

Global Transport Development

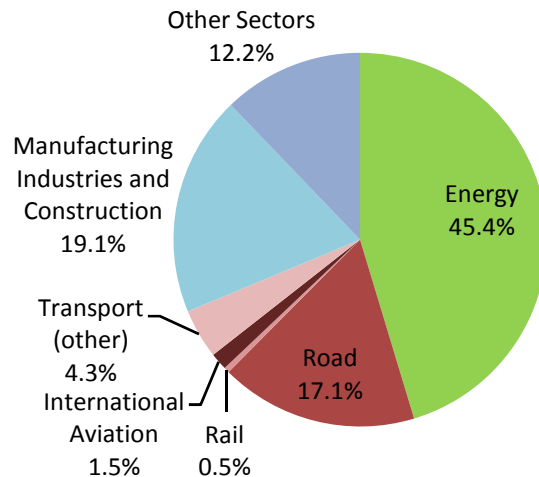


Report by Nicole Foletta & Jürgen Heyen-Perschon
Hamburg November 2009

Transport is a key economic sector, which supports economic development and growth in our cities, and facilitates exchange. However, the transport sector is also a significant and growing contributor to greenhouse gas emissions (GHG), traffic congestion and motor vehicle accident rates.

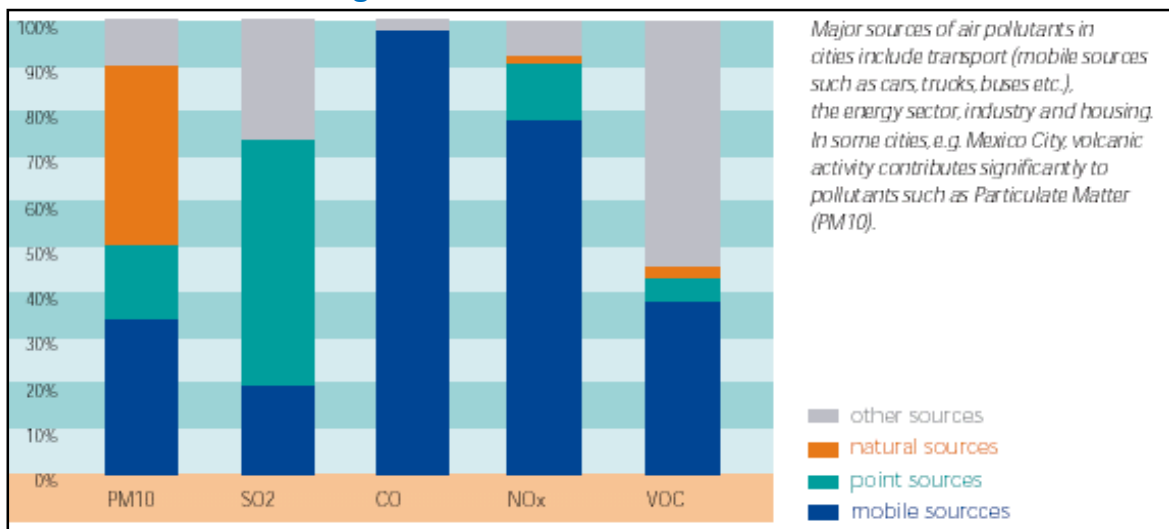
It must be clear that in order to avoid dramatic environmental damage, significant reductions in greenhouse gas emissions from all sectors are required, including the transport sector, which **is responsible for 23% of world CO2 emissions from fossil fuel combustion**. As seen in Figures 1 and 2, the **majority of these emissions come from mobile sources** (such as cars, trucks, buses, etc.). In OECD countries transport's share of CO2 emissions from fossil fuel combustion is even higher at 30%.

Figure 1: World CO2 Emissions from Fuel Consumption, 2005



Source: International Transport Forum Leipzig 2008

Figure 2: Urban Emissions Sources



Source: GTZ 2004

95% of the transport sector is dependent on oil and accounts for 60% of oil consumption worldwide. This also makes urban transport increasingly vulnerable to oil price instability and supply shocks (IEA 2007).

