

# Getting Societal Values from Trucks

- an overview of the recent OECD/ITF JTRC study of the topic

Presented to

## Stakeholders' Workshop on "Gigaliners"

Called by the European Commission

Directorate-General for Energy and Transport

In Bruxelles, on 24 June 2009

by

**Jørgen Christensen, M.Sc. MS**

Chair, JTRC Working Group on Heavy Goods Vehicles

# OECD

## Analyses of Heavy Vehicle issues

- Impacts of Heavy Freight Vehicles [1983]
- Dynamic Loading of Pavements [1992]
- Dynamic Interaction between Vehicles and Infrastructure Experiment (DIVINE), Technical Report, [1998]
- Dynamic Interaction between Vehicles and Infrastructure Experiment (DIVINE), Policy Implications, [1999]
- Performance-based Standards for the Road Sector [2005]

## Why this project?

- Increasing road freight transport on capacity-limited infrastructure – Urgent need to increase efficiency of road freight transport.
- DIVINE project showed potential for heavier loads on “road-friendly” HGVs.
- Implications of technological development for HGV productivity, safety and environmental impact
- Improving HGV compliance with rules and regulations.
- Conditions for higher productivity vehicles to deliver overall socio-economic benefits

# Major Tasks

- Benchmarking (safety, productivity)
- Logistics and operations
- Effects of Regulatory Measures
- Potential Changes
- Possible Regulatory, Technological and Operational Improvements

