The Environmental Impacts of Transportation

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1. The Issue of Transport and the Environment

The issue of transportation and the environment is paradoxical in nature since transportation conveys substantial socioeconomic benefits, but at the same time transportation is impacting environmental systems. From one side, transportation activities support increasing mobility demands for passengers and freight, while on the other, transport activities are associated with growing levels of environmental externalities. This has reached a point where transportation is a dominant source of emission of most pollutants and their multiple impacts on the environment. These impacts fall within three categories:

- **Direct impacts.** The immediate consequence of transport activities on the environment where the cause and effect relationship is generally clear and well understood.
- **Indirect impacts.** The secondary (or tertiary) effects of transport activities on environmental systems. They are often of higher consequence than direct impacts, but the involved relationships are often misunderstood and difficult to establish.
- **Cumulative impacts.** The additive, multiplicative or synergetic consequences of transport activities. They take into account of the varied effects of direct and indirect impacts on an ecosystem, which are often unpredicted.

The complexities of the problems have led to much controversy in environmental policy and in the role of transportation. The transportation sector is often subsidized by the public sector, especially through the construction and maintenance of road infrastructure which tend to be free of access. Sometimes, public stakes in transport modes, terminals and infrastructure can be at odd with environmental issues. If the owner and the regulator are the same (different branches of the government), then there is a risk that regulations will not be effectively complied to. It can also lead to another extreme where compliance would lead to inefficient transport systems with subsidized costs. Total costs incurred by transportation activities, notably environmental damage, are generally not fully assumed by the users. The lack of consideration of the real costs of transportation could explain several environmental problems. For instance, external costs account on average for more than 30% of the estimated automobile costs. If environmental costs are not included in this appraisal, the usage of the car is consequently subsidized by the society and costs accumulate as environmental pollution. This requires due consideration as the number of vehicles, especially automobiles, is steadily increasing.

**Climate change.** The activities of the transport industry release several million tons of gases each year into the atmosphere. These include lead (Pb), carbon monoxide (CO), carbon dioxide (CO2; not a pollutant), methane (CH4), nitrogen oxides (NOx), nitrous oxide (N2O), chlorofluorocarbons (CFCs), perfluorocarbons (PFCs), silicon tetraflouride (SF6), benzene and volatile components (BTX), heavy metals (zinc, chrome, copper and cadmium) and particulate matters (ash, dust). There is an ongoing debate to what extent these emissions are linked to climate change and the role of anthropogenic factors. Some of these gases, particularly nitrous oxide, also participate in depleting the stratospheric ozone (O3) layer which naturally screens the earth’s surface from ultraviolet radiation. It is also relevant to underline that climate change also has a significant impact on transportation systems, particularly infrastructure.