The European Union Road Federation (ERF), the Brussels Programme Centre of the International Road Federation (IRF)

Brussels Programme Centre

DISCUSSION PAPER

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SUSTAINABLE ROADS

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This study is also available at www.erf.be/section/positionspapers

I) Introduction

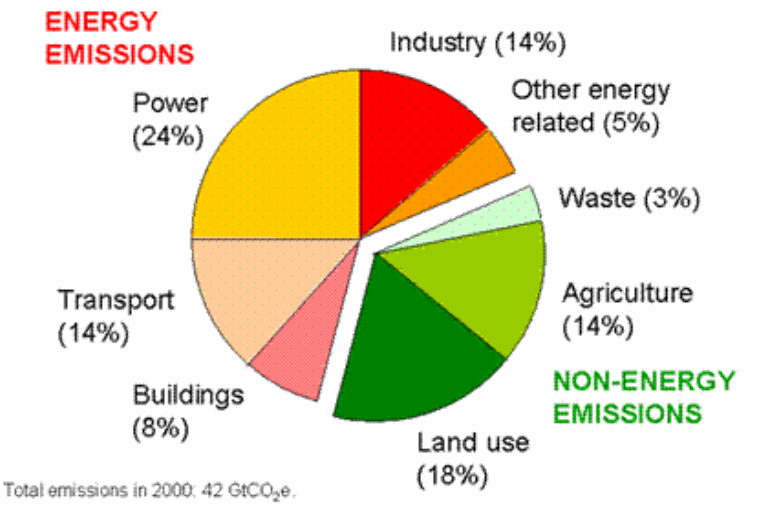
An important dimension of the European Commission's recent Transport Policy review has been the conceptual shift from demand management to a greater focus on the supply side of transport, where each mode needs to work harder to contain the negative environmental effects of growing demand. In other words, as stated in a recent European Environment Agency report**, "modal shift towards rail and inland shipping is not in all circumstances an efficient way to reduce the environmental impact"**.

The implication of this policy chance has been to place the "burden of proof" on the road sector to improve its performance at a time when there is widespread concern that Kyoto and other environmental targets are not being met by the Member States.

This paper however will argue that enormous progress has been made by the road sector and that the technologies are for the most part in place to change the environmental "footprint" of road construction and management while generating new opportunities for road sector stakeholders.

II) Putting CO2 into the right context

For many European citizens, the recent publication of the Stern findings shortly followed by the International Panel on Climate Change's fourth assessment report have sounded as an ominous warning bell that our socio-economic welfare is in jeopardy through disruptions on a scale "similar to […] the great wars and the economic depression of the first half of the 20th century".



A "business as usual" scenario would see a surge in the stock of greenhouse gases (GHG) in the atmosphere to double pre-industrial levels by 2035, generating an average temperature rise of 0.2 degrees per decade. Though some of the baseline assumptions of both reports (e.g. projected GDP growth rates) can challenged and substantial research still needs to be carried out on the causes and consequences of global warming, everyone can agree that a temperature change of this magnitude would undoubtedly contribute to transforming the physical geography and social balance of the world.

Climate change is a global phenomenon. Yet, in developing countries, access to reliable road networks remains a prerequisite to socio-economic wellbeing and numerous studies have established that isolation translates into pockets of poverty. **The inescapable fact is that more roads are being built around the world and that an estimated 70 million road vehicles enter the market every year.**

As the third man-made contributor of GHG (on par with agriculture and industry, but well behind energy production and land-use) responsible for perhaps 60% of oil consumption, the transport sector has an environmental responsibility it cannot shy away from. However, the relationship between roads and CO2 is more complex than meets the eye. A recent study carried out by the World Bank on Morocco's multi-annual road development programme found that greater access to roads had translated into increased usage of motor vehicles and energy consumption, but also into improved agricultural practices and the replacement of firewood by gas heating which both have positive effects on greenhouse gas emissions. The fact is that no single instrument is able to capture the direct and indirect environmental effects of roads and balance them against other transport alternatives (e.g. building a ring road versus constructing a metro line).

According to the European Commission, road transport is one of the main reasons why the EU will fail to meet its Kyoto targets. In this context, can the road sector ever hope to become carbon-neutral? Sir Nicholas Stern estimates that if the target were between 450-550ppm CO2, then the social cost of carbon would start in the region of EUR 20 per tonne of CO2.

The road sector has nothing to fear from an economic appraisal of its CO2 performance. With an estimated 750 million tonnes of CO2 emitted every year, the monetary value of the European road sector can be put a under EUR 15 billion a year. This may sound high but must be counterbalanced by EUR 360 billion generated through road and vehicle taxes by the EU-15.

Borneo's rainforests

According to the Stern report, the loss of natural forests around the world contributes more to global warming than the entire transport sector. Annual deforestation in Borneo is taking place at a rate of 1,000,000 hectares every year, equivalent to the annual CO2 emissions of 5,000,000 vehicles. Continued deforestation at current annual rates in Brazil and Indonesia alone would negate 80% of the emissions reductions gained by implementing the Kyoto Protocol.