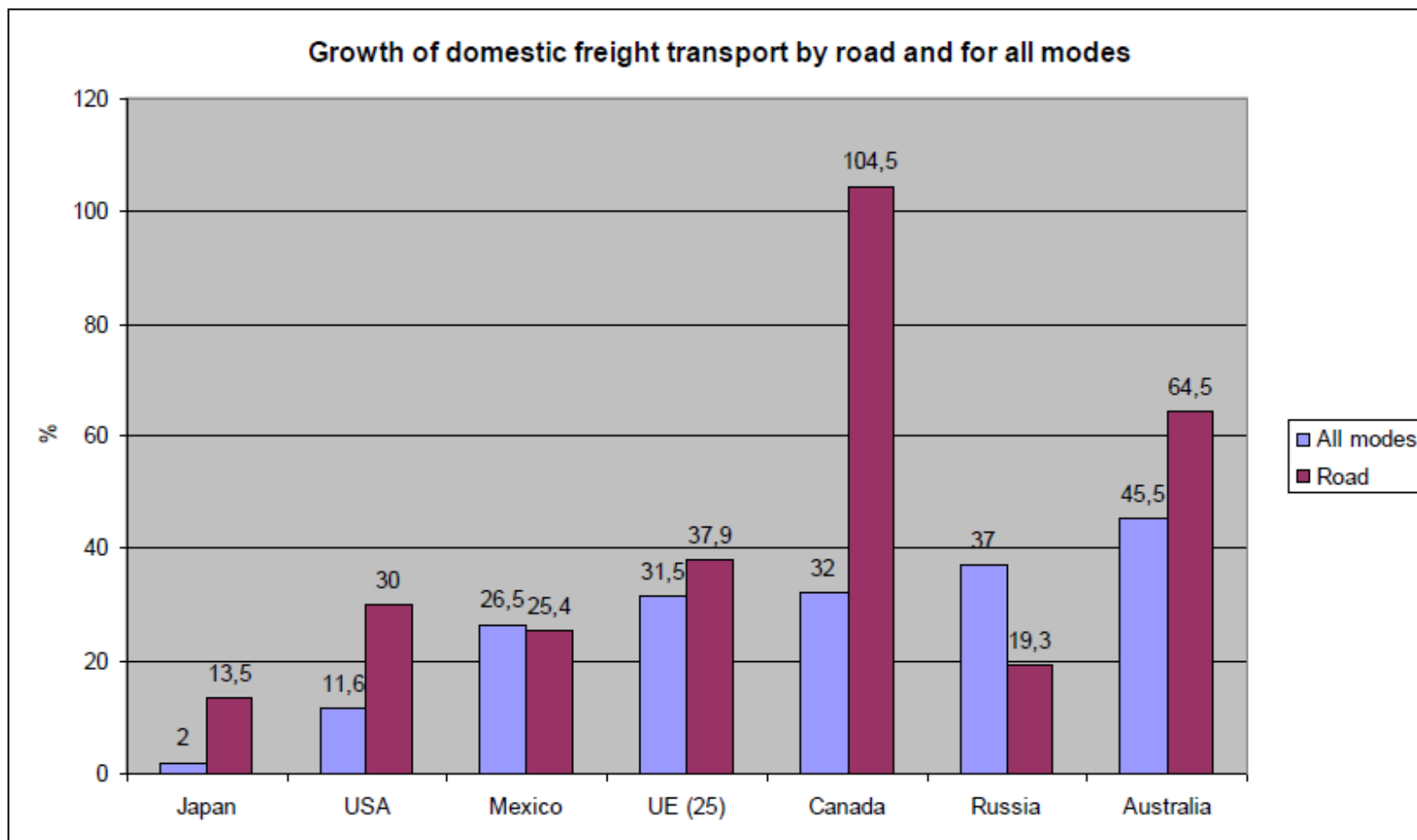
# Membership

- Australia (4)
- Belgium(1)
- Canada (2)
- Czech Rep. (1)
- Denmark (2)
- EU-Commission (1)
- France (2)
- Germany (1)
- Hungary (1)
- Latvia (1)
- Mexico (1)
- Netherlands (3)
- Norway (1)
- Poland (2)
- Russia (1)
- Republic of South Africa(1)
- Spain (1)
- Switzerland (1)
- Sweden (1)
- Ukraine (1)
- UK (1)
- USA (2)

# Growth and challenges facing freight transport

- *Recent past has seen significant growth in interurban transport*
- Advances in technology, logistics and regulatory environment.
- Challenges : road safety, social amenity, fossil fuel consumption, for CO2 and air pollution, congestion, individual mobility.
- Important external costs of road freight transport.
- Some advances in other modes of transport.
- Challenge: the major share of further growth in freight transport will go on the road.
- Public attitudes vary, but some concerns everywhere.
- For societal acceptability: effective measures to mitigate undesirable consequences of continued growth.
- Irrespective of growth efficiency must be improved

