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SPEED MANAGEMENT, AN ENVIRONMENTAL ISSUE

Brussels, September 21th 2010 by Ms. Cyriel Pelletier

SUMMARY

- Introduction
- The association Voiture & co
- Speed management : environmental impacts
- Speed and road safety
- Case studies
- Onclusion



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INTRODUCTION

TRANSPORTS AND ENVIRONMENT

Transportation

- is a major user of energy
- burns most of the world's petroleum
- accounts for between 20% and 25% of world energy consumption and CO₂ emissions
- is a major contributor to local air pollution and smog,
- Greenhouse gas emissions from transport are increasing at a faster rate than any other energy using sector.



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GREENHOUSE GAS EMISSIONS IN VARIOUS CITIES



Greenhouse gas emissions from transport vary widely, even for cities of comparable wealth.

Source: UITP, Mobility in Cities Database



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TERMS

Environment

- 1. The circumstances or conditions that surround one; surroundings.
- **2.** The totality of circumstances surrounding an organism or group of organisms, especially:
 - a. The combination of external physical conditions that affect and influence the growth, development, and survival of organisms: "We shall never understand the natural environment until we see it as a living organism" (Paul Brooks).
 - **b.** The complex of **social** and **cultural conditions** affecting the nature of an individual or community.



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TERMS

Car pool

 or "ride-sharing" refers to the shared use of a car for a specific journey, in particular for commuting to work. It is an arrangement whereby several participants or their children travel together in one vehicle, the participants sharing the costs and often taking turns as the driver.



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Speed management, an environmental issue

TERMS

Carsharing

- A model of car rental where people rent cars for short periods of time, often by the hour.
 Carsharing differs from traditional car rentals in the following ways:
 - Self-service reservation, pickup, and return
 - Vehicles can be rented by the hour, as well as by the day
 - Users are members and have been pre-approved to drive (background driving checks have been performed and a payment mechanism has been established)
 - Vehicle locations are distributed throughout the service area, and often located for access by public transport.
 - Insurance and fuel costs are included in the rates.



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THE ASSOCIATION VOITURE & CO

FROM CARPOOLING...

Voiture & co's history

I995: major strikes in France

Students from the University of Paris X Nanterre set up a carpooling system

I998: founding of the association

- Encouraged by their success, they decide to continue their activities to promote a different way to travel daily
- 2000 : creation of a unique concept of road safety in France
 - Night carpooling is offered on major events (festivals, clubs...), associated with health and road safety actions



... TO SAFE AND SUSTAINABLE MOBILITY

2005: towards greener mobility

Development of the "Houses of Transports" dedicated to eco-mobility

2007: the European network "Route 25" to the French National Assembly

This recognition led to a participation on behalf of the European Commission to the International Week of Road Safety at the UN.

2010: still developing

- ⇒ 10 existing mobility platforms being opened
- Experiments on rural and disabled mobility issues
- ⇒ 150 road safety actions per year



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AN ORGANISATION BASED ON ISSUES

Issues faced by Voiture & co in France regarding mobility led to a 3 departments' structure.

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SUSTAINABLE AND SOCIAL MOBILITY DEPARTMENT

Today, transportation is a key sector for sustainable development. Given our current way of life, private cars can not provide satisfactory solutions in terms of economic, health, social and environmental issues.

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Objectives:

- Change the travel habits
- And reduce inequalities in work access

Figure:

Of all modes of transport is by far the road's biggest emitter of carbon dioxide (93.5%), followed by air (2.8%).

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EUROPEAN DEPARTMENT

Tha main objective of this division created in January 2004 is to gather and to share the experiences with European NGO's working on suistanable mobility and road safety issues.

