



Assessment of Transport Issues relevant to the Policy Programme of the European Forum on Integrated Environmental Assessment (EFIEA)

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References

1 Introduction

This report is a contribution to the Policy Programme of the European Forum on Integrated Environmental Assessment (EFIEA). EFIEA is a Concerted Action funded by the Environment and Climate Programme of the European Commission, Directorate-General XII set up to develop Integrated Environmental Assessment. Its Policy Programme aims to strengthen the interaction between science and policy by reviewing and sharpening the methods for defining problems and communicating the results among scientists, decision-makers and stakeholders (Tol and Vellinga, 1998).

This report looks at the various aspects of European transport policy and the wide number of issues involved in order to explore the potential for Integrated Environmental Assessment in this context. The report:

- reviews the outlines the environmental and social impacts of transport (Section 2);
- identifies the issues relevant to transport policy at the EU level and maps these to European policy processes (Section 3);
- discusses IEA generally and outlines and assesses existing assessment methodologies which have been used in the transport sector (Section 4);
- outlines and explores the opportunities for IEA (Section 5); and
- identifies the potential players that could be involved in IEA relating to European transport policy (Section 6).

The work drew on the expertise and literature sources that were already at IEEP's disposal and also included wider literature and internet searches. Interviews were also undertaken which covered the research and policy communities and other stakeholders in order to ensure the comprehensiveness of the issues addressed.

2 Environmental and Social Impacts of Transport

The transport sector contributes to a wide range of environmental problems because of its ubiquitous nature, steady growth and large share of fossil fuel consumption. As yet, the contribution of non-fossil fuels to transport energy demands remains small, for a range of economic and technical reasons.

Growth in transport demand continues, and has been predominantly in the road transport subsector. Between 1970 and 1995, road freight in the 16 western European members of the European Conference of Ministers of Transport (ECMT) grew from 439 billion tonne-kilometres (btkm) to 1133 btkm per year; in the 11 central and eastern European members it grew from 56 btkm to 132 btkm. Over the same period, private car use in the west grew from 1567 billion passenger-kilometres (bpkm) to 3551 bpkm per year, and in the east from 9 bpkm to 102 bpkm. Rail freight traffic declined, while rail passenger transport increased only marginally (ECMT, 1997).

The main impacts of transport on the human and natural environment are set out in the paragraphs which follow, but this list is far from comprehensive. Transport also has significant social impacts, some of which are discussed.

Climate: CO₂ emissions from transport account for a large and growing share of the European total, and grew by 43 per cent between 1980 and 1993. The Commission's communication on *The Energy Dimension of Climate Change* projects a 39 per cent growth in CO₂ emissions from the transport sector by 2010 against a 1990 baseline. This accounts for the whole of the emissions growth predicted for the EU, thus threatening attempts to set emissions reduction targets under the UN Framework Convention on Climate Change.

Other greenhouse gas emissions are also significant and growing. Increasing incorporation of air conditioning into new cars will result in increased emissions of HFCs, while catalytic converters lead to increased formation of ammonia and nitrous oxide in vehicle exhausts.

Air quality, including tropospheric ozone, and acidification: in spite of tightening fuel and vehicle technology standards, road transport makes a very large contribution to most urban air quality problems. A recent report from the UK Department of Health's Committee on the Medical Aspects of Air Pollution estimates that up to 24,000 Britons die prematurely each year through the effects of air pollution (primarily particulates and ozone) and a similar number are admitted to hospitals. Long term impacts and the effects of most other pollutants were excluded, so the full figure may be even higher. For Europe as a whole, a recent WHO report put the annual death toll from air pollution which could be linked to road traffic pollution at 80,000 (WHO, 1998).

Increases in transport emissions are particularly likely in the CEECs, as road transport expands rapidly and second hand cars are imported from western Europe.

The principal contribution of transport to acidification is through emissions of the oxides of nitrogen (NO_x), but in the EU these have been decreasing due to the introduction of catalytic converters on all new cars. However, growth in traffic in the EU and CEECs could reverse recent improvements.