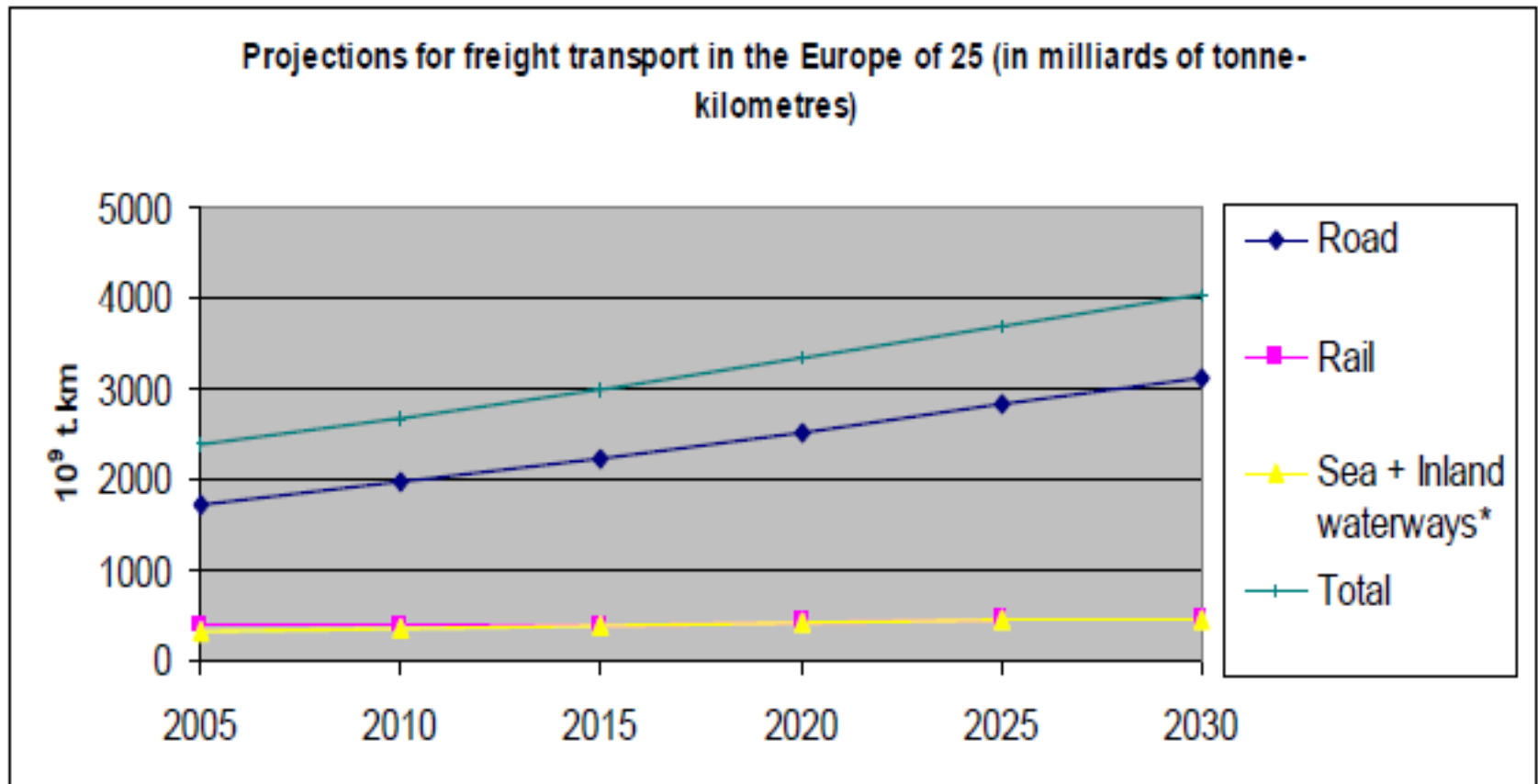
# Growth in freight transport 1995-2005



# Growth and challenges facing freight transport

- Recent past has seen significant growth in interurban transport
- *Advances in technology, logistics and regulatory environment.*
- *Challenges : road safety, social amenity, fossil fuel consumption, for CO2 and air pollution, congestion, individual mobility.*
- *Important external costs of road freight transport.*
- *Some advances in other modes of transport.*
- *Challenge: the major share of further growth in freight transport will go on the road.*
- Public attitudes vary, but some concerns everywhere.
- For societal acceptability: effective measures to mitigate undesirable consequences of continued growth.
- Irrespective of growth efficiency must be improved

# Continued growth in freight transport



# Growth and challenges facing freight transport

- Recent past has seen significant growth in interurban transport
- Advances in technology, logistics and regulatory environment.
- Challenges : road safety, social amenity, fossil fuel consumption, for CO2 and air pollution, congestion, individual mobility.
- Important external costs of road freight transport.
- Some advances in other modes of transport.
- Challenge: the major share of further growth in freight transport will go on the road.
  
- *Public attitudes vary, but some concerns everywhere.*
- *For societal acceptability: effective measures to mitigate undesirable consequences of continued growth.*
- *Irrespective of growth, efficiency must be improved*

## Mitigating Impacts and Improving Efficiency

- Higher Performance Vehicles (HPVs) are already on our roads and their use is spreading. This is good for efficiency.
- Broad community acceptability calls for advances in technology, logistics planning and regulatory conditions.
- Working group findings confirm that such measures are possible in near to medium term and can contribute to a more efficient and sustainable transport system.