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- a European network of NGOs working on road safety for young people:
- Organization of the annual European Youth Conference for Road Safety .
 - Creation of the European actions for road safety
 - CLEAN PARTIES PROJETS organized in 3 countries (France, Belgium and The Netherlands)



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NIGHT MOBILITY AND PREVENTION DEPARTMENT

Main objectives and actions:

- Night car pooling and prevention actions:
- 150 events per year covered in France :
- The main festivals: Solidays, Rock en Seine...
- The biggest students parties and events
- Day prevention actions in the Universities and Colleges
- > A great network of volunteers :
 - 250 young volunteers
- Our public:
 - Students, young workers, young people in general (from 18 to 25 years old)



NIGHT MOBILITY AND PREVENTION DEPARTMENT

Our communication campaigns

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SPEED MANAGEMENT : ENVIRONMENTAL IMPACTS

ENVIRONMENTAL IMPACT OF ROADS

- The environmental impact of roads includes the local effects such as on:
 - urban management,
 - noise,
 - local air quality,
 - water pollution,
 - habitat destruction/disturbance,
 - and the wider effects including climate change.



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FROM URBAN MANAGEMENT ...



- design, construction and management of roads, parking and other related facilities,
- design and regulation of vehicles.

Myth: Implementing a 30 km/h urban speed limit will require many structural measures Fact: Numerous examples of existing practice show that a 30 km/h urban speed limit is possible without significant structural measures. The city of Lucerne has managed to implement a 30km/h policy without taking any such measures. And making 30km/h the standard speed within city limits will result in much better safety for all. All it needs is sign-posting on those few streets where there are exceptions to a 30km/h rule; such as on part of a road where one can drive at 50 km/h.



... TO ROAD SHARING

- © Cities are shaped by their transport systems.
- Nowadays' objective :
 - Move to more economically and environmentally efficient transport in higher density communities
 - Greater safety for the children, aged and disabled
 - Consider transport impacts on urban planning policies
 - Develop telecommunications and telecommuting



NOISE

Over 80 % of urban noises are due to transport infrastructure

- The main health effects of noise are physiological and psychological :
 - Impaired hearing
 - Stress
 - Insomnia...



AIR QUALITY

Motor vehicle emissions

- include particulate emissions from diesel engines, NOx, volatile organic compounds, Carbon monoxide and various other hazardous air pollutants including benzene.
- may trigger **allergic reactions**.
- About 4% of deaths in the United States can be attributed to air pollution (Environmental Science Engineering Program, Harvard School of Public Health).



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VOLATILE ORGANIC COMPOUNDS SOURCES IN THE US



Source : http://www.epa.gov/air/emissions/voc.htm



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WATER POLLUTION

Orban runoff from roads

- tends to pick up gasoline, motor oil, heavy metals (nickel, copper, zinc, cadmium, lead and polycyclic aromatic hydrocarbons), trash and other pollutants dispersed by road traffic and crashes.
- contaminate groundwater and pollute surface waters and then the entire environment.



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HABITAT FRAGMENTATION

- increased animal mortality
- prevent species from migrating and recolonising
- restricting access to seasonally available or widely scattered resources
- o divide large populations into smaller more isolated populations, more vulnerable to genetic drift, inbreeding depression and an increased risk of population decline and extinction.



WIDER EFFECTS INCLUDING CLIMATE CHANGE



Emission Database for Global Atmospheric Research version 3.2, fast track 2000 project





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ENVIRONMENTAL IMPACT OF ROADS

- According to the OECD transport generates:
 - **7 billion tons** of CO₂ per year
 - Cars are responsible for more than **40**% of these emissions
 - It is estimated that the fleet will be multiplied by 3 between 2000 and 2050 to reach 2 billion light vehicles
- Speed variance is one of the major contributory factors of emissions, and also one of the easiest to influence



FOCUS ON SPEED REDUCTION

By Matthijs Otten, Huib van Essen,

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- Pilot study on the climate gains of motorway speed reduction
- Delft, CE Delft, February 2010



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Why slower is better

- Pilot study on the CO2 reduction of a lower speed limit on the motorway
- Ordered by NGO Milieudefensie (Friends of the Earth Netherlands) to CE Delft

