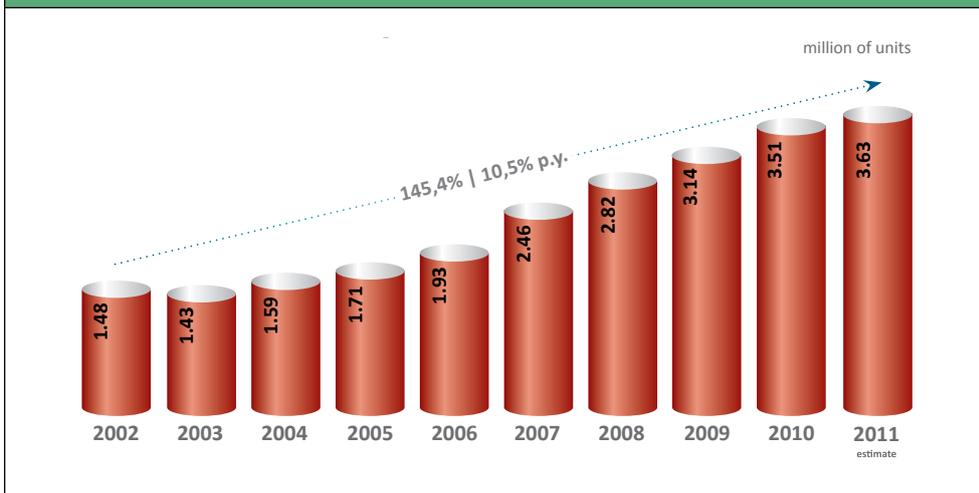


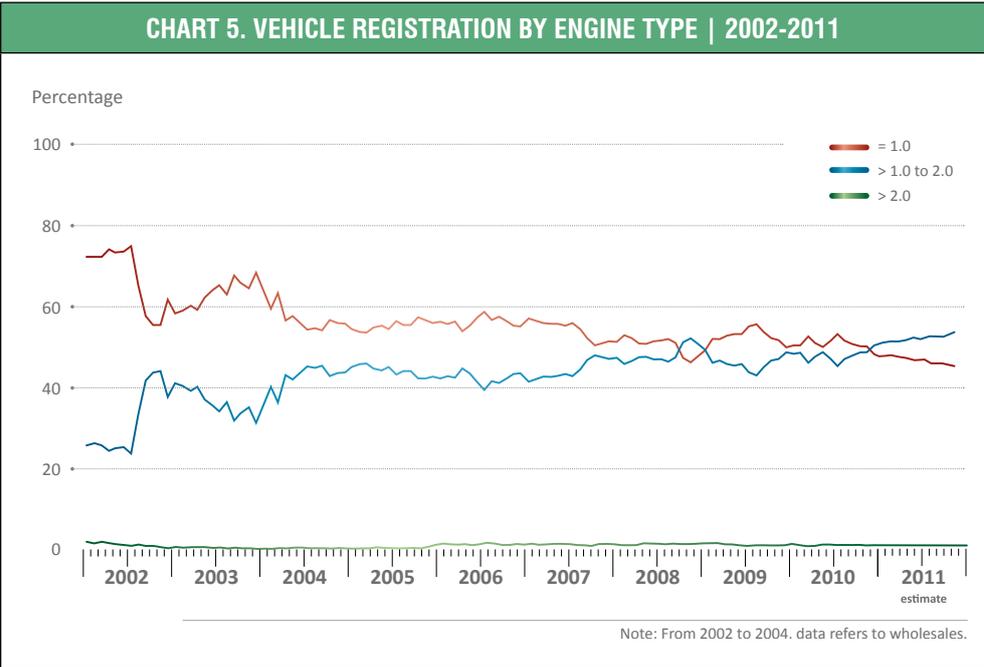
In 54 years of operations in the country, the automotive industry has manufactured 63 million vehicles.

**CHART 3. VEHICLE MANUFACTURING BY SEGMENT | 2005-2011**

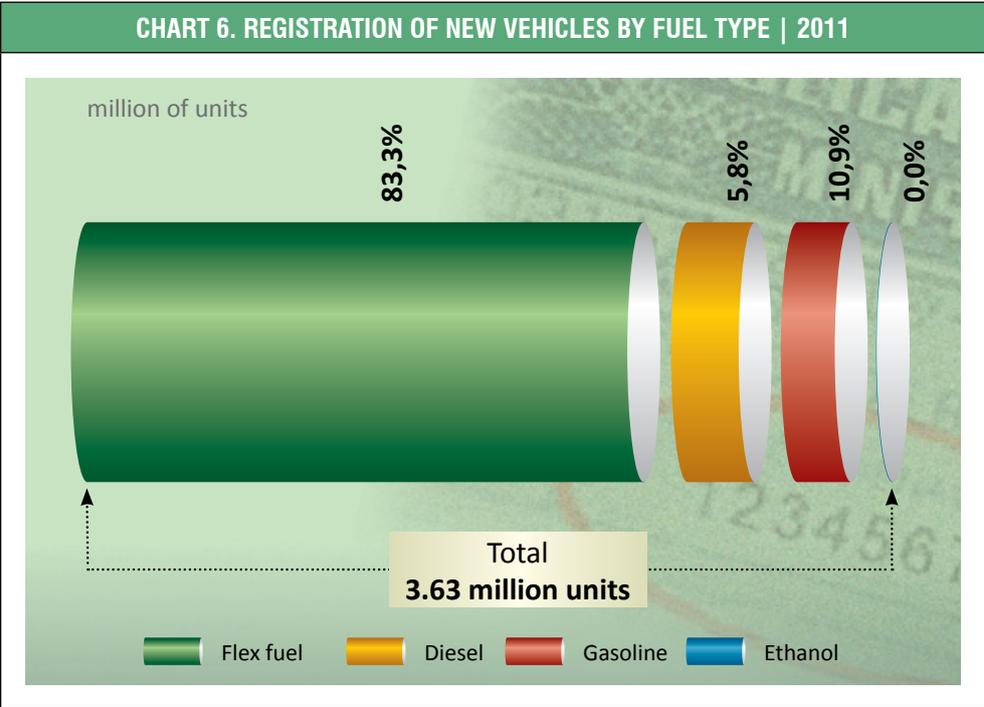


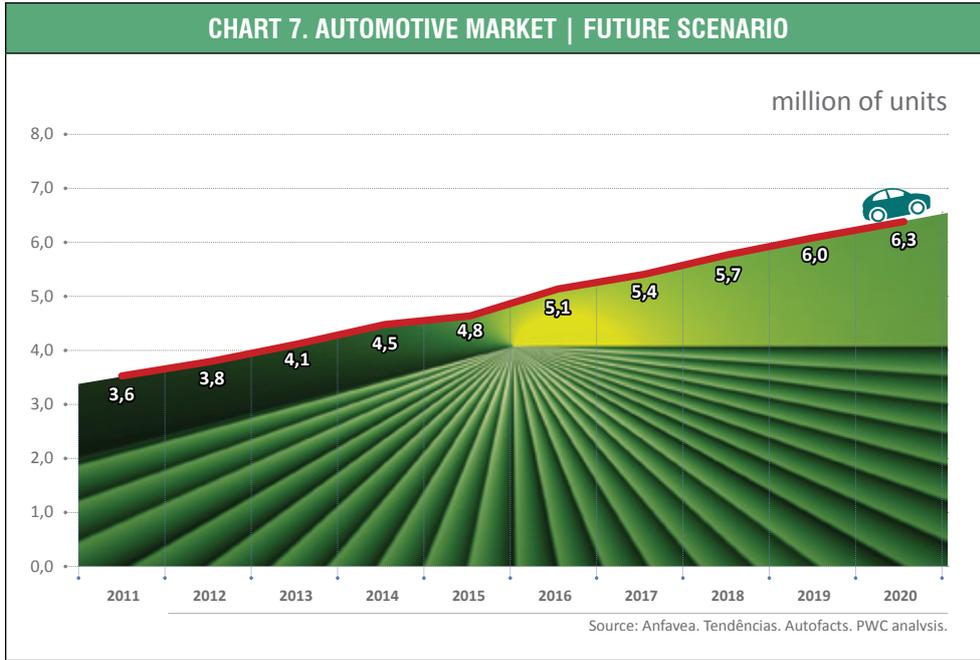
**CHART 4. BRAZIL – NEW VEHICLE REGISTRATION**