Beyond the limitation of fossil fuel resources and the impact transport has on climate change, almost all mega-cities of the developing world are also facing transport sector problems related to high local noise and pollution levels, a high level of traffic congestion and inappropriate land use changes causing losses of biodiversity and agricultural land.

Urban sprawl policies from the US and many European countries are still spreading to developing countries, narrowing their policy alternatives for sustainable mobility structures. Once residential areas, schools, health facilities, shopping centers and leisure facilities have spread into the outskirts of cities, the private automobile seems to be the logical and only mobility choice, encouraging broader urban streets, circular ring-roads and highways, which leads to a vicious circle of car-dependant development.

Against this background a business-as-usual development in the urban transport sector is no longer acceptable. Unsustainable investments in transport infrastructure and car-dependant spatial planning will last for decades and would obviously lead to a critical and nearly irreversible economic and social situation in the affected cities. Therefore, the *“Transport Question”* must be placed high on the political agenda and it is necessary to call for actions both in developed and developing countries.

Europe and the EU are trying to address urban transport issues more seriously, but transport-related emissions continue to increase in those regions. Unfortunately, current political discussions about Europe’s transport sector tend to concentrate on technical, supply-side options for the mitigation of CO₂ emissions, and not enough focus is placed on policies related to transport demand reduction. Also, the US and other OECD countries have not included transport in their GHG emission reductions efforts and a paradigm shift in urban mobility planning is still out of sight.

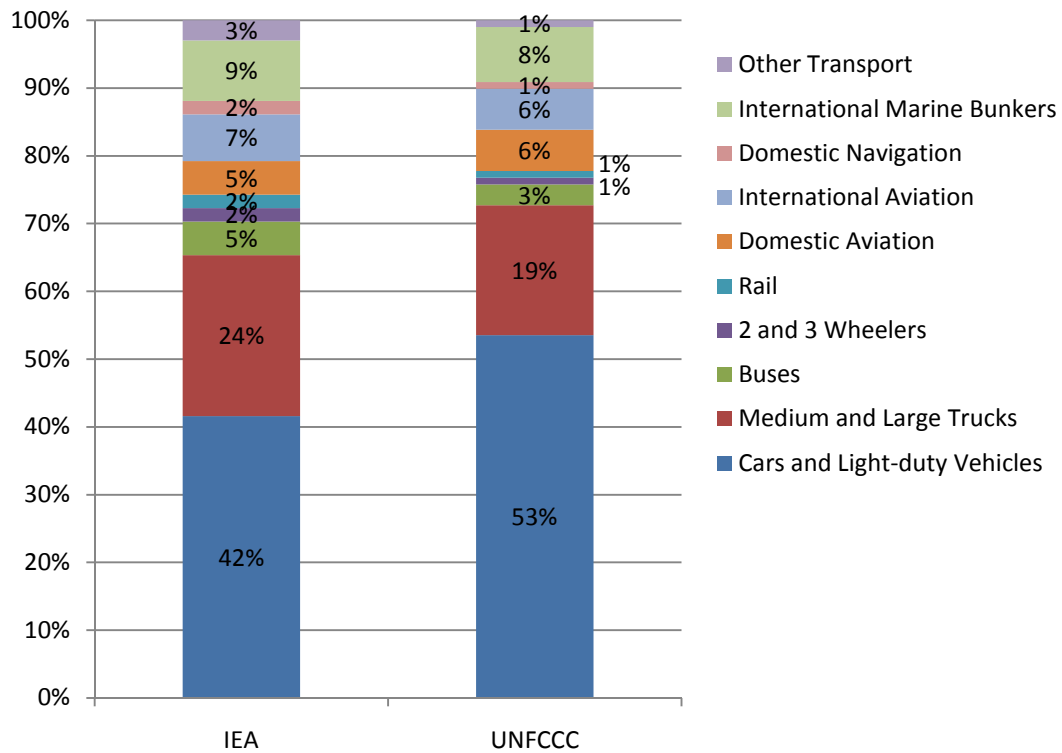
Modal Breakdown of Transport Sector Emissions

Figure 3 displays the breakdown of CO₂ emissions by mode within the transport sector from two different sources (the IEA and national reports to the UNFCCC). Although estimates vary, both sources paint a similar picture of modal share of transport emissions.