Relation between CO_2 Emissions factor and speed



Theoric relation CO₂ emission factor vs driving speed

Schematic image of relation between CO_2 emission factor and speed including acceleration and deceleration





INFLUENCE OF TRAFFIC ON CO₂ EMISSIONS

- Influence of decreasing the maximum speed on CO₂ emissions:
 - Decrease of emission per vehiclekilometre
 - 2. Decrease in amount of car-kilometres.
 - 3. Increase in kilometres of other modes of transportation.
 - 4. Change in congestion level



DECREASE OF EMISSION PER VEHICLE-KILOMETRE

- The fuel consumption of a passenger car depends, among other things, on:
 - driving speed
 - driving pattern
 - driving behaviour.
 - ⇒ Eco-driving



DECREASE OF EMISSION PER VEHICLE-KILOMETRE

Relationship between vehicle speed (km/h) and CO2 emission (gram/km) at constant speed



Source: TNO data, adapted by CE Delft.



Correlation average speed (km/h) and CO2 emission (gram/km) including vehicle dynamics



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Source: TNO data, adapted by CE Delft.

REDUCTION OF TOTAL TRAFFIC VOLUME AND SHIFT TO PUBLIC TRANSPORT

- Links speed reductions and modal report
 - two reactions of drivers can be expected:
 - continue to travel the same distance.
 - drivers will travel less or less far in order to loose no more time on travelling.
- The correlation between total traffic volume and travel time is expressed in so-called elasticities.



CONSTANT TRAVEL TIME BUDGET

Development of average travel time spending per 24 hours per person

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(1994 = 100)



REDUCTION OF TOTAL TRAFFIC VOLUME AND SHIFT TO PUBLIC TRANSPORT

Possible effects of decreasing the maximum speed limit which lead to less road use.

Term	Behavioural changes leading to less car-kilometres
Short term	Working at home
	Teleconferencing instead of face-to-face meetings
	Shortest route instead of the fastest
	Choosing destinations closer to home
Medium term	Public transport / bicycle instead of car
	Less journeys, combining destinations
	Public transport season tickets, electric bicycle, scooter
Long term	Move to live closer to the workplace
	Improved bicycle and public transport infrastructure as
	effect of a higher demand
	Building in more advantageously located places in relation
	to transport possibilities (car as well as train)
	Increase in locally oriented business and industry



EFFECTS ON CONGESTION

- Almost not possible to calculate exact effects of reducing speed limitation on congestion.
- It is expected that total congestion in case of an uniform speed limit will decrease compared to the current situation of varying speed limits.
- The reduction of congestion has a direct impact on CO₂ emissions.



ADDITIONAL EFFECTS OF SPEED LIMIT REDUCTION

The most important effects are:

- Economical effects of longer travel time.
- Effects on air quality.
- Effects on noise pollution.
- Traffic safety effects.



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ECONOMICAL EFFECTS OF EXTENDED TRAVEL TIME

- Limited effect on cargo transport.
- For the consumer:
 - loss in economical welfare
 - extra time spent in the car
 - decrease in travelled kilometres
 - economical gains
 - reduced fuel consumption per kilometre
 - mainly social gains



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OVERVIEW OF SOCIAL COSTS AND BENEFITS

Overview of social costs and benefits of lower motorway speed limits

Social costs	Social benefits
Prolonged travel time	Reductions of CO ₂ emissions
Reduction vehicle kilometres of passenger	Reduction of air polluting emissions
cars	
Enforcement costs	Reduction of noise pollution
	Improvement of traffic safety
	Congestion reduction
	Saving infrastructure costs
	Savings fuel



EXPECTED CO₂ REDUCTIONS: VARIOUS SCENARIOS

CO2 reduction for the scenarios on the short and the long term (passenger cars and vans)





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EXPECTED CO₂ REDUCTIONS: VARIOUS SCENARIOS

Short- and long-term CO_2 emission reductions as a share of total motorway CO_2 emissions by cars in various scenarios



Note: 100, 90 or 80 everywhere means that all highway speed limits that are higher than 100, 90 or 80 are reduced to 100, 90 or 80. Lower speed limits remain the same.