However, pricing carbon, by itself, cannot bring about the long term goal of stabilising GHG emissions. An integrated carbon policy needs to promote behavioural changes and technological innovation. There is enormous potential in the development and deployment of a wide range of low-carbon technologies affecting all components of the road sector.

Tackling carbon exposure is more than good environmental stewardship; it could also protect a company's share price in the near term and create a long-term competitive advantage. A particular relevant illustration has been the highly successful launch of Toyota's Prius, a hybrid model based on integrated oil and electric propulsion, which has seen the share value of its manufacturer surge by 70%. Today, numerous road sector companies are engaging in voluntary approaches to become carbon-neutral organisations.

III) Cleaner road transport for all

It is generally recognised that achieving sustainable motoring has to be the result of a shared responsibility between industry, policy makers and road users.

Results have largely paid off: if the motor vehicles of today were exhausting as much pollutants as the vehicles of 1970, total emissions of pollutants would have increased at the rate of automobile circulation. Through a string of stringent norms, total CO, SO2 and Nox emissions are in fact a small fraction of what they were 20 years ago. Because of a "stock effect" of old vehicles, the

decline is bound to continue at a natural rate, however there is a lot policy-makers can do to speed up process by encouraging the purchase of cleaner vehicles through fiscal incentives and derogations (e.g. letting the cleanest goods vehicles use motorways during weekends). It also needs to be widely recognised that **regulatory measures must primarily address the most polluting vehicles still in circulation**.

Progress has been less evident on the CO2 front. In 1998, Europe's car manufacturers committed themselves in a voluntary agreement with the European Commission to achieve a level of emissions of 140g/km by 2008 and to decrease CO2 to 120g/km by 2012. Despite an estimated 13% reduction – already an achievement in a context of heavier cars – these targets have not been met and call for a readjustment of Community policies and a renewed commitment by the automotive and energy industries to prepare the deployment of environmentally-friendly propulsion technologies.

As highlighted in the recently adopted compromise CO2 package which splits a new 130 g/km target between car manufacturers and other road sector stakeholders, existing measures must now be completed by initiatives in the field of road infrastructure which currently represent an underexploited opportunity for energy efficiency gains. **More investment in road infrastructure is needed to remove bottlenecks, avoid city centres and complete missing links which together cost billions every year in lost fuel and undoubtedly contribute to the sector's environmental footprint**. Cases where road authorities and municipalities have deliberately restrained capacity to jugulate demand have been found to be environmentally counterproductive.

Better roads reduce emissions

A Norwegian study released on 19 March 2007 has found conclusive evidence that road realignments and upgrades reduce car emissions. Taking three baseline scenarios, the emissions of CO2 were found to be reduced by up to 38% while local pollutants dropped by a staggering 75%. The same study indicated that in a majority of cases, the changes did not generate new car trips, putting an end to one of the most enduring transport myths.

IV) Sound environmental road design

Global warming is insidious while other negative by-products of road transport, such as automobile emissions, water pollution and habitat fragmentation are around for us to see, contributing to the traditional image of the road sector as a "unsustainable" industry. This generalisation ignores the spectacular progress achieved since the 70s through innovation and regulation, nor does it take due account of the true environmental footprint of other transport modes. This does not mean the road sector should not act – indeed it may well have an economic interest in anticipating future policies and adapting to legitimate societal concerns. Sound environmental road design and management is a combination of processes and techniques to minimise the impact of road construction and create "ecological corridors". These include:

✓ **Optimising route planning through environmental impact analyses**

Strategic Environmental Assessments and Environmental Impact Assessments carried out within large-scale infrastructure programmes provide a framework for cooperative dialogue with civil society and ensure that environmental considerations are taken into account. Both approaches

typically allow project engineers and financing agencies to address environmental issues in a timely and cost-effective fashion, enable the assessment of alternatives in the project design and provide a formal mechanism for interagency consultation and dialogue with environmental associations.

✓ **Use of recycled and environment-friendly construction material**

As a material-intensive industry, **road contractors have a long history of recycling**. There is an economic logic to this, particularly when the recycled material adds value to the road asset, saves money or provides an outlet for waste generation. Powdered rubber tyres, glass and broken concrete now routinely find their way into the underlayers and surfaces of roads, reducing the overall energy consumption and CO2 emission of infrastructure construction programmes by as much as 10%. For road materials and fixtures, clean alternatives (such as water-based markings) systematically exist, yet **the continued use of polluting products is still tolerated in many Member States owing to lack of information, innovation-adverse road authorities, and confusing European regulation on waste management**.

✓ **Mitigating habitat fragmentation**

Building transport infrastructure inevitably leads to conflicts with other land uses such as nature conservation or agriculture. Roads – particularly those with average daily traffic of 5,000 vehicles and more – can act as a barrier between patches of land and constitute a threat to biodiversity and driver safety. **This fragmentation effect can be minimised in different ways**. For new transport infrastructure developments, **finding optimal alignment of roads** in the landscape can minimise conflicts and the need for mitigation measures. On existing transport infrastructure, environmental impact can be mitigated through **changes in the design and operation** such as avoiding stationery traffic, the planting of shrubs along roads and animal over/underpasses. When fragmentation is unavoidable and mitigation measures are ineffective, then compensation in the form of habitat creation may be the appropriate response to achieve 'no net loss' because of infrastructure development plans.