Car and light-duty vehicle transport produces up to half of all transport sector emissions, and overall, emissions from road transport produce about three-fourths of all transport

emissions. Cars, obviously, are a major mode of urban transportation in developed countries and a growing sector in developing countries. Although motorized 2 and 3 wheelers provide a relatively small percent of emissions worldwide, it should be noted that these vehicles are a major part of traffic in many emerging cities. They provide essential mobility to low and mid-income families but add to traffic congestion, accidents and local air pollution (International Transport Forum Leipzig 2008). Marine and air transportation contribute a relatively small percent of transport emissions, but these values could grow due to increasing international trade and the slow rate of improvements in fuel efficiency of these modes.

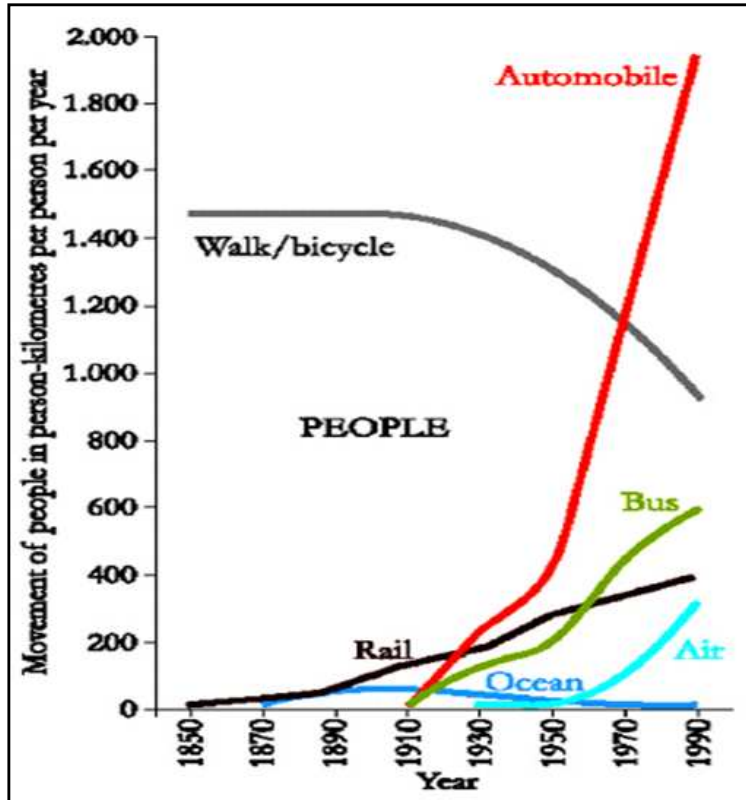
Figure 3: Modal Shares of Transport CO2 Emissions, 2005



Source: International Transport Forum Leipzig 2008

Figure 4 describes the development of passenger transport since 1850 to date and clearly shows the decrease in walking and cycling versus the tremendous increase in automobile use.

Figure 4: Changes in Use of Various Transport Modes over Time



Source: Petersen 2008

Although bicycle use is decreasing globally, in many areas it is still quite prevalent, such as in the Netherlands, where 27% of all trips are made by bike, and in Denmark, where 18% of trips are made by bike. Figure 5 shows a comparison of percent of trips made by bicycle in various countries. While the mode share for most countries is quite small, an increase in bicycling is possible, especially through the application of policies supporting bike use. This would have many positive impacts on society such as improved health, fewer emissions, fewer vehicle miles traveled, reduced demand for parking spaces and less traffic congestion.