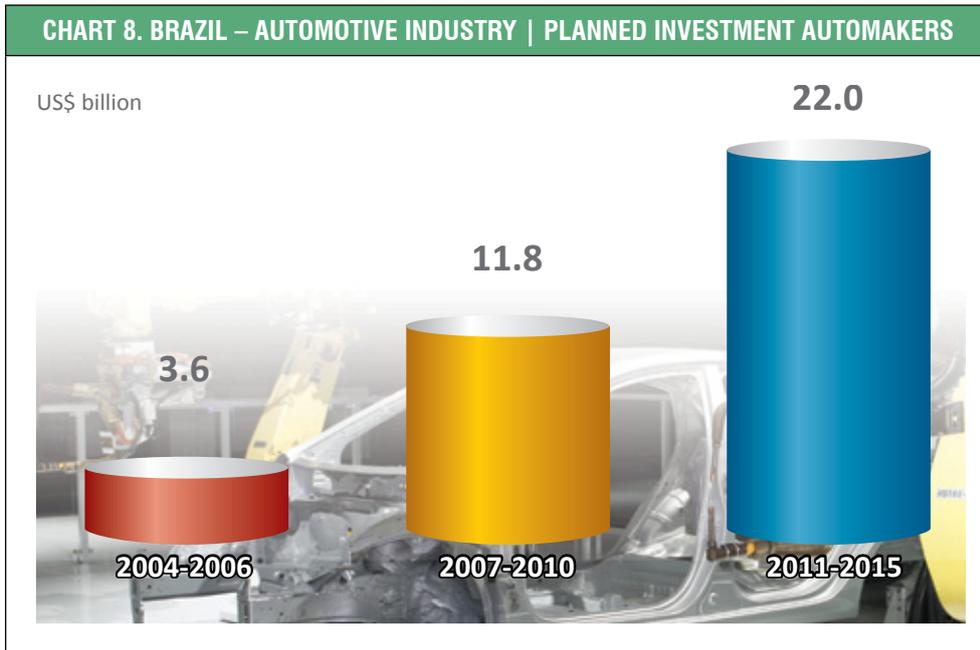


Throughout its long history of manufacturing in Brazil the 1.0 L engines represents more than 50% of production and sales.





Projections indicate domestic market potential of 6.3 vehicles/year in 2020.



US\$ 22 billion of planned investments by 2015, to increase production capacity, processes, products, technology and innovation, prepare the industry for the future.



## 2 REGIONALIZATION AND SUSTAINABILITY

The Brazilian automotive industry has decentralized its manufacturing operations throughout the country, both regarding the manufacturers, who produce the final products, as well as the auto part suppliers industry.

Regarding the automobile and agricultural machinery manufacturing industry, there are 26 companies with 53 industrial units, and others based in 39 municipalities in nine Brazilian states, from the Mid-Southern region to the Midwestern and Northeastern – in other words, throughout the entire country.

The regionalization of the automotive industry in the country, most noticeably since the 1990s, also led to decentralization of the auto parts supplier industry, especially through the creation of industrial parks which integrate suppliers and manufacturers, such as automotive industrial hubs in Gravataí (RS), Camaçari (BA), and other automotive industrial hubs in Betim (MG), Pinhais (PR), and Resende (RJ).

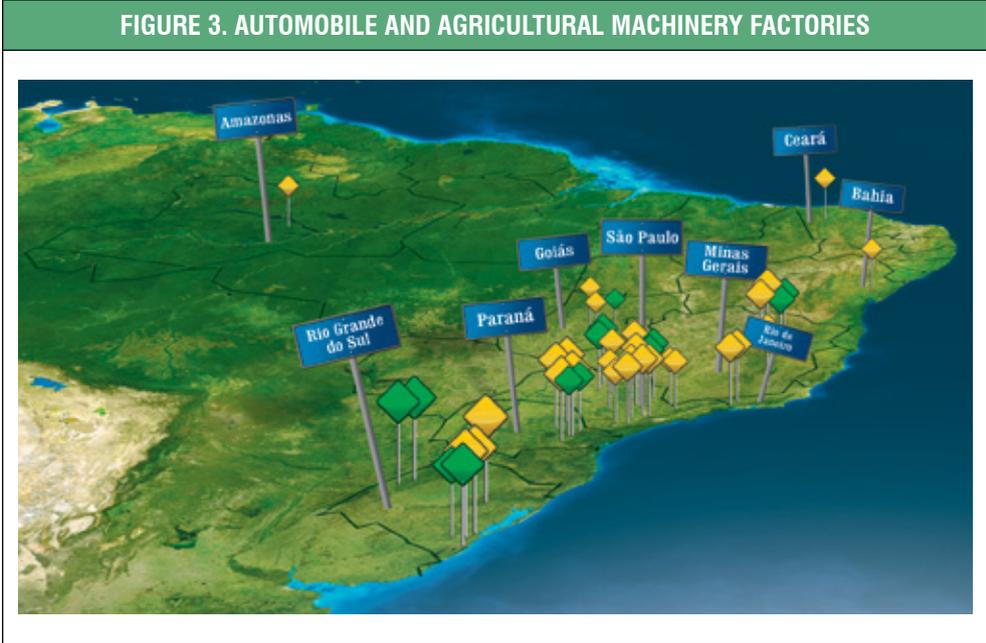
The investment planned by the automotive industry over the next years focuses on the decentralization of production within the country.

The effects of the internalization of these automotive investments are undeniable, for they change the socioeconomic scenario of the regions where they settle radically, and for the better. Consequently, significant investments are made in the infrastructure and public services of these communities and regions, while, at the same time, there is a multiplier effect that occurs with private investments to meet new consumer needs for local goods and services.

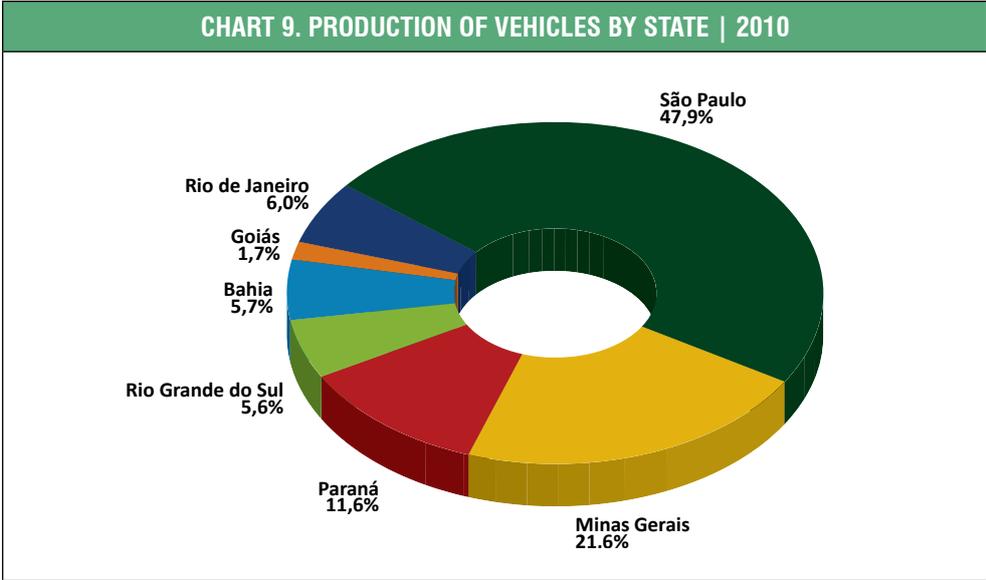
The decentralization of automotive investments creates new local and regional economies, creating employment, and raising income, consumption and quality of life in a virtuous circle.