✓ **Avoiding water pollution**

The construction and upgrading of a road may present a risk to aquatic life, but it is often an occasion to check and re-design water management in order to protect underground drinking water reserves, wetlands and rivers, or to reduce the risk of flooding. On roads open to traffic, the sources of interferences with surrounding water are potentially numerous (metal, chlorides, pesticides, hydrocarbon and accidental spillages). Road authorities and private operators have a panel of mitigating measures at their disposal such as increasing the usage of porous surfaces (which fix pollutants while increasing driver safety), adopting intelligent spraying of de-icing solutions, or providing adequate drainage to ensure contaminated water is captured and treated to avoid the release of residual pollutants in the environment.

✓ **Making the most of Intelligent Transportation Systems (ITS)**

The growing deployment of ITS solutions across Europe provides infrastructure operators a considerable opportunity to improve the environmental performance of the road network. **The provision of real time traffic information is one of the most cost-effective value added services by allowing motorists to make informed route choices and book car parking ahead of their trip**. In a context where "search traffic" can account for up to 30% of urban traffic at peak hours, the resulting congestion decrease can significantly contribute to energy savings and environmental protection.

✓ **Quieter roads**

Traffic noise is another area of conflict between individual mobility needs and legitimate societal aspirations for quieter lifestyles. **Up to 80 million Europeans suffer from unacceptable levels of noise, much of it caused by the transport sector**. Here too, traffic management strategies combined with road infrastructure improvements can help. It is estimated that **pavement properties** on a well-maintained road network can reduce noise emission levels by as much as 5 dB(A). **Acoustic barri**ers offer another on-site noise solution, typically reducing noise levels by 5 to 10 dB(A), cutting the loudness of traffic noise by as much as one half.

Solar Panels on Highway Noise Barriers

A demonstration trial was undertaken for the UK Highways Agency using solar panels mounted on highway noise barriers on the M27. The trial followed an earlier feasibility study which found that the significant infrastructure of noise barriers which already exists on UK highways forms an ideal location for solar panels.

The common thread between these complimentary approaches is that they are based on tried and tested techniques and their impact can accurately be measured. Simulators have recently been developed to estimated CO2 emissions saved in selecting different construction techniques and supply alternatives, including the use of primary or recycled and secondary aggregates. It is also a fact that more often than not, **industry is the main driving forces behind these innovations**. This is one of the results of the spreading of motorway concessions and performance-based maintenance contracts which act as incentive to adopt lifecycle approaches to asset management and environmental protection. As a result, **motorway operators routinely invest 20-30% of total road construction investment in noise mitigation and environmental protection**.

Can roads in fact improve the environmental value of the surrounding area by acting as "ecological corridors"? Roads often act as an involuntary means of transportation for vegetal seeds which once converted into stable vegetal communities, increase animal biodiversity. A pilot test conducted over two highways in Spain, established a methodology for the evaluation of the environmental and landscape value of the road surroundings. Additionally **a project is being studied to create the first CO2-free highway in the Spanish island of Ibiza**. This tool can be used as an element to value the effectiveness of different road management policies and to set up recommendations for the maintenance of roads with a high ecological value.

V) The ethical challenge

There is a moral obligation to generalise methods and techniques that can contribute to more environmentally sustainable forms of road transport. Studies conducted in the UK suggest that it is the most fragile segments of our society which are exposed to the greatest level of nuisances.

In many respects, the situation is comparable to another by-product of personal mobility, **unsafe roads responsible for tens of thousands of deaths and billions of Euros lost every year**.

Both issues run through the very fabric of our societies, insofar as they result from a complex combination of causation factors and can only be remedied through coordinated long-term programmes.

However, where the spectacular improvement of safety figures has been the result of target-setting and a shared understanding of policy instruments available, the debate on how to address global warming often verges on the irrational. No one is seriously suggesting today that lives can be saved by compelling citizens to use public transport. Nor should this be a pre-condition to a cleaner environment.

The European Union Road Federation (ERF), the Brussels Programme Centre of the International Road Federation (IRF), deplores the current lack of dialogue between environmental and transport policy-makers. Environment cannot be kidnapped by vested interests, but nor can the road community ignore the societal implications of its activity.

VI) About the authors

The European Union Road Federation (ERF) is a non-profit association, which coordinates the views of Europe's road sector and acts as a platform for dialogue, information and research on mobility issues.

The ERF is the Brussels Programme Centre of the International Road Federation (IRF), established in 1948 and with over 500 members in 6 continents. The IRF seeks to promote the benefits of a valid road transport infrastructure at all levels of society.

Further information available from: http://www.irfnet.eu

Source documents

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