Figure 5: Bicycle Share of Trips in Europe, USA and Australia



Source: ECMT 2004

CO2 Emissions Trends from the Transportation Sector

Transport sector emissions grew 1412 million tons (31%) worldwide between 1990 and 2003, increased 820 million tons (26%) in OECD countries and 592 million tons (42%) in non-OECD countries (IEA 2005). CO2 emissions from fuel combustion are growing faster for the transport sector than for other sectors. Furthermore, emissions are growing much more quickly in the developing world than in the developed world. Adequate transport infrastructure and services are essential for economic development and improving welfare. However, it is important to steer this development towards more sustainable patterns in order to curtail emissions.

Transport's share of CO2 emissions is gradually increasing in all regions of the world; its share of world emissions increased from 22% in 1990 to 24% in 2003. Transport's share is higher in the more developed countries of the OECD (30% in 2003) than in non-OECD countries (17% in 2003).

Increases in CO₂ emissions have been seen in all transport modes, but particularly in road transport. Although CO₂ emissions from road transport are increasing, aggregate figures for Europe suggest that greenhouse gas emissions have increased at a slower pace than the number of passenger and freight kilometers (EEA 2008). That is to say, although road passenger kilometers are increasing, fuel efficiency per passenger kilometer is improving. However, improvements in energy efficiency of vehicles and non-fossil fuels are still not enough to counteract the increase in transport demand. Therefore, measures focused on reducing transport demand, or shifting demand to more sustainable modes of transportation are extremely important to provide significant emissions reduction results.