The internalization of the automotive industry acts as a local, regional and national sustainability factor.

## 2.1 Automobile and agricultural machinery factories



The decentralization of the investments continues. New factories will be built, generating new economies in the regions.



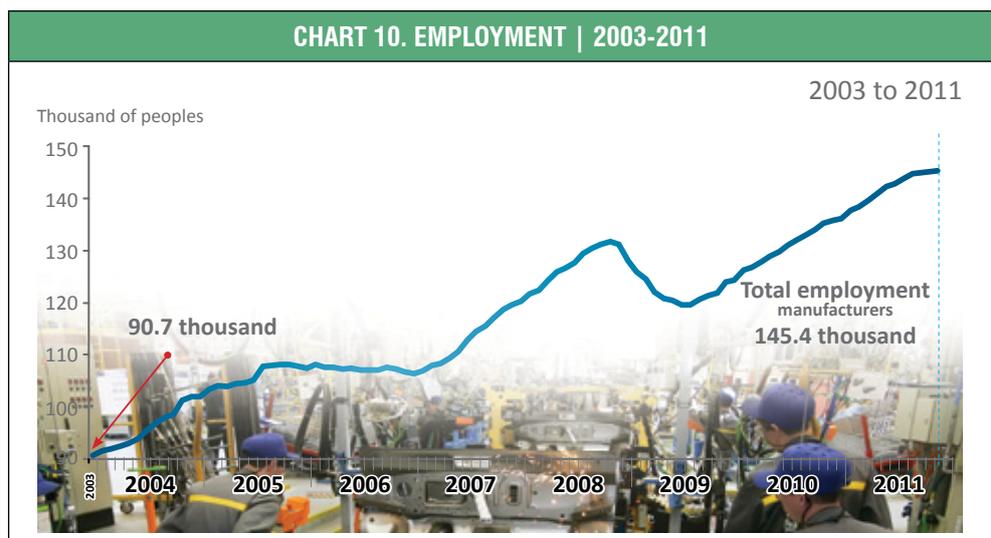


### 3 EMPLOYMENT, LABOR AND SUSTAINABILITY

A striking feature of the automotive industry is the generation of highly qualified jobs and remuneration compatible with the high level of their professional staff.

Over 145,000 workers are directly employed in the automotive industry. However, the reach of this sector is so great that, when we add the workers from the distribution network and automotive services in general to that number, about 1.5 million people work directly in, or have their jobs indirectly linked to the automotive and automotive product industry.

The automotive industry is aggregating, with numerous and severe repercussions on important economic chains and especially on the scale of economic and social communities and regions, multiplying the possibilities of employment and labor, quality of life and social mobility.



Each job created in the industry may generate up to ten other jobs in the wide university of activities linked to the industry and to automotive products.





## 4 VEHICLE ENERGY MATRIX AND SUSTAINABILITY

The work on research and development of innovations and technologies for the chain of sustainability of the energy matrix for vehicles are intense all over the world, regarding fuel and vehicle technologies.

In the fuel area, the focus is on new alternatives for fossil fuels, such as renewable biofuels, synthetic fuels and fuel cells.

In the engine area, the developments aim at greater energy efficiency for internal combustion engines, hybrid vehicles and electric motors.

The global vehicle energy matrix tends to be multiple, with greater influence from one or other sources according to talent and resources available in each region and to the range of automotive consumption.

In Brazil, the short to medium term technical and economic viability lies in the planning of combustion engines, making use of oil derivatives and biofuels such as ethanol and biodiesel. There are individual cases of electric motors or hybrid vehicle in niche markets, generally for company and institution fleets.

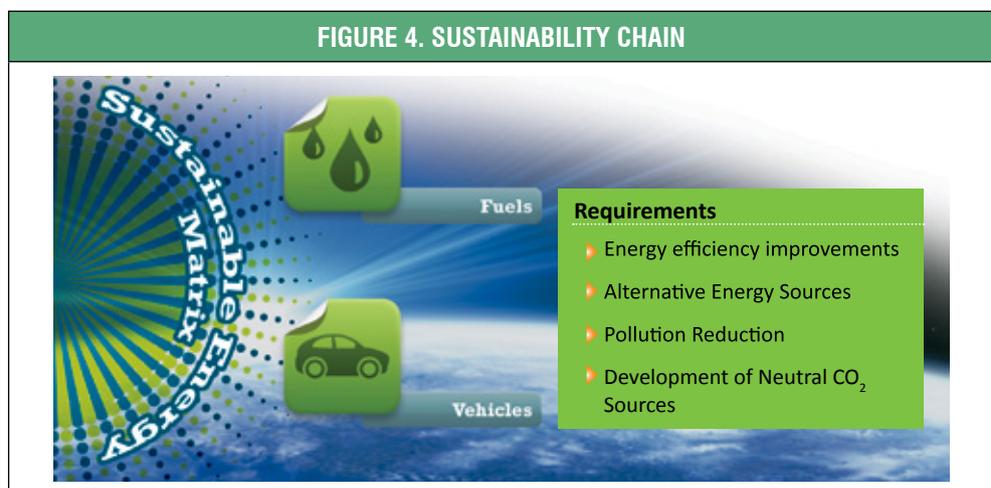
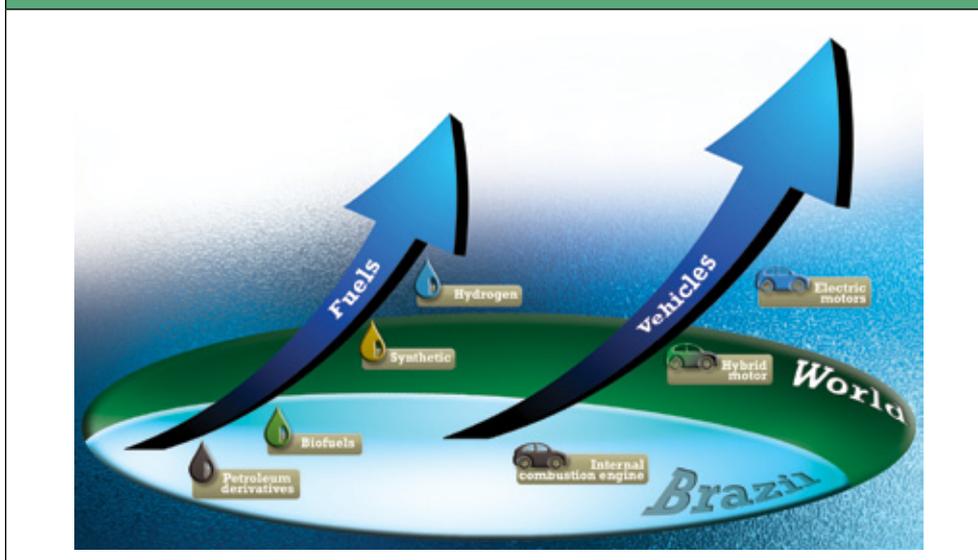


FIGURE 5. VEHICLE ENERGY – DEVELOPMENT STATUS



Brazil has focused on biofuels in its vehicle energy matrix.

## 4.1 Pioneering and Progress of Biofuels

With ethanol, Brazil is the global pioneer in the large-scale use of biofuel as a renewable source of vehicle energy.

Since 1979, with the National Alcohol Program and the beginning of ethanol vehicle production, a new extensive economic chain has been created in the country, from production of ethanol in the sugarcane industry to distribution and large-scale use of fuel directly in Otto cycle engines (hydrous ethanol) and for adding up to 25% in gasoline consumed in the country (anhydrous ethanol). Between 1979 and 2000 5.6 million vehicles which run exclusively on ethanol were manufactured in Brazil.

