

TECHNOLOGY AND POLICY OPTIONS FOR POSSIBLE ENERGY SAVING AND REDUCTION OF EXHAUST EMISSION IN MOTOR VEHICLES*

JACOB OLUDOYE OLUWOYE, Ph.D., Research and Graduate Programs, Faculty of Design, Architecture and Building, University of Technology, Sydney

and

WERNER ROTHENGATTER, Ph.D., Universität Karlsruhe(TH) Institut für Wirtschaftspolitik und Wirtschaftsforschung, Germany

The relationship between technology, energy and the environment is now more than ever a challenge for the member countries of the Organisation for Economic Cooperation and Development (OECD) and the International Energy Agency (IEA), as it presents crucial problems of reconciling separate agendas of energy consumption, security, environmental protection and sustainable growth. This paper examines the technological and policy options for possible energy savings and the purpose are two-folds:

- a. to provide a synthesis of the findings of ten OECD 1991 expert studies on technological advancements and trends.
- b. to develop a conceptual framework of policies options for possibilities for energy saving and reduction of exhaust emission in motor vehicles.

The main issues

The main environmental problem remains unresolved because very few of the technological possibilities are without adverse effects on roads and its environment, therefore combination of technology and strategy approach could accelerate less car exhaust.

Feasible solutions

The experts discussed a wide range of technology options and improvements. The synthesis findings of the ten OECD 1991 expert concentrated on the optimum combination of technology options in automobiles, and on the resulting improvements in fuel efficiency and emissions, while the author focuses on policy framework centres on three basic kinds of environmental impacts of transport that can be addressed through the policies options [ie.(a) by reducing the impact of specific modes through technological means (b) by shifting to less damaging modes of transport or forms of behaviour and (c) by reducing the total amount of transport undertaking] through the following three policies options shown in figure1:

1. policy objectives-for new technologies of aiming at minimising energy and environmental impact of transportation within our community
2. policy means (Instruments)-to control future development in such a way as to maintain compatibility between the type of scale of technology and its environment.
3. policy structure-simply the relationship between the objectives, instruments for implementation, the organisation management of policy setting and implementation process.

* This paper is part of the research work during my visit to Germany funded by the DAAD office in Germany

Figure 1 indicated a framework for addressing new technologies and their potential to reduce the environmental impact of transportation. Also the figure shows the interactions between technology, transport and environment.