## Conclusion

*" There is community concern over the safety, environmental and amenity impacts of higher performance vehicles and issues of compatibility with infrastructure assets.*

*However, higher performance vehicles have the potential to deliver improved safety, productivity and environmental outcomes if effectively managed and regulated."*

## Recommendation

- *"The key to effective utilization of trucks is to demonstrate to the community and their political leaders that these vehicles comply with route restrictions, deliver high safety and environmental outcomes and recover all costs associated with their use of the network.*

*The tools to deliver these requirements are available. The challenge for regulatory agencies is to implement an integrated and effective approach to the regulation of trucking."*

(Recommendation no 50)

# Safety

- Safety benchmarking of trucks is hampered by difference in statistics, lack of reliable exposure data by vehicle class and lack of differentiation in many countries by vehicle class.
- Crash rates have not deteriorated in recent past, but involvement in fatal crashes higher than for any other car or commercial vehicle.
- Country differences suggest improvement potentials in higher risk countries.
- Errors in hazard recognition and decision-making are dominating accident factor for truck drivers as compared with other drivers.
- Technologies are available or becoming available to mitigate driver errors and truck-specific accident types. Implementation is the issue.

## Stability and spatial performance

- Dynamic stability and geometric performance of forty different heavy truck types were analysed and compared with the computer models of Australia's Performance Based Standards (PBS) method.
- Showed major differences between the trucks and showed the potential value of this method for developing trucks and vehicle standards.
- Showed also that workhorse trucks used around the world to transport the majority of road freights are often not any safer or better performing than many higher capacity trucks in the analysis.
- The better performing higher capacity vehicles tend to be associated with countries that use PBS to support their regulatory system.

# Experiences with higher capacity trucks

- Studies and experience confirm that safety performance of ‘higher performance vehicles’ is not worse than that of traditional ‘workhorse’ trucks.
- It may in fact be better: less kilometers travelled, more regulatory controls and better driver selection.
- Safety improvements can be secured through advances in active safety features as well as numerous driver support systems.
- Challenge: such systems will not find widespread use if not mandated, incentivized or offering direct operator benefits that exceed costs of acquisition and operation.

# Active Safety Systems

- Risk detection and avoidance
  - Roll stability control/Electronic stability control
  - Lane departure/Side Collision warning
  - Forward collision warning/Adaptive cruise control
  - Intelligent speed adaptation
  - Emergency assisted braking
- Vehicle condition warning
  - Brake stroke monitoring
  - Tyre pressure monitoring
- Driver condition warning
  - Fatigue detection
  - Onboard monitoring