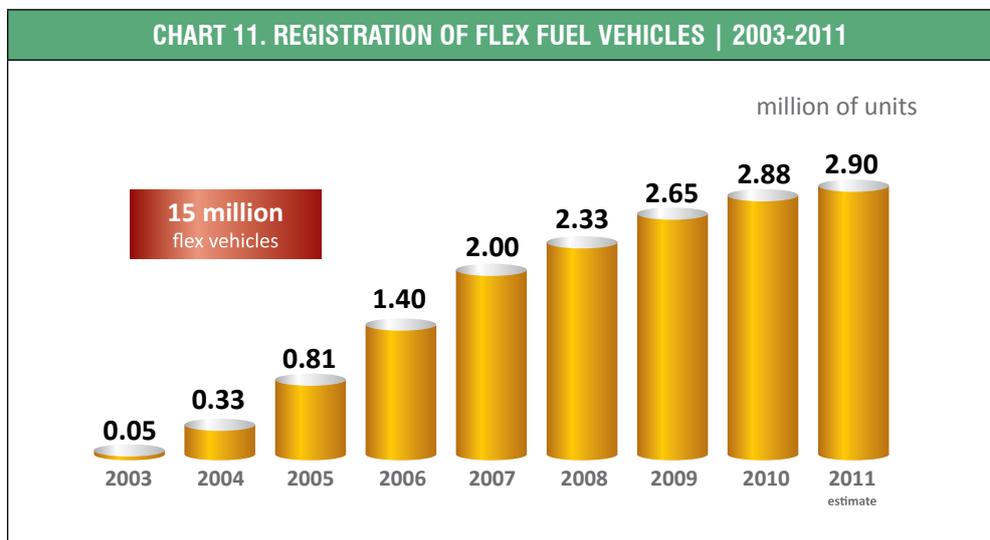
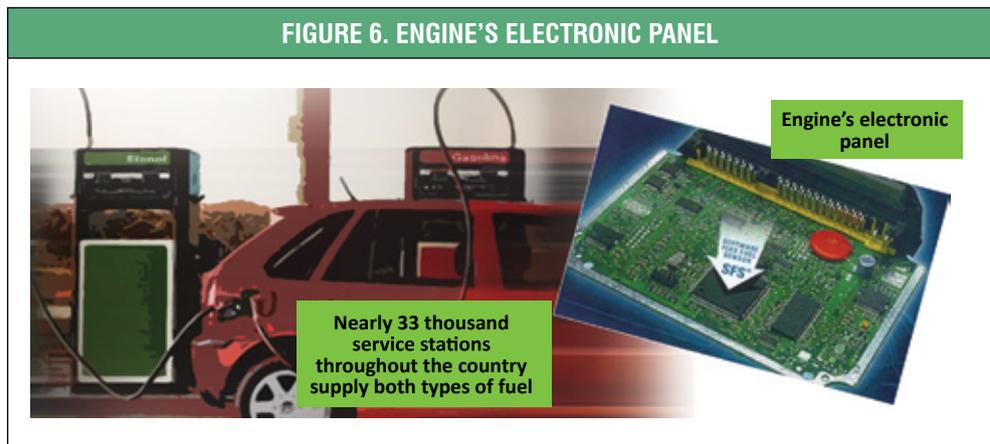
Since 2003, with their own technological improvements, flex fuel vehicles have been released in Brazil, which can consume ethanol or gasoline alike, at the same time, in any proportion. There are already 15 million flex vehicle in circulation in the country, which represent more than 40% of the fleet, or about 32 million vehicles (2010).

The technical and economic viability of ethanol fuel has consolidated this new and important economic chain in the country. The technological, economic and social effects of these activities are intense, interiorizing development with investments, production, employment, income, consumption, and quality of life of producing regions of the renewable fuel, and even moving the automotive industry itself, with the production of flex fuel vehicles.

In addition to these social-economic benefits, there are the environmental benefits of ethanol production and consumption, with the reduction of CO<sub>2</sub> emissions in the atmosphere. The environmental balance of ethanol is positive, considering that its CO<sub>2</sub> emissions during consumption are offset by the cultivation of sugarcane to produce fuel.

## 4.2 Flex fuel vehicles

- Flex fuel vehicles are designed to be fueled by gasoline, ethanol, or any mixture of these fuels.
- Through some special sensors, the onboard computer recognizes which fuel is being used and adjusts the combustion engine parameters accordingly, without any driver input.
- Introduced in the Brazilian market in March 2003.



Flex fuel vehicles already represent over 40% of the light vehicle fleet in Brazil.

**FIGURE 7. EXPANDING THE USE OF ETHANOL**

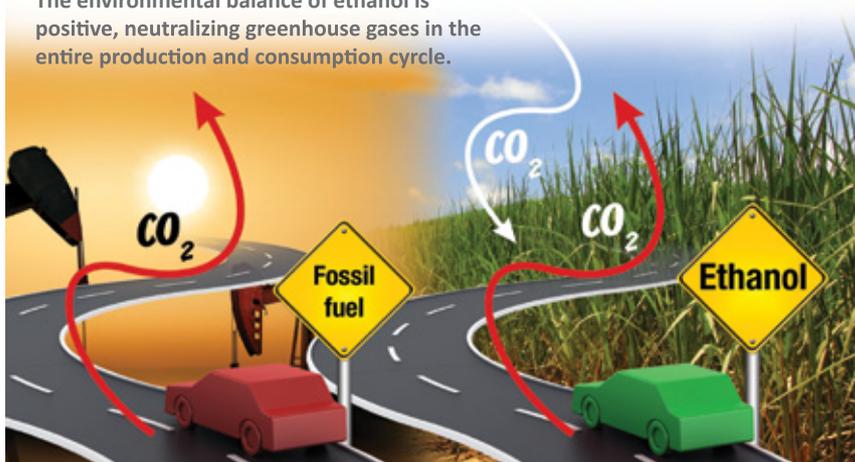
- ▶ **Motocycles** The Brazilian industry extended the flex concept to two-wheeled vehicles manufacturing motorcycles that can run on gasoline, ethanol or any proportion of both.
- ▶ **Airplanes** Embraer, one of the largest aircraft companies in the world, took the technology of ethanol engines to airplanes, developing the Ipanema agricultural model.

**FIGURE 8. OTHER USES OF ETHANOL**



**FIGURE 9. ADVANTAGES OF USING ETHANOL**

The environmental balance of ethanol is positive, neutralizing greenhouse gases in the entire production and consumption cycle.

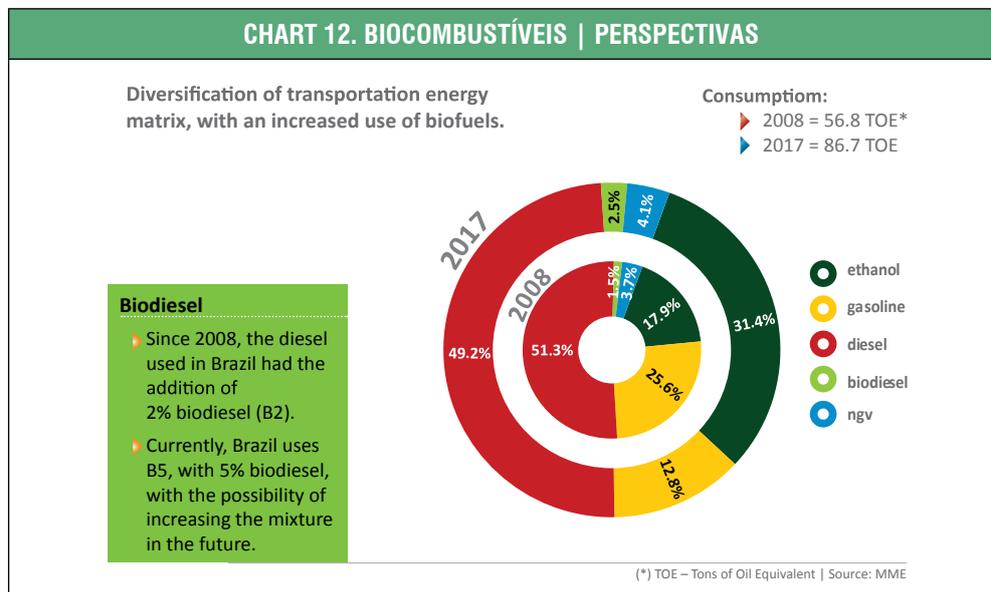


## 4.3 Biodiesel

In recent years, Brazil went on to develop the Biodiesel Program, which can become a new major sustainable economic chain, with strong economic, social and environmental consequences, notably through the social inclusion of family agriculture involved in the production of raw materials for fuels.