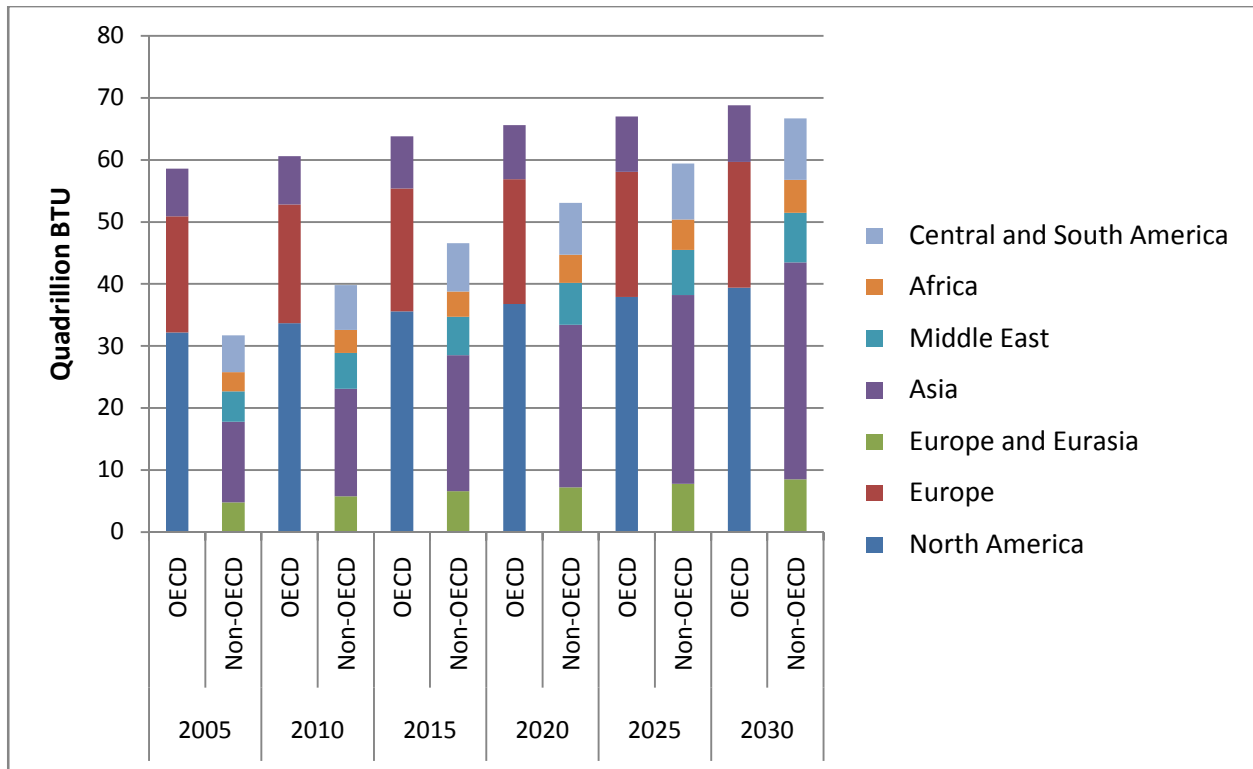
Transport Sector Forecasts

Future scenarios project a dramatic increase of global transport volume, and personal transport activity is expected to grow globally at an average annual rate of 1.6% per year up to the year 2030 (WBCSD 2004). However this differs from region to region, depending on existing policies, income projections, expected availability of new technologies and - last but not least - population growth and urbanization rates, which are high in almost all emerging cities in developing and transition countries.

Energy consumption by the transportation sector is increasing much faster for non-OECD countries than for OECD countries, and this trend is expected to continue. Forecasted values of energy consumption by the transportation sector can be seen in Figure 6. On average, transportation energy consumption is projected to increase by 0.7% per year between 2005 and 2030 for OECD countries, while the increase for non-OECD countries is projected to be 3% per year. The main driver of this growth is non-OECD Asian countries, which are expected to have a transportation energy consumption increase of 4.1% per year. The United States has the highest transport energy consumption rate of any country.

In most countries, the majority of emissions within the transport sector come from road transport. Road transport includes both private and commercial, however private transport generally contributes a larger share of emissions. Looking at either OECD countries or European Union countries, the split between transport emissions is two thirds from passenger transport and one third from freight. However, emissions from freight have been growing at a faster rate than for passenger transport and this trend is expected to continue.