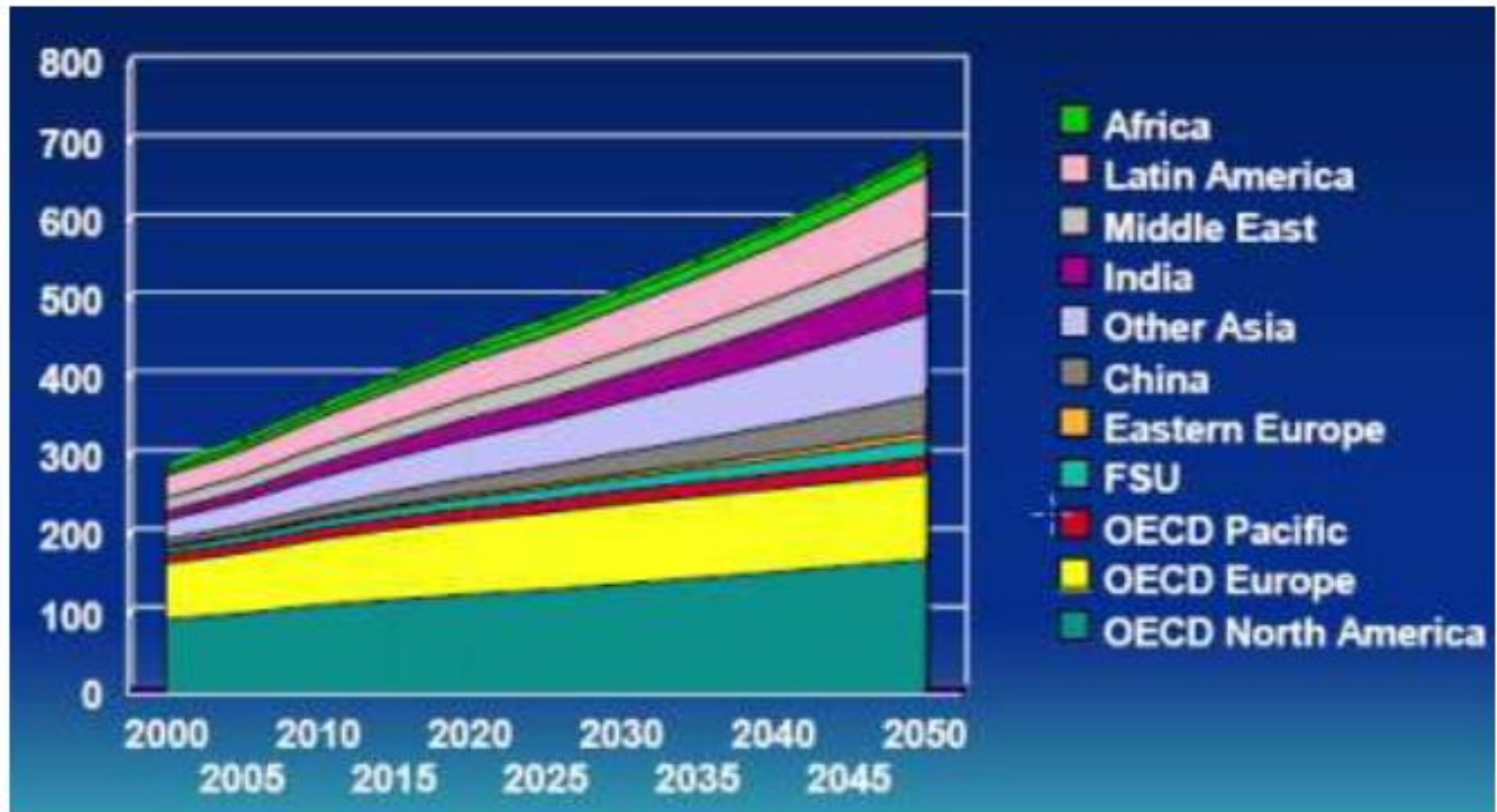


## Fuel issues

- *Consumption of fossil fuel key issue for reasons of cost and climate.*
- Important premise for long-haul trucks: diesel engine will remain dominant power source in the near and medium term, supplemented by mild hybridization.
- Fuel consumption of workhorse truck today about 35 liters/100 km (down from 50 since mid-70s)
- Further savings of 30 % (25 liters/100 km) in near to medium term through less drag and rolling resistance, drive trains and auxiliaries.
- For current fleet of heavy trucks eco-driving training holds potential of near term savings of 10-15 %.
- Mitigating congestion will in itself enable savings: five stops per 10 km doubles fuel consumption.

# Fuel and CO2 issues

Worldwide evolution of energy consumption by trucks in millions of tons of oil equivalent

