Conclusions from WCTRS Research

- Today's transport is **unsustainable** in the long-term and a main contributor to **climate change** and **air pollution**.
- **Global vehicle stock** is projected to **double** and **mobility levels** (pkm) to grow over the next decades.
- Developing countries may benefit from **leap-frogging technologies**.
- **Road electrification** reduces the oil-based vehicle stock and synergises with **green electricity generation**.
- **Non-motorised** and **public transport** are real alternatives with positive impacts.
- **Freight transport** has a significant share on emissions.
- **Freight road transport, aviation,** and **shipping** emissions will continue to grow fast.

Policy Recommendations from WCTRS

- Mitigation action in transport is **urgent**. The risks of **policy resistance** and **costs of inaction** are high but can be avoided.
- **Scaling up** present action demands more **resources** – especially for developing countries.
- A **systems approach** that includes a coherent set of transport measures is required.
- **Clean technology deployment** is not enough, **travel behavioural change** and **improved logistics** favouring cleaner vehicles and modes is also necessary.
- Smarter **land planning** and mobility services are crucial to reduce travel demand.
- Information campaigns and **investment in human capital** can act as powerful catalysers.

Main Outcomes of COP21 in Paris

WCTRS welcomes the outcomes of COP21 for transport:

- Limit the rise in global temperature to less than 2°C in the 21st century and pursue efforts to achieve 1.5°C above the pre-industrial level.
- Role of Intended Nationally Determined Contributions (INDCs) to support mitigation and adaptation actions in transport.
- Public Transport Declaration on Climate Leadership.
- The Paris Declaration on Electro-Mobility and Climate Change aiming at the deployment of >400 million two and three-wheelers and >100 million cars in 2030.

World Conference on Transport Research Society

WCTRS provides a forum for the interchange of ideas among transport researchers, managers, policy makers, and educators from all over the world, from a perspective which is multi-modal, multi-disciplinary, and multi-sectoral.

President: Yoshitsugu Hayashi (Nagoya University)

WCTRS Special Interest Group
SIGf2 – Transport, Climate Change, and Clean Air

WCTRS SIGf2 provides interdisciplinary scientific evidence on the interaction between transport systems and the environment and delivers policy recommendations with the aim of encouraging policy actions towards low-carbon sustainable transport.

Key Publications

Creutzig, F.; Jochem, P.; Edelenbosch, O.Y.; Mattauch, L.; Vuuren D.P.v.; McCollum, D.; Minx, J. (2015), Transport – a Roadblock to Climate Change Mitigation?, Science (Policy Forum) 350 (6263), 911-912.

Hayashi, Y., Morichi, S.; T. Oum; Rothengatter, W. (2015), Intercity Transport and Climate Change: Strategies for Reducing the Carbon Footprint, Springer.

Jochem, P.; Rothengatter, W.; Schade, W. (2016), Special Issue on Climate Change and Transport, Transportation Research Part D: Transport and Environment, Elsevier.

Proposers

D. **Banister**, F. **Creutzig**, H. **Edwards**, J. **Gómez**, A. **Gühnemann**, Y. **Hayashi**, E. **Heinen**, C. **Huizenga**, A. **Huzayyin**, P. **Jochem**, H. **Kato**, O. **Lah**, A. **May**, K. **Nakamura**, W.-S. **Ng**, T. **Oum**, H. **Pan**, M. **Ponti**, C. **Raux**, W. **Rothengatter**, H. **Ruiz-Lopez**, W. **Schade**, T. **Turrentine**, M. **Wegener**.

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World Conference on Transport Research Society (WCTRS)

BRINGING TRANSPORT MITIGATION INTO FOCUS

Recommendations from WCTRS to COP23

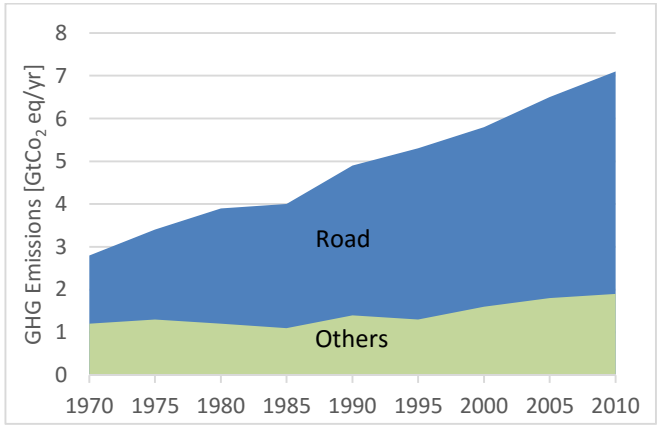
www.wctrs-society.com

Global Facts

According to the WGIII AR5 (*IPCC, 2014*):

- Transport generated **7.0 Gigatonnes** ($GtCO_{2eq}$) of *direct* greenhouse gas (GHG) emissions in 2010.
- Transport was responsible for ca. **23%** of total energy-related CO_2 emissions in 2010.
- Transport might generate ca. **12 $GtCO_{2eq}$/year** by 2050.
- Since 1970, **transport emissions grew faster** than emissions from any other energy end-use sector.
- **Decarbonising transport** is seen as more **challenging** compared to other sectors.