EXPECTED CO₂ REDUCTIONS: VARIOUS SCENARIOS

CO2 savings for short term scenarios



CO₂ savings for long term scenarios





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CONCLUSIONS OF THE PILOT STUDY

- The maximum long-term CO₂ reduction was estimated to 2.8 Mt for passenger cars and a further 0.2 Mt for delivery vans.
- In the case of cars, this means a 30% reduction of emissions on motorways, which equals 12% of all CO₂ emissions of passenger cars in the Netherlands, attained at a uniform speed limit of 80 km/h.



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Speed, environment and Road safety

- Speed not only affects the environment by change in
 - > The level of exhaust emissions
 - The level of traffic noise
 - Fuel consumption
 - > Quality of life for people living or working near the road.
- but also the road safety

Co-operation between road safety and environmental organizations may increase the political and public acceptability for speed management measures.



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SPEED AND ROAD SAFETY

Speed management, an environmental issue

SPEED AND ROAD SAFETY

Speed is a central issue in Road safety

- contributory factor in around 10% of all accidents and in around 30% of the fatal accidents.
- Both excess speed and inappropriate speed are important accident factors.
- > Increase of the likelihood of an accident.

The faster driver and the slower driver had a higher risk of being involved in an accident.



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SPEED AND ACCIDENT RISK: HIGHER SPEED MORE ACCIDENTS

- High speed reduces the possibility to respond in time when necessary.
 - At high speeds the distance between starting to brake and a complete stand still is longer.
 - Speed also dramatically reduces vision scope.
- The possibility to avoid a collision becomes smaller as speed increases.



SPEED AND ACCIDENT RISK: HIGHER SPEED MORE ACCIDENTS



The relationship between speed and accident risk

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THE RISK OF SPEEDING AND DRINK-DRIVING

- The increased risk from driving at speeds 10-20% above the average for the road is similar to the increased risk from driving at the drink drive limits. (Sources : Kloeden et al., 1997)
- Exceeding a speed limit of 60 km/h by 5 km/h is comparable to the risk of a BAC of 0.05.
- The risk of exceeding the 60 km/h speed limit by 10 km/h is higher than driving with a BAC of 0.08.



LARGER SPEED DIFFERENCES: MORE ACCIDENTS



When Speed differences increase, the accident risk increases



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EXEMPLES OF ACTIONS TO REDUCE THE SPEED IMPACT ON ROAD SAFETY

- Stop making speed glamorous
- Social changes in driving behaviours
- Implementation of laws is unavoidable
 - involvement . of the governments



CASE STUDIES

SPEED REDUCTION EFFECTS ON CO₂ EMISSIONS - FRANCE

Additional commuting because of TGV Paris - Lyon

- With the introduction of the TGV on the Paris Lyon route in 1981, it became possible to cover this distance in less than two hours.
- For many people, this gave the possibility to work in Paris and live, for instance, in Lyon (approximately 450 km).
- In 2006 the TGV was used by 45.000 people for long distance commuting.
- So event if people drove less cars, they were offered the possibility of travelling more kilometers... with different impacts on their environment
 - construction of railways, consumption of energy majorly atomic electricity in France, ...



SWITZERLAND : SPEED LIMITS FAIL TO REDUCE OZONE LEVELS

- The use of measures such as speed limits to keep ozone levels low during summer has little effect. Most of the toxic gas comes from abroad.
- Ticino and Graubünden were the first cantons to introduce speed limits on certain stretches of motorway in August 2003 as Europe suffered from an unprecedented heatwave, which in Switzerland caused almost 1,000 additional deaths. At that time, they decided to lower the maximum speed limit from 120 km/h to 80km/h.
- Studies carried out by the Paul Scherrer Institute (PSI), Switzerland's largest national research centre, found that the reduction in pollution that resulted from such limits was negligible, as 75 per cent of the ozone present in Germanspeaking Switzerland comes from other countries.