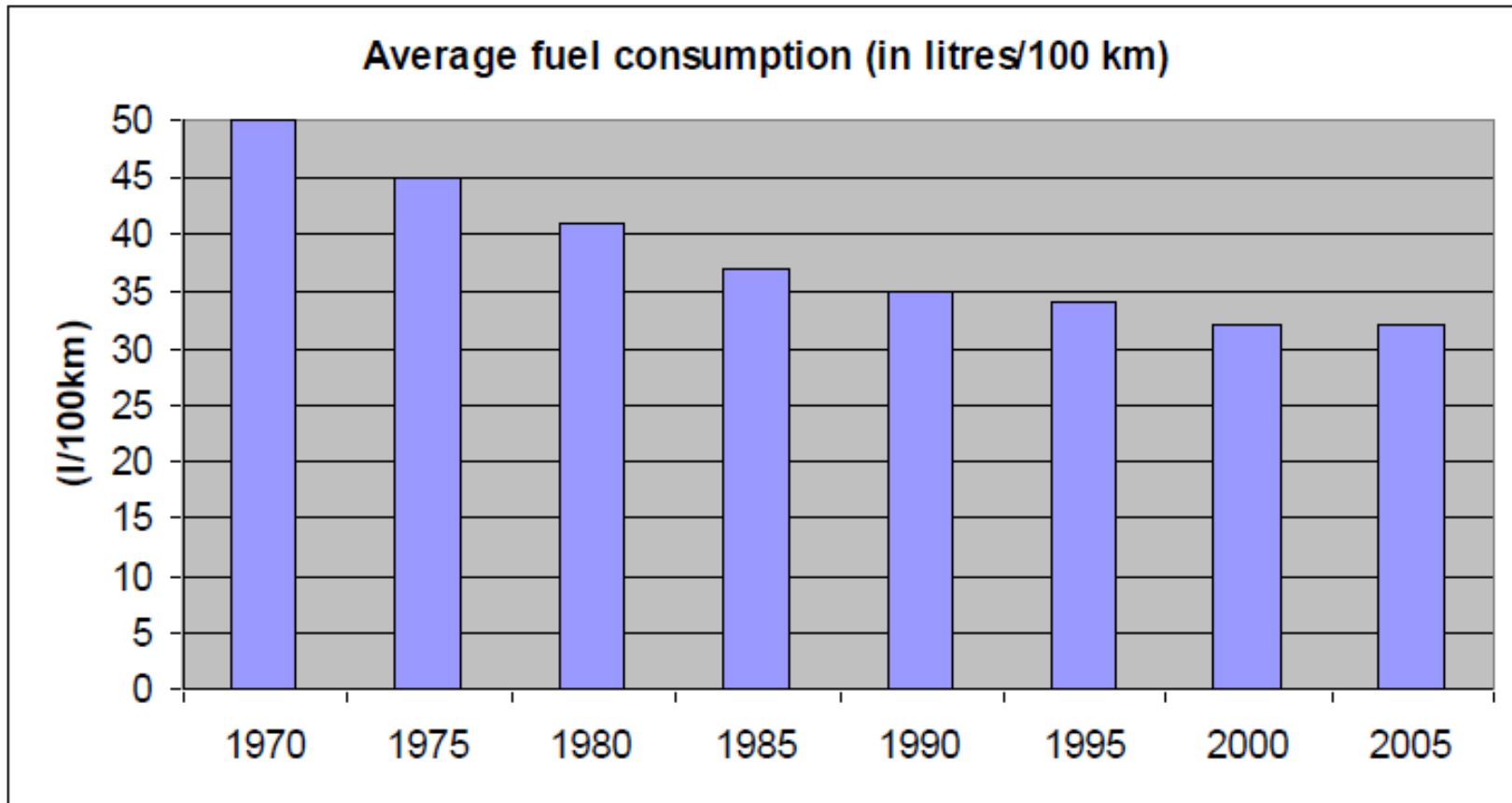


## Fuel issues

- Consumption of fossil fuel key issue for reasons of cost and climate.
- *Important premise for long-haul trucks: diesel engine will remain dominant power source in the near and medium term, supplemented by mild hybridization.*
- *Fuel consumption of workhorse truck today about 35 liters/100 km (down from 50 since mid-70s)*
- Further savings of 30 % (25 liters/100 km) in near to medium term through less drag and rolling resistance, drive trains and auxiliaries.
- For current fleet of heavy trucks eco-driving training holds potential of near term savings of 10-15 %.
- Mitigating congestion will in itself enable savings: five stops per 10 km doubles fuel consumption.