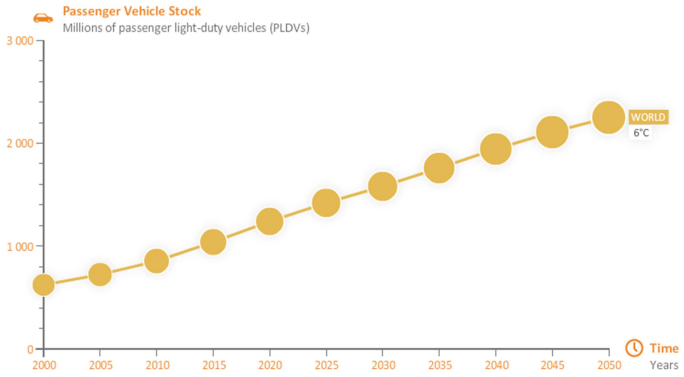
Transport Emissions by Mode (direct GHG)



Based on data from IPCC (2014)
Chapter 8, Figure 8.1, p.606. See Edenhofer et al. (2014)

Key Projections

Trend Projection of World Vehicle Stock



The projected dramatic increase in world vehicle stock is expected to be caused by **higher motorisation** (predominantly, car ownership) levels. Key assumptions underlying such projections are population and GDP growth. **Rapid growth** in vehicle stock does not only **accelerate GHG accumulation** but also **depletes faster non-renewable oil** resources.

Mitigation Options in Transport

Analytically, GHG emissions from transport can, in a simplified manner, be decomposed as follows [*units of measurement*]:

$$\underset{[CO2eq]}{GHG} = \underset{[km]}{Travel} \times \underset{\left[\frac{energy}{km}\right]}{Efficiency} \times \underset{\left[\frac{CO2eq}{energy}\right]}{Intensity}$$

This formula, known as the **A-S-I framework**, indicates drivers of transport emissions – and therefore shows possible leverages for policy measures. There are several extensions such as the A-S-I-F approach, which includes the financing issue, too.

A-S-I Policy Framework

Avoid unnecessary trips and reduce travel distance (mileage)

Shift travel to more energy-efficient, environmentally-friendly vehicles and modes

Improve technology and support deployment of cleaner fuels and low-carbon vehicles

Transport is a complex nonlinear system. Individual policy measures in isolation have a limited impact. The effects of implementing two policy measures are not always simply additive. **The greatest impact is achieved when a sustained combination of coherent policy measures is pursued, taking advantage of their multiplicative beneficial effects.**

Transport Decarbonisation Measures

Below some real-world examples are listed. These are effective, individual policy measures, aiming at mitigating GHG emissions from transport activities.

Avoid "excessive" mobility

- Compact city: Durban (SA) and Dutch national policy
- Transit Oriented Development (TOD): Curitiba (Brazil)
- Telework and teleconferencing: Federal Government's Telework Act (US)

Shift to more efficient modes

- Improve conditions for pedestrians: Strøget in Copenhagen (Denmark)
- Increase attractiveness of cycling through investment in bike lanes and sharing systems: Hangzhou (China) and *Vélib'* in Paris (France)
- Car free development: Vauban in Freiburg (Germany)
- Promotion of public transport through:
  - Cross-subsidisation from road traffic: congestion tax to fund *Västlänken* rail link in Gothenburg (Sweden)
  - Integrated ticketing and smart cards: *SmartRider* in Perth (Australia)
  - Reduced or zero fares: free travel for residents in Tallinn (Estonia)
  - Improved service info: SBB mobile apps (Switzerland)
  - Budgetary decisions to shift to rail (Thailand)
- Investment in a Bus Rapid Transit (BRT) system: *Rea Vaya* in Johannesburg (South Africa)
- Investment in high-speed rail to shift passengers from air: Madrid – Barcelona rail link (Spain)

Improve modes

- Emission standards: Tokyo retrofit programme (Japan)
- Promotion of car sharing, smaller cars and Low Emission Vehicles (LEV): electric car grant (UK)
- Eco-driving: ECOWILL programme in Europe
- Deployment of Intelligent Transportation Systems (ITS): Portland (US)