With this program, Brazil started to add 2% biodiesel (esterified vegetable oil, renewable biomass) to diesel consumed by cargo transport and passenger vehicles in the country. Currently, the addition of biodiesel is 5%.

Projections indicate a significant share of biofuels in the vehicle energy consumption of the country, with positive effects on the environmental balance and the generation of new economies within the country.



## 4.4 Vehicle environmental gains

Automotive products have a long lifecycle, representing significant impacts in society, in terms of environment, urban mobility, road safety, in other words, sustainability.

Constant investments in vehicle innovations, both regarding engine and alternative fuel technologies, as to design and overall performance of automotive products, have become essential.

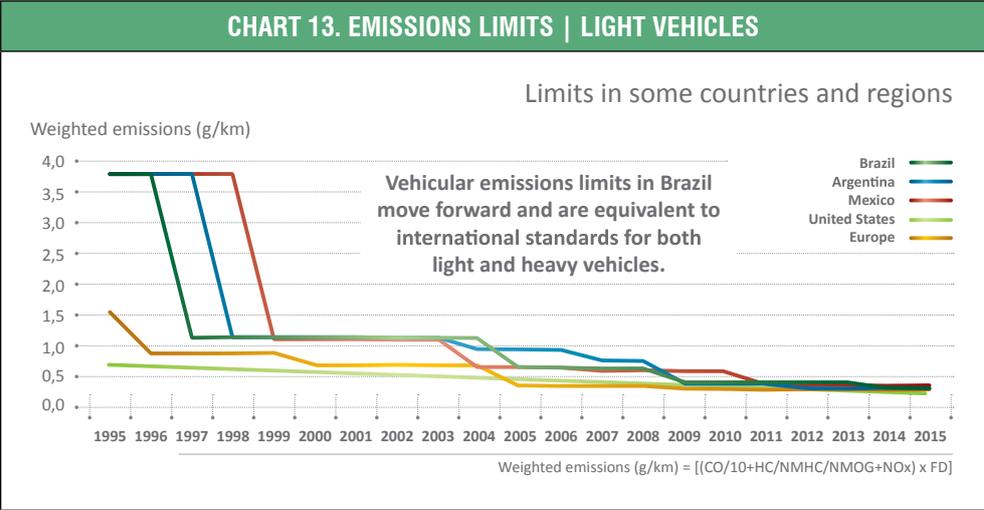
More efficient engines, with lower fuel consumption and lower emissions, as well as alternatives to petroleum derivatives, are the focus of the automotive R&D center projects worldwide, and also in Brazil.

Gains in energy efficiency and emissions reductions in Brazil are significant. As for emissions, Brazilian light and heavy vehicles comply with their respective laws, in order to reduce emissions of carbon monoxide (CO), hydrocarbons (HC), oxides of nitrogen (NOx), total aldehydes (CHO), and particulate matter (PM).

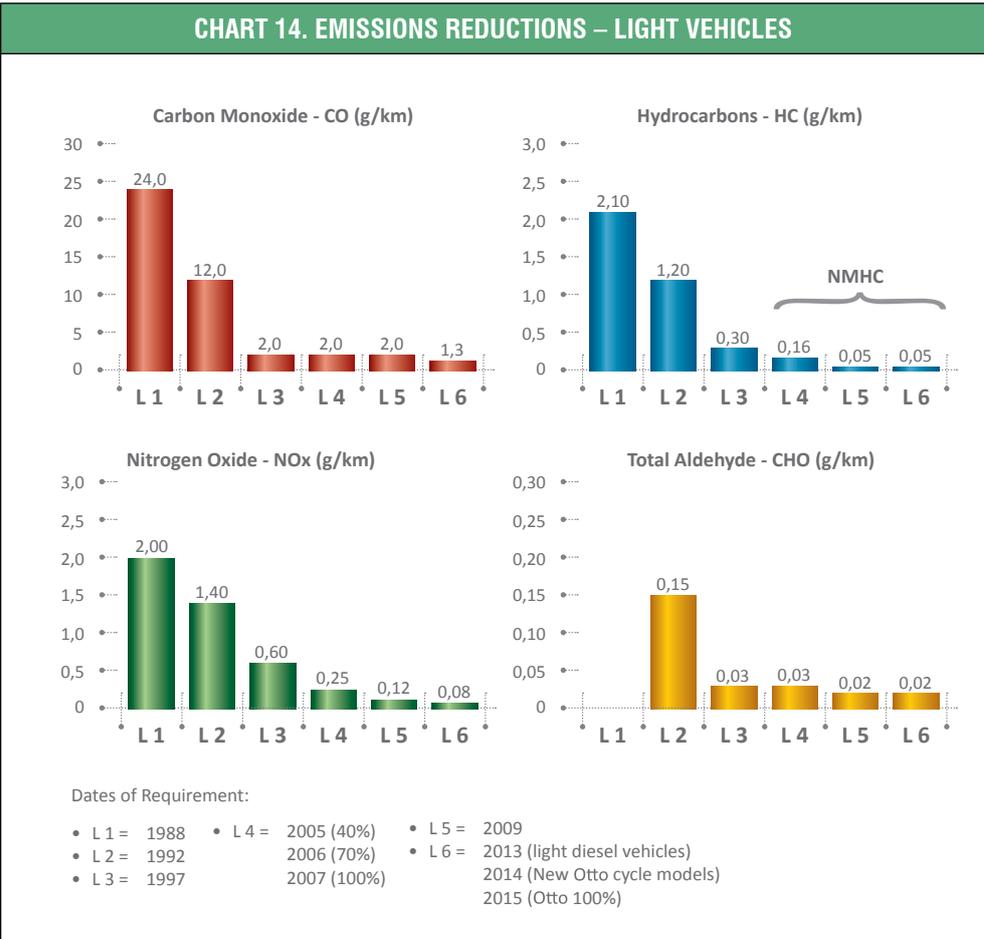
The utilization of new materials and less pollutant and more recyclable technologies is already high and will be more intense and clear in future. The introduction of the named "green tires", for example, with lower attrition coefficient, less wear and higher durability is being increasing in the production assembling lines, bringing environmental gains in the vehicle operation.

As a representative result of Proconve – Program for Air Pollution Control by Automotive Vehicles, a vehicle today pollutes 28 times less than one manufactured in the 1980s. In other words, it would take 28 current vehicles to generate the same emissions level of only one vehicle of the mid-1980s.

From 2012 to 2013, new emission limits for diesel vehicles will come into effect (stages P7 and L6 of the Proconve, equivalent to Euro 5), establishing further emissions reductions, especially oxides of nitrogen and particulate matter. In the case of Otto-cycle light vehicles (gasoline and ethanol), a new stage (L 6) comes into effect in 2014, reducing emission limits.