# Fuel and CO2 issues

Evolution of the average fuel consumption of a forty-ton truck over 100 km



## Fuel issues

- Consumption of fossil fuel key issue for reasons of cost and climate.
- Important premise for long-haul trucks: diesel engine will remain dominant power source in the near and medium term, supplemented by mild hybridization.
- Fuel consumption of workhorse truck today about 35 liters/100 km (down from 50 since mid-70s)
- *Further savings of 30 % (25 liters/100 km) in near to medium term through less drag and rolling resistance, drive trains and auxiliaries.*
- *For current fleet of heavy trucks eco-driving training holds potential of near term savings of 10-15 %.*
- *Mitigating congestion will in itself enable savings: five stops per 10 km doubles fuel consumption.*

## Systemic impacts

- HPVs will reduce environmental and safety costs if they replace a larger number of smaller trucks, if load factors do not fall and empty runs do not grow substantially.
- Though not studied in detail by us, induced traffic from reduced cost of transports is expected to erode only a small fraction of the gains.
- Modal shift effects between rail and road could be complicated. Rail could lose business to road, depending on the types of HPVs and routes on which they are granted access.
- Rail could gain markets where HPVs provide feeder services that make overall logistic chain more competitive for intermodal transport.
- Route restrictions can be used to manage the impacts as part of an explicit modal protection policy.

# Pavement impacts

- Recent research on infrastructure impacts of trucks provides better understanding of the issues.
- Truck traffic must be adapted to road geometry and capacity. Trucks, pavements and bridges interact and the assets must be managed as a system.
- Whenever possible use the less aggressive truck combinations.
- Axle loads are far more important than gross vehicle mass (GVM) for assessment of pavement impacts .
- Essential to sustain and enforce the necessary limits on axle loads and axle group loads.
- If GVM is increased then axle numbers must also be increased to avoid increasing wheel loads.
- Some Higher Performance Vehicles are less aggressive to infrastructure than conventional trucks.

## Bridge issues

- Bridges may be critically sensitive to gross vehicle mass (GVM)
- To protect bridges if GVM limits are raised, vehicle length and axle numbers should be increased proportionally.
- For medium and long span bridges a minimum spacing between heavy trucks would mitigate bridge damage and failure risk.
- For short and medium span bridges avoiding heavy trucks meeting or overtaking on worst locations would be beneficial to bridge durability.
- ITS systems, including WIM may provide efficient tools to enable such traffic management protection of bridges.
- Bridge strengthening to allow Higher Performance Vehicles will in some circumstances maximise efficiency overall.

# Transport Efficiency

- Bottom-line efficiency depends on operator's optimization of operations within the regulatory framework and thus on freight policies imposed on the freight industry.
- Policy initiatives to support operational efficiency and service quality cannot be successful without understanding the features of the system that can influence acceptance and implementation.
- Challenge: to establish framework conditions for minimizing external impacts while enabling the transport sector to deliver improvements that are affordable and cost effective.

# Regulations

- Heavy trucks can achieve superior productivity, sustainability and safety to serve objectives of the broad community.
- Challenge: careful regulation needed to ensure that all three outcomes are improved.
- Standards must be based closely on the desired performance of safety, operational and environmental outcomes and thus allow innovation in vehicle design and use to maximize productivity.
- Access to networks must consider condition of network, community amenity, vehicle performance and operation, i.e. optimize truck operations and maximizing likelihood of community acceptance.
- Innovative approaches to enforcement are available to improve compliance and introduce more effective regulatory systems

# Compliance

- Effective enforcement of compliance with regulations is a condition for acceptance of Higher Performance Vehicles.
- Control systems must be lean and efficient in terms of resources, and supportive of self monitoring schemes and good management.
- Enforcement is most effective when it targets all actors in the Chain of Responsibility for freight logistics. [ Checking shipper receipts e.g. can be a cheap and powerful way of preventing overload of vehicles]
- Regulatory systems can benefit from same advances in technology as transport operations, e.g. positioning systems, on-board monitoring and recording systems, detection and measurement systems at roadside or in the infrastructure.
- Using such technologies in controls can allow fair and graduated responses ranging from improvement notices to prohibition orders.

## Recommendation revisited

- *"The key to effective utilization of trucks is to demonstrate to the community and their political leaders that these vehicles comply with route restrictions, deliver high safety and environmental outcomes and recover all costs associated with their use of the network. The tools to deliver these requirements are available. The challenge for regulatory agencies is to implement an integrated and effective approach to the regulation of trucking."*

(Recommendation no 50)

**Thank you for the  
attention**