EFFECTS ON CONGESTION

- Maximum speed limit can have some effect on the extent of congestion although this effect is not singular.
- For instance, introducing 80-kilometre zones in the Dutch agglomeration Randstad induced an increase in congestion in some places and a decrease in others. Local situations play a large role in the outcome of these measures.
- At the Utrechtse Baan in The Hague congestion increased. This is mostly due to the fact that the maximum speed limit is lowered twice over a short distance: from 120 to 100 and a little further on from 100 to 80. In addition, close to the 80-kilometre zone is a merger lane because several roads conjunct.



TRAFFIC SAFETY EFFECTS

- A reduction of the maximum speed limit in the Netherlands influenced traffic safety in several ways:
 - Lower speed limits and fewer dissimilarities in speed between passenger cars and trucks increases traffic safety.
 - A decrease in traffic volue results in a decrease of the amount of road casualties. Although in general this decrease is relatively less than the decrease in traffic volume.
 - A shift to other modes of transport affects traffic safety.
 - A shift of traffic from motorways to secondary roads will worsen traffic safety.
- The overall effect of a reduction of the maximum speed limit is difficult to assess. It is expected that overall traffic safety improves. For instance, speed limit reduction on the A13 from 100 km/h to 80 km/h resulted in more than 50% drop in the number of injured people (Beek et al., 2007).



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CURRENT SPEED LIMIT POLICIES - EU

- Weather is one of the only legal condition to affect speed changes
- In the EU, only France applies lower general speed limits for bad weather conditions. In case of rain or snow, the speed limit for motorways changes from 130 km/h to 110 km/h and at rural roads from 90 km/h to 80 km/h. In case of fog (visibility less than 50 meters) the speed limit on all types of roads is 50 km/h. In other countries (e.g. Germany, United Kingdom) matrix signs on motorways provide advisory or compulsory reduced speed limits when weather conditions are bad.
- Both Finland and Sweden apply different general speed limits in wintertime. In Finland, the speed limit at motorways changes from 120 km/h to 100 km/h and, on main rural roads, from 100 km/h to 80 km/h; these have been evaluated by Peltola . Similarly in Sweden the speed limits change respectively from 110 km/h to 90 km/h and from 90 km/h to 70 km/h.
- In France, it is common to reduce the general speed limit by 20 or 30 km/h on a temporary basis, generally in case of high temperatures, with the aim to reduce air pollution and smog.



THE UNITED STATES CLEAN AIR ACT IN TEXAS

- The United States Clean Air Act is a United States federal law enacted by the United States Congress to control air pollution on a national level.
- Texas is the first state to lower speed limits for air quality reasons. In roughly a 50 mile (80 km) radius, the Texas Department of Transportation reduced the speed limit on all roads with 70 mph (113 km/h) or 65 mph (105 km/h) speed limits by 5 mph. Initial studies found that lower speed limits could bring the areas roughly 1.5% closer to compliance. However, follow-up studies found that the actual reduction is far less:
- The emissions modeling software initially used, overestimated the emissions contribution of speed limit reductions.
- Speed checks in the Dallas area performed 1 year after implementation of speed limit reductions show that actual speed reductions are only about 1.6 mph, a fraction of the anticipated 10% (5.5 mph) speed reduction.
- In 2003, the Texas Legislature prospectively banned environmental speed limits effective September 1, 2003. The wording of the bill allows environmental speed limits already in place to remain indefinitely; no new miles of roadway may be subjected to environmental speed limits, however.
- In 2009, the North Texas Tollway Authority generally raised the speed limit by 10 mph on two freeways.
- The story does not tell the role played by the petroleum lobby in this change...



CONCLUSION

- Human being's central position
- Road sharing / « Road permit »
- Our State of Washing State of State
- Consequences on road safety
- Rethink place given to car
 - Impacts on speed/environment/road safety



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