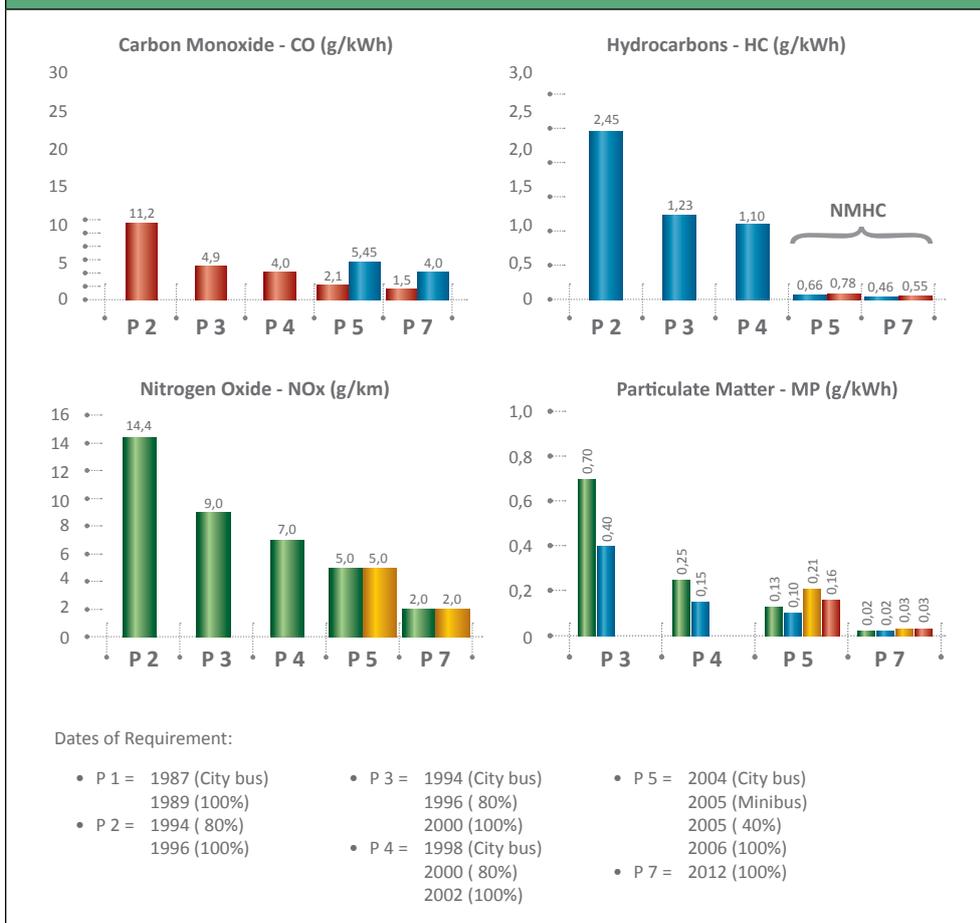


Vehicular emissions limits in Brazil move forward and are equivalent to international standards for both light and heavy vehicles.

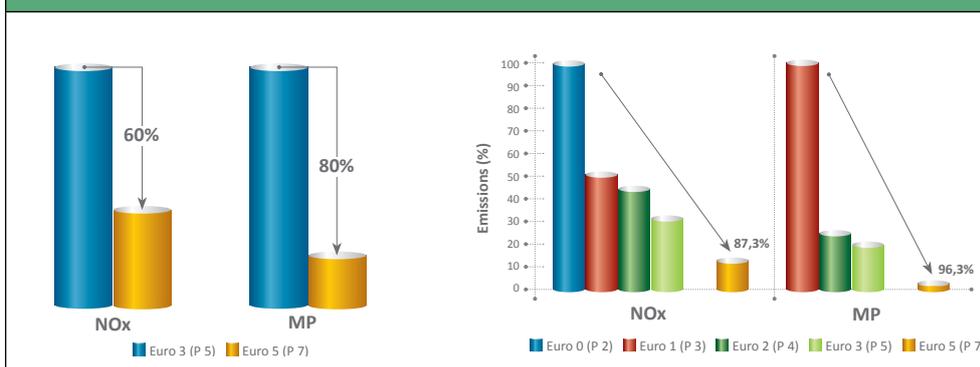


Between 1985 and 2011, Brazil lowered vehicular emissions by 97%.

**CHART 15. EMISSIONS REDUCTIONS – HEAVY VEHICLES**



**CHART 16. PROCONVE P7 – EMISSIONS REDUCTIONS**



The new P7 legislation, effective as of January 2012, brings a 60% reduction of oxides of nitrogen (NOx) and 80% of particulate matter (PM) emissions in relation to the current stage (P5 equivalent to Euro 3, valid for vehicles manufactured until December 2011). Compared with the onset of Proconve in 1986, the reduction of particulate matter in the new stage is 96.3%, and of NOx, 87.3%.

## 4.5 Proconve – Technological and environmental gains

- Modernization of the Brazilian automotive industry
  - ◇ international level products
  - ◇ modern manufacturing processes
  - ◇ increased productivity
- Adoption, updating and development of new technologies
  - ◇ Fuel quality improvement
  - ◇ Training of high-qualified technicians
  - ◇ canisters
- Fuel quality improvement
  - ◇ lead elimination
  - ◇ sulfur reduction
  - ◇ increased use of biofuels
- Training of high-qualified technicians
  - ◇ Brazilian technology development
  - ◇ use of biofuels
  - ◇ flex fuel development
- Investment in the productive chain, new products and control laboratories

Created in 1986, the Program for Air Pollution Control by Motor Vehicles (Proconve) established new vehicular emissions paradigms in Brazil.