Figure 6: Energy Consumption by the Transportation Sector

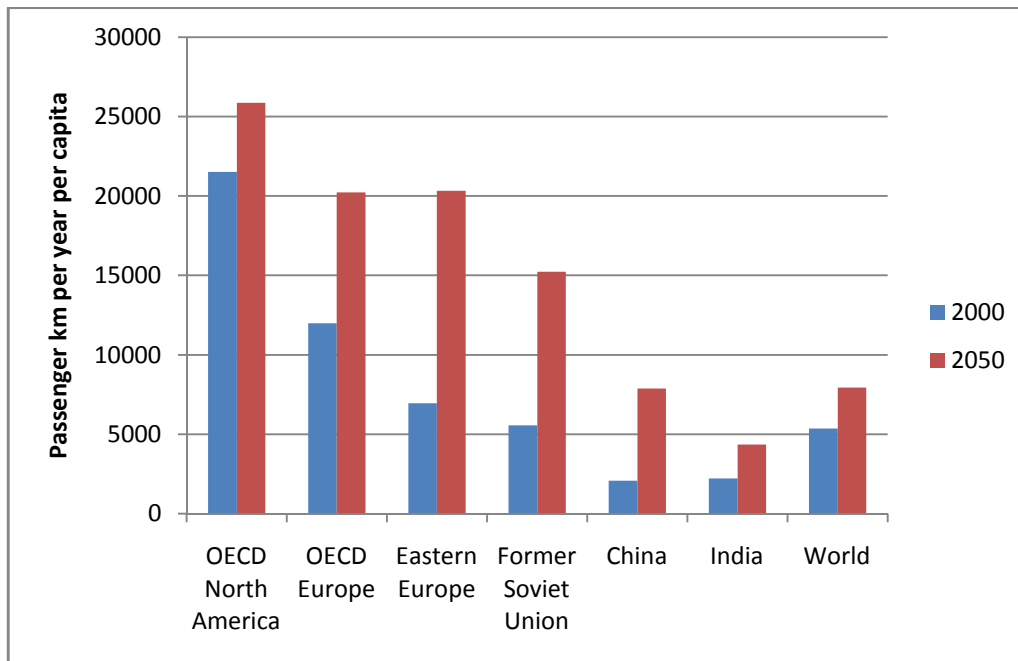


Source: EIA 2007

Per Capita Passenger Kilometers

According to European Environment Agency (EEA 2008) projections, worldwide per capita passenger-km traveled per year is expected to increase 48% between 2000 and 2050 (see Figure 7). This increase is even more dramatic in China (279%), Eastern Europe (193%) and the Former Soviet Union (174%). However, it should be noted that fuel economy of new cars sold in emerging economies is actually quite high. In China and India the average performance of new cars already matches or exceeds US targets for 2020 (International Transport Forum Leipzig 2008). This is mainly due to the small size and low power of cars used in these countries. Nevertheless, growing demand for cars outweighs the environmental benefits from efficiency improvements.

Figure 7: Per Capita Passenger-km per Year in 2000 and Projected for 2050



Source: EEA 2008

Recommendations

It is possible to change travel patterns and reduce transport emissions while still providing access and mobility by organizing transport and land use in an efficient way and applying transport policies that facilitate an efficient use of transport. Typically technical solutions, mainly new vehicle and fuel technologies, are the first choice of decision makers and non-technical solutions, such as policy, regulation, pricing, and support of efficient driving are seen as less important. There is no question that technological innovations are part of the solution. However, technical solutions alone cannot initiate the paradigm shift in transport planning needed to change mobility in our cities to reduce climate change. Reductions in vehicle and passenger-km travelled are needed in order to achieve reductions in transport emissions globally. Therefore, behavioural change in our cities is required.

It is important for both the developing and developed world to commit to making changes. Wealthy societies must find their way towards far less energy-intensive social and economic structures, including changes of individual life styles and behavioral patterns. In developing countries, where per-capita energy consumption is generally still

quite low, it will be necessary to find strategies for economic growth and societal prosperity that *don't* require the high level of energy consumption associated with the Western life style.

The following recommendations to counteract the current trend in transport development and begin the process of reducing transport sector emissions worldwide generally fall into the following three categories:

- (1) **Travel Demand Reduction:** Reduce the amount of passenger kilometers traveled (pkm) and freight ton-kilometers traveled (tkm)
- (2) **Transport System Shift:** Shift urban mobility from less sustainable travel modes towards transport modes with fewer emissions per pkm/tkm
- (3) **Transport Technology Improvements:** Improve performance of transport modes by making engines and vehicles which make a more efficient use of fuel and shift from fossil to alternative fuels with reduced or zero carbon content

These recommendations are general and should be tailored to fit each local situation.

1. Travel Demand Reduction

- a. **Create land use plans supporting the new need for people to live near central areas, in satellite cities or along well served public transport corridors.** Plans should encourage development in these areas, improved pedestrian and bicycle infrastructure and improved public transit service. Encouraging people to live near transit will enable them to satisfy all of their daily needs (such as going to work, going to medical appointments, shopping and running errands) by using public transportation, walking or biking, rather than using a car. This will reduce passenger-km traveled, improve efficiency of trips, encourage social interaction, provide exercise, create more vibrant neighborhoods and reduce emissions.
- b. **End fuel subsidies where they exist and apply auto fuel taxes** where they do not already exist. Fuel subsidies only encourage driving. They should not be used in any future transportation policies. Conversely, charging more for fuel such as through fuel taxes will encourage more efficient driving behavior. Drivers will be more conscious about how often and how far they drive because of their increased fuel costs. This could motivate them to drive less or chose other transport modes. In addition, since the auto fuel tax is paid directly by drivers, it can be adjusted to reflect the costs of environmental damage and health impacts from driving. Furthermore, the revenue from the tax can be used to support measures that counteract these negative effects.