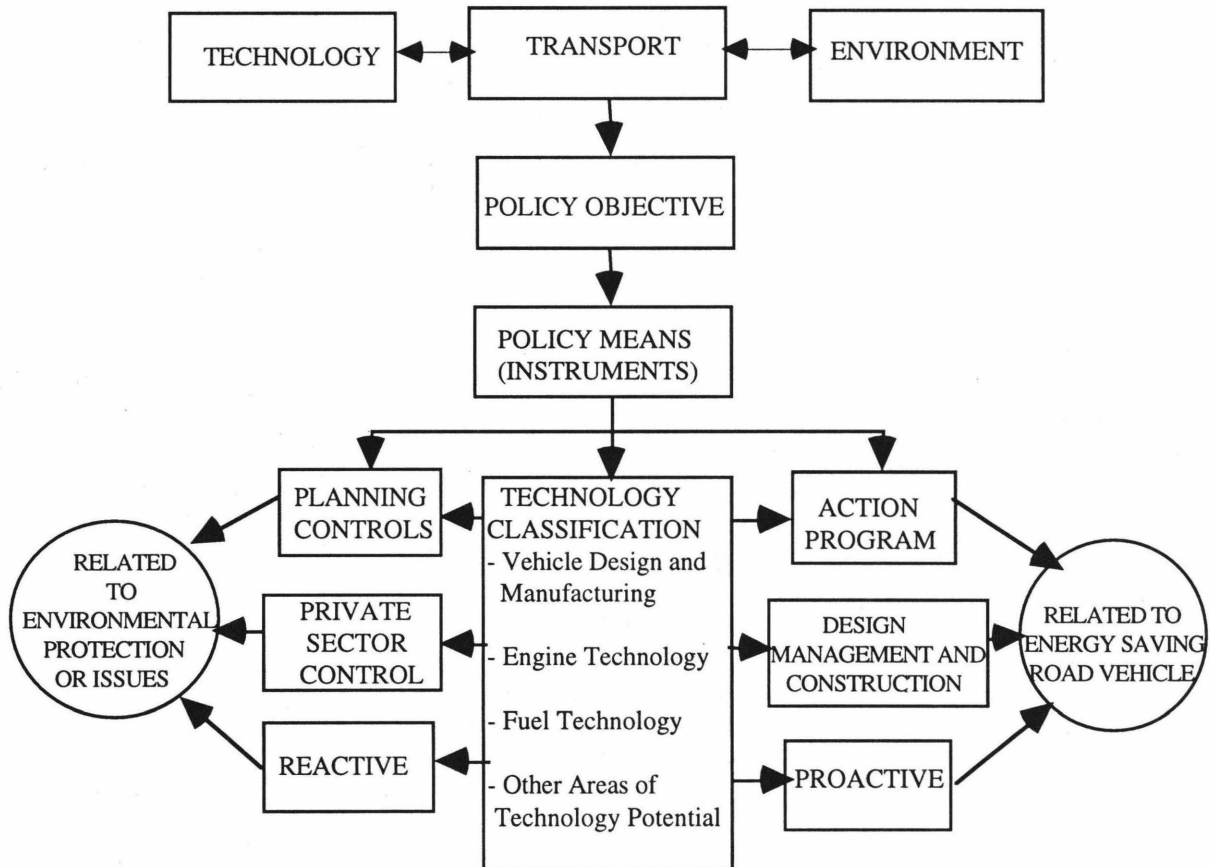


Figure 1: Conceptual Framework for Policies and Measures to Reduce the Environmental Impact of Low Emission Automobile

In figure 1 above there are three basic kinds of environmental impacts of transport that can be addressed (1) by reducing the impact of specific modes through technological means (2) by shifting to less damaging modes of transport or forms of behaviour and (3) by reducing the total amount of transport undertaking.

The table 1 below addresses the strategies that the author thinks that could be useful for future energy saving of road vehicles.

Table 1: Schematic of Long Term and Short Term Future Policy Options for Energy Saving of Road Vehicles

	Legislation	Measures/ Management	Self Discipline	Technology	Effectiveness of Technology	Type of Policy
IMPROVEMENT OF FUEL EFFICIENCY	√	-	Vehicle Designer / Auto Manufacturer	(i) Setting up of new target value for fuel efficiency (use of Energy Saving Act)	Very Effective	Medium-term Plan
			Vehicle Designer / Auto Manufacturer	(ii) Development and Popularization of Variable Element energy saving type engine with Electronic Control (air fuel ratio, valuable compression ratio)	Effective	Medium-term Plan
			Vehicle Designer / Auto Manufacturer	(iii) Development of High Efficient Engine (Ceramic Engine)	Effective	Long-term
CHANGE TO ALTERNATIVE FUEL	√	-	-	(i) Popularization of Vehicles with Liquefied Petroleum Gas Engine (already popular in tax)	Non (effective for the reduction of CO2)	Short-term
				(ii) Development and Popularization of Electric Vehicles	Less effective	Medium-term
				(iii) Development of Hydrogen-fueled Vehicles	Effective	Long-term
MINIMIZATION OF SOURCES	(i) Urban scale & population control (ii) Authoritative organization standard: vehicles fuel & its additive	Vehicle standards & monitoring Polluter pays principle Fuel quality Energy conservation Public transit priority Impose restrictions on private cars	Administrator	Design Manufacture Processing maintain Inspection (for vehicle)	Less effective	Long-term
MINIMIZATION OF EMISSIONS	Traffic and Environmental Planning	*Emission standards and monitoring *Traffic noise standards and monitoring.	Driver	Fuel composition saving energy	Less effective	Long-term
MINIMIZATION OF EFFECTS	City planning urban roads building parking areas open & green space	Ambient air quality standards & monitoring traffic capacity	Cyclist and Pedestrian	Building shapes Building surface material	Effective	Long-term

However, the balance of the results does suggest a strategic approach which could be useful for reducing environmental impacts of transportation and the four aspects of the strategic approach proposed by the authors are as follows:

There are four aspects to the strategy:

1. More innovative solutions will be required, rather than relying on technology alone to solve greenhouse problems.
2. Better fuel economy is not a function of the technology alone but also a function of avoiding congestion and cold starts.
3. Combination of technology and policy measures could accelerate the cleansing of the air and reduction in energy use for automobiles than relying on technology alone to solve greenhouse problems.
4. Doubts as to whether expected oil supplies and technological advances can satisfy projected oil consumption.

In conclusion, reduction in polluting and Co2 emissions are expected to result mostly from new technologies, auto manufacturer, traffic regulation, alternative town planning principles, and the promotion of public transport.