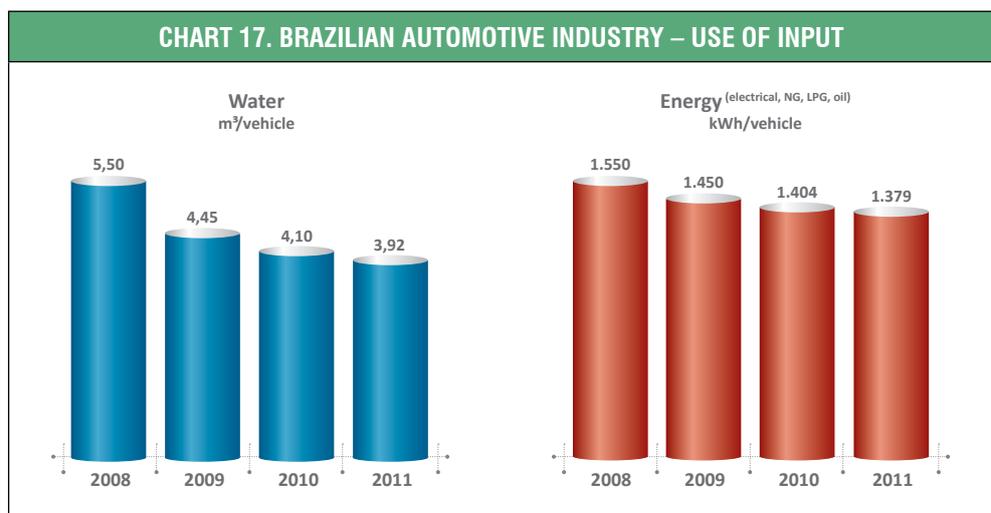


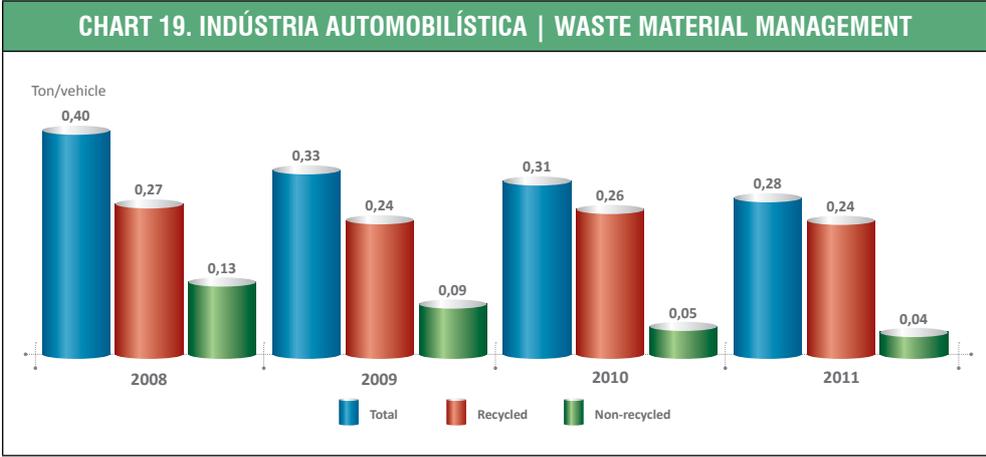
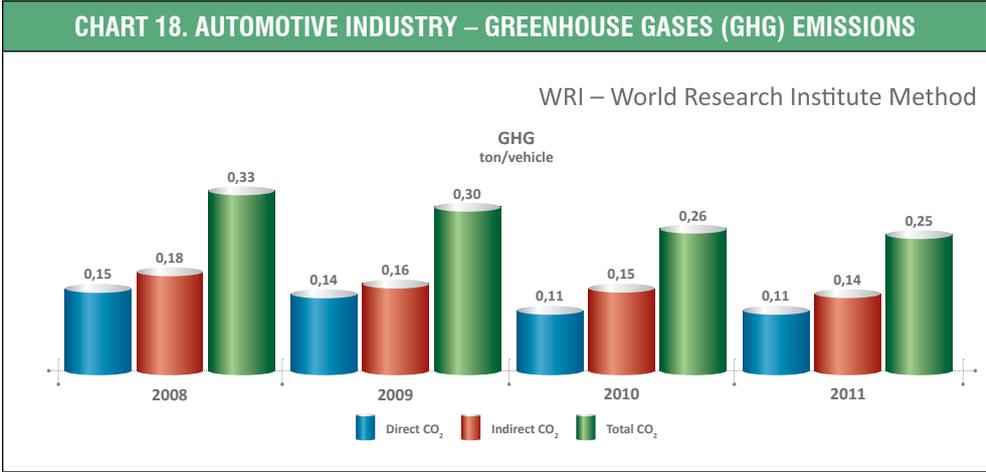
## 5 INDUSTRIAL MATRIX AND SUSTAINABILITY

The environmental issue is one of the pillars of sustainable automotive industrial matrix, alongside product sustainability. Systems, processes and management for greater environmental quality, with clean production processes, resource economy, waste reduction, treatment and reduction of industrial waste, and gains in competency and productivity are building blocks for sustainability in companies.

Environmental and social sustainability policies and principles adopted in the automotive industry are absorbed by all previous supply chains and subsequently by assembly lines, aligning raw materials suppliers and intermediaries, as well as logistics and dealers, to operate based on green economy principles, with clear targets and goals.

As for the automotive industry environmental issue, the main indicators concern to the lowering of input consumption per vehicle manufactured. The reduction of greenhouse gases is also a relevant factor. The tripod is complete with indicators of waste and recycled waste. The Brazilian automotive industry's efforts towards this direction can be seen in the graphs below.





**CHART 20. MAIN WASTE MATERIALS IN THE AUTOMOTIVE INDUSTRY**

Material	General process
Scrap metal	Separation, mischaracterization, recycling
Oils and paints	Storage, recycling, co-processing
Hazardous residues	Storage, co-processing, incineration
Inert residues	Recycling, industrial landfill



## 6 FLEET AND SUSTAINABILITY

Vehicle fleet in Brazil is estimated at about 32 million vehicles (2010): 28 million cars and nearly 4 million light commercial vehicles, trucks and buses.

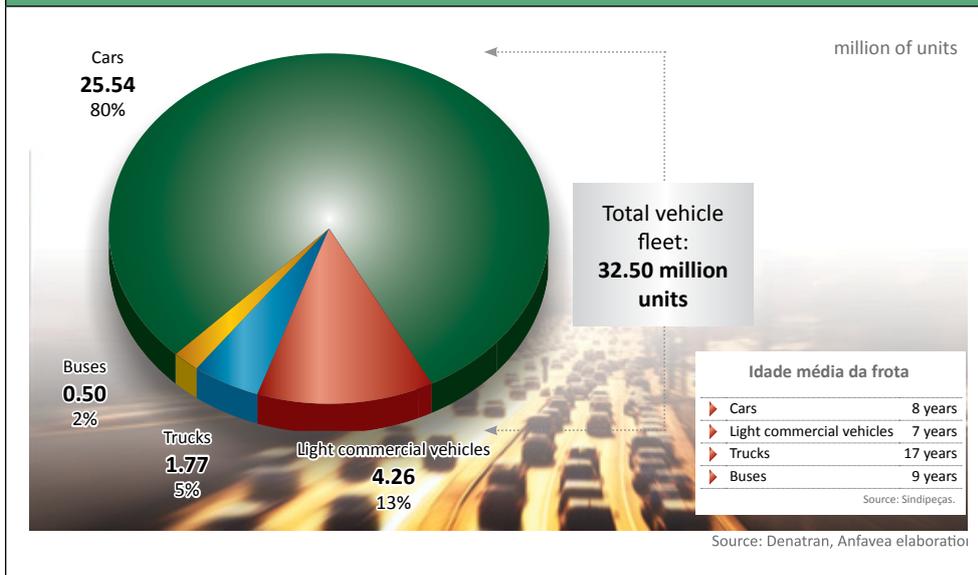
Estimates assign one vehicle for every 6.5 inhabitants in the country, still modest numbers considering the relationship of one vehicle per capita in the United States, one per 1.8 inhabitants in Europe and one per 4.0 inhabitants in Argentina.

Projections indicate that in the medium and long term, the market may add more than 6.3 million vehicles a year, and the stabilization of the Brazilian fleet, with approximately 70 million units in a proportion of one vehicle for every three inhabitants, may occur after 2020. Estimates consider population and the automotive market growth, and also the scrapping of vehicles at the end of its life cycle.

In recent years, there has been a renewal of the Brazilian fleet and a reduction of its average age. Currently, the Brazilian fleet of cars and light commercial vehicles is considered to be an average age of about 8 years.

Fleet renewal and adoption of vehicle maintenance inspection programs nationally, combined with future fleet stability, will compete for environmental quality, of urban mobility and traffic safety improvement, all relevant factors in sustainability.

CHART 21. BRAZIL – VEHICLE FLEET | 2010



## 6.1 Vehicles of the future

Conceptually, vehicles evolve towards innovations and technologies that benefit the environment, urban mobility and traffic safety.

With technology's dynamic process, these vehicles become sustainable, whether they are cars, trucks or buses. There is a real technological revolution in the worldwide centers for vehicle research and development, increasingly focusing in integrating vehicle safety, environmental quality and urban mobility into the DNA of future vehicles. These are projects that emphasize compact cars, higher efficiency engines, lower consumption and lower emissions and alternative fuels to petroleum.