2. Transport System Shift

- a. **Create urban policy that consists of coordinated elements** that work together to produce cumulative long-term effects that attain a balanced set of environmental, social and economic goals. This should include combining pricing policies directed at car users with public transit improvements in order to encourage a modal shift from cars to more sustainable modes of transport. These pricing policies should reflect the costs of environmental damage and health impacts and should include differentiation between peak and off-peak hours as well as congested and non-congested areas. Pricing strategies include congestion pricing, charging based on vehicle miles traveled and charging for parking. While these policies will make driving less attractive, it is important to make other modes more attractive in order to encourage a modal shift. Therefore, improvements to public transportation should be made simultaneously and can even be paid for using money collected from the pricing strategies. Improvements to public transit can include fare reductions and service improvements such as increased speed and reliability.
- b. **Coordinate intervention at both local and national decision making levels.** It is important to coordinate plans so that they do not run in opposition to one another. Transportation and land use plans are stronger when they are coordinated to work together. In addition, some decisions can only be made at one level (either local or national) so it is important to communicate when changes are needed at the other level.
- c. **Increase diesel tax rates** to discourage freight shipping by trucks and encourage more fuel efficient modes like trains. As mentioned, emissions from freight are growing even more quickly than emissions from passenger transport. Increasing diesel tax rates could encourage a shift to more sustainable modes of freight shipping in addition to improved logistics to reduce vehicle miles travelled. In addition, if these increased shipping costs are passed on to consumers, it could affect consumer choice, encouraging shoppers to buy goods grown or produced closer to where they live, therefore reducing the average distance of transported goods.
- d. **Limit number of motorcycle registrations allowed and promote electric bikes** as a clean alternative in areas with clean electricity production (not coal power plants). Motorcycle use is increasing in many dense cities in both the developing and developed world (for example, several countries in southern Europe, and China). However, many motorcycles can be just as polluting as cars, they add to traffic congestion, add to parking problems and increase accident rates. One way to reduce

the number of motorcycles on the roads is to limit the number of motorcycle registrations allowed in a city or region. However, this must be coordinated with other regions so that drivers are not encouraged to purchase a motorcycle in a nearby region without a restriction. A more sustainable alternative to motorcycles are electric bikes. These can be used in bike lanes, have slower speeds and therefore would reduce severity of accidents, are less expensive, and in areas with clean electricity production would produce fewer emissions. However, in areas with coal power plants electric bikes might not be the best option.

- e. **Promote non-motorized transport such as walking and biking.** Walking and biking produce no emissions, so it is beneficial to promote these modes whenever possible. Strategies include improving bicycle and pedestrian lanes, adding amenities (such as bike parking stations, benches, street trees, lighting), providing events such as car free days (based off of Ciclovía in Bogotá, Colombia), providing trainings on how to use and repair a bike, initiating a bike-share program (such as Velib in Paris), and initiating a marketing campaign to highlight the benefits of biking and walking (both environmental and health related).

3. Transport Technology Improvements

- a. **Apply fuel economy standards** in order to improve fuel economy of vehicles. Applying standards will encourage auto-makers to improve efficiency of vehicles. Possible improvements include making vehicles lighter and smaller (while maintaining safety), improving powertrain efficiency, and further developing alternative technologies such as hybrid and fuel-cell vehicles.

Sources:

Davies, J., M. Grant, J. Venezia, and J. Aamidor. *US Transportation Sector Greenhouse Gas Emissions: Trends, Uncertainties and Methodological Improvements*. Transportation Research Board Annual Meeting CD-ROM, 2007.

Energy Information Administration (EIA). *International Energy Annual*. Washington DC, 2007.

European Conference of Ministers of Transport (ECMT). *Cutting Transport CO2 Emissions, What Progress?* ECMT, OECD Publishing, Paris, 2007.

European Conference of the Ministers of Transport (ECMT), Conference Report 2004

European Environment Agency (EEA). *Greenhouse gas emission trends and projections in Europe 2008, Tracking progress towards Kyoto targets*. 2008.

GTZ. *Clean air in cities*, 2004.

International Energy Agency (IEA). *CO2 Emissions from Fuel Combustion*. IEA, OECD Publishing, Paris, 2005.

International Transport Forum Leipzig 2008. *Transport and Energy: The Challenge of Climate Change*. 2008.

Petersen, Rudolf. *Transport Demand Reduction*, 2008.

World Business Council for Sustainable Development (WBCSD). *Mobility 2030: Meeting the challenges to sustainability*, 2004