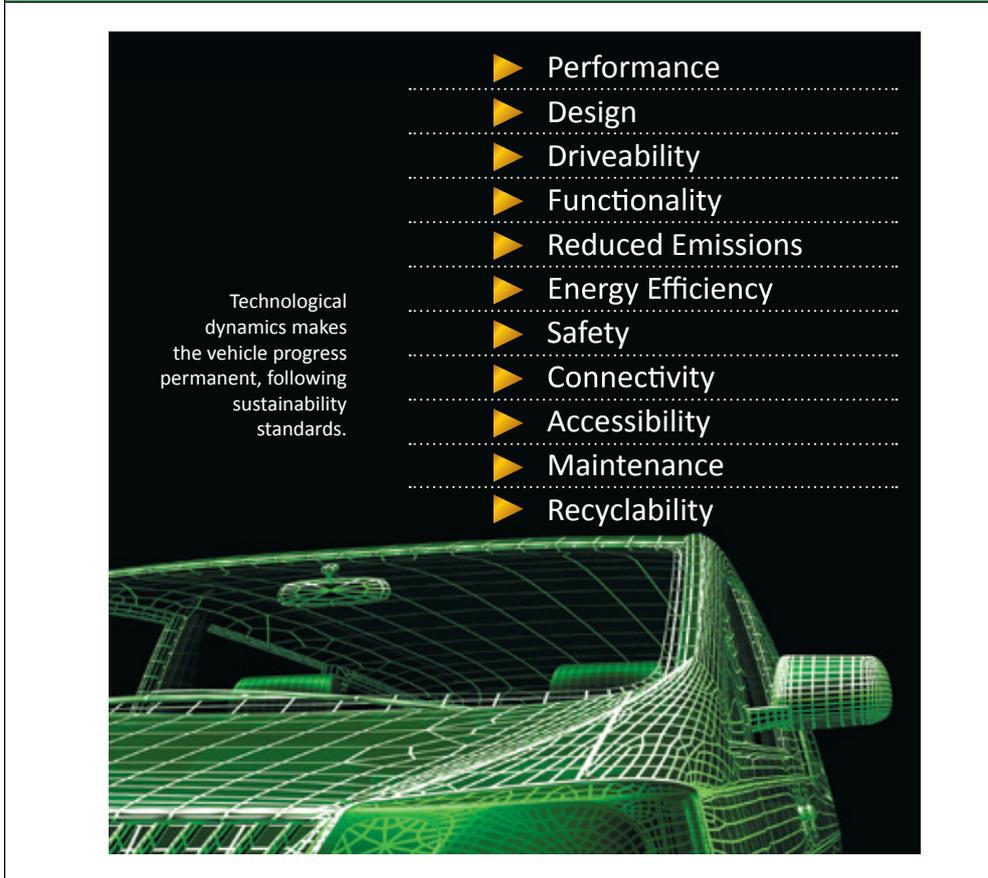
Electronics, computing and connectivity are the most varied forms and will be growing presence in vehicles, driving them and moving them, defining routes and directing operations for greater driveability for the driver, saving time and resources, with appropriate traffic safety and environmental quality standards. New materials and nanotechnology make lighter vehicles and also more recyclable at the life cycle end.

Pollutant emissions from vehicles will be increasingly lower and in some cases, probably eliminated or drastically reduced. Biofuels, hybrid and electrical vehicles are already realities and are increasingly gaining more space. Other vehicular energies, such as hydrogen cell and others not yet thought of, will be tested in new ways to move vehicles in future years. Vehicles tend to become even more global products in their overall design. This means that these new concepts, developed or brought from abroad, will also eventually be incorporated in the country, observing its characteristics, particularities and vocations.

FIGURE 10. NEW NATURAL MATERIALS



FIGURE 11. DYNAMIC EVOLUTION OF VEHICLES







## 7 MOBILITY AND SUSTAINABILITY

THE ROLE OF THE AUTOMOTIVE INDUSTRY ON THE URBAN MOBILITY ISSUE IS AND WILL CONTINUE TO BE RELEVANT, WITH ADVANCED AND ADEQUATE PRODUCTS.

The theme of urban mobility in metropolitan areas becomes a constant and increasing presence in the lives of citizens, governments and enterprises, because of their effects on the quality of life of inhabitants, on the environment and even on competitiveness and attractiveness of metropolitan economies.

That is, urban mobility goes beyond everyday problems of traffic jams. It is a social, environmental and economical issue for both the round-trip commute of the citizen, and for the quality of life and the sustainability of metropolitan areas economies.

The role of the automotive industry in this context is and must be relevant. It is responsible for the development and manufacturing of vehicles technologically capable of promoting reduction of fuel consumption, lower levels of emissions and noise, engines powered by alternative fuels, and vehicles able to run within the required safety standards. And in their field, there must be a relentless pursuit of technology which translates into mobility and environmental sustainability for metropolitan areas, both regarding vehicles for transporting people and for public transportation. In addition to these areas of activity areas, there are compact cars in Brazil – a specialty of the local automotive industry – of smaller engine sizes, ranging from 1.0 to 2.0 L, which helps in occupying less space on public roads and in improving environmental quality.

The issue of urban mobility should be seen by considering not just one or the other aspect by itself, such as the number of vehicles on roads. Urban mobility should be seen from a series of factors: quantity of vehicles, individual transportation, public transportation, residential and population density, road infrastructure, traffic engineering, traffic laws and road safety, and urban planning for large cities. Metropolitan areas growth implies adequate, organized and parallel growth of the surrounding area of residential

concentrations, of the road grid and planning of traffic engineering and public transport as an essential condition for urban mobility.

The issue of mobility in metropolitan areas is challenging. Alongside specific palliative solutions, structural and long-term public policy solutions should be sought, because only these will be able to make life in metropolitan areas easier in the future. The equation automobile, traffic safety, environment and urban mobility will be built with adequate and advanced products by the industry, with legislation and public policy and education and discipline of citizens, pedestrians, drivers and passengers.



## 8 AUTOMOTIVE INDUSTRY AND SUSTAINABILITY | CONCLUSIONS

Economically and socially, automotive products – here we summarize all these synonyms of mobility that are cars, trucks and buses – are much more than means of mobility, transportation or realization of a dream. They are powerful creations, that project backwards and forwards, resulting in a long and complex economic chain, before, during and after its manufacturing.

The automotive industry is an industry with reflexes in major chains such as iron and steel, electronics, computers, fuels and agribusiness, plus a multitude of services. For its extensive reach, the automotive industry is a strong economic chain with multiple effects on the economic and social aspects. Its products, the vehicles, keep generating new revenues and taxes for years, moving new businesses, employment and investment.

In this context, and considering the negative and positive impacts of their activities and products on sustainability, the automotive industry works according to socio-economic and environmental principles that cover a broad range of policies to make production and administration processes leaner and cleaner; to make their products more economical and environmental friendly; and to promote improvements in communities and regions where it operates, through investments and social, economic and environmental actions.

## 8.1 Automotive industry | Sustainability principles

- **Products**

- ◇ Engine and vehicle performance
- ◇ Atmospheric emissions reduction
- ◇ Product development with alternative energy
- ◇ Noise reduction
- ◇ New technologies and green materials
- ◇ Recyclability
- ◇ Nanotechnology and embedded electronics

- **Factories**

- ◇ Sustainable purchases
- ◇ Monitoring the supply chain
- ◇ Saving energy and resources
- ◇ Emissions reduction and industrial wastewater treatment
- ◇ Waste management, reducing, reusing and recycling
- ◇ Logistics improvement
- ◇ Employees qualification
- ◇ Adequate working conditions
- ◇ Appreciating people

- **Offices**

- ◇ Saving energy and resources
- ◇ Functionality
- ◇ Waste reduction
- ◇ Materials and supplies reuse
- ◇ Improved recycling rates
- ◇ Maximum use of solar energy

- **Dealers**
  - ◇ Improving the energy efficiency of installations
  - ◇ Resources economy and reduction (water, electricity, air conditioning)
  - ◇ Adequate waste and wastewater allocation
  
- **Communities**
  - ◇ Investments
  - ◇ Employment and labor
  - ◇ Professional qualification
  - ◇ Income
  - ◇ Quality of life
  - ◇ Social inclusion
  - ◇ Strengthening communities/regions
  
- **Socioenvironmental Actions**
  - ◇ Education and awareness
  - ◇ Environmental mitigations and compensations
  - ◇ Support and social projects

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