Waste and the use of resources and energy: Additional problems arise in disposing of the enormous quantities of discarded tyres, batteries, engine oil and glass from motor vehicles. Protracted fires at large tyre dumps are becoming increasingly common, causing pollution of air, soil and water; while much of the engine oil replaced each year is not disposed of properly and ends up in waterways or groundwater systems. Tyres and vehicles have been identified as priority waste streams for the EU, but remedial action so far has been limited.

The actual use of resources and energy is not considered to be a direct problem in the short- or medium-term.

Noise: in large cities, about 8 per cent of the population is exposed to outdoor noise above 70 dB(A), primarily from road traffic but also from aircraft and other transport sources. While fewer people are exposed to acute noise effects over time, an increasing share of the population is exposed to moderate noise levels which can have adverse effects on the quality of life and on ability to sleep properly, concentrate on specific tasks, etc. Road traffic noise in particular can also adversely affect the tranquility of previously unspoilt countryside

Water and Soil Pollution: Further indirect effects arise in the course of road use, through runoff of oil, salt and other waste products, and accidental spills. Heavy rain or sudden thaws can

result in pulses of waste materials including heavy metals being washed from the roads, along with large amounts of salt in winter, causing damage to ecosystems and polluting water resources.

Nature Fragmentation, Biodiversity and Land Take: transport infrastructure can affect ecosystems directly, through loss of habitat, and less directly through the fragmentation of sensitive habitats and the establishment of ecological barriers. The full impact of these effects is as yet relatively poorly understood, and is difficult to quantify or assess.

Social Impacts and the Urban Environment: Transport infrastructure and use can cause community severance, but again the effects are poorly understood or quantified. The physical presence of infrastructure reduces the aesthetic quality of both rural and urban areas. Growing dependence on private road transport (ie cars) can threaten the mobility of disadvantaged sections of the community. New infrastructure can also encourage out-of-town developments, leading to urban sprawl and threatening the viability of traditional urban centres and public transport systems as well as adversely affecting the accessibility of the less mobile members of society.

Other impacts which have social and economic effects include accidents and congestion which cost individuals and the economy significant amounts of money each year.

In summary, the transport sector gives rise to a complex set of interacting problems, and is arguably unique in the breadth and ubiquity of its impacts. Demand and energy consumption in the transport sector continues to increase rapidly. Furthermore, potential solutions to one of these problems may either ameliorate or exacerbate the others. This problem in particular does not appear always to be accounted for in policy formulation, and is of particular relevance to carbon dioxide control policy for the transport sector.

3 Mapping the Issues Relevant to Transport Policy at the EU Level to the Policy Processes

Identifying the Issues Relevant to Transport Policy at the EU Level

Before exploring the opportunities for the further use of IEA in transport policy at the European level, it is necessary to identify the relevant issues and map these to the EU policy processes. This is the purpose of this section.

The relevant environmental, social and economic issues are given in the first column of Table 1. The inclusion of social and economic issues is important as all are integral to increasing the sustainability of transport, and are therefore relevant for consideration in Integrated Environmental Assessment (IEA). The inclusion of the issues of the free market and free movement is important as these are central to European Community policy and are the major positive impacts of transport. Consequently they also contribute to transport's adverse environmental and social impacts.

Table 1:- Competency of different levels of Government with respect to the various issues relating to transport and the environment¹

Political level:- Issues:-	European	Member States	Regional/local
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Transport/ environment, general	European framework	National framework	Regional/local framework
Air quality	Emissions standards; regulation of/agreements with industry; harmonisation of taxation	National targets; national air quality strategies; <i>economic incentives</i>	<i>Local planning measures; local air quality strategies</i>
Acidification	Emissions standards; regulation of/agreements with industry; harmonisation of taxation	<i>National critical loads; monitoring; economic incentives</i>	Effect of local policies
Climate change	Emissions standards; regulation of/agreements with industry; harmonisation of taxation	<i>National targets; monitoring; economic incentives;</i> transport and energy policies	Effect of local policies
Noise	Noise standards; regulation of/agreements with industry; harmonisation of taxation	National targets; economic incentives	<i>Local planning measures</i>
Energy use	Regulation of/agreements with industry; harmonisation of taxation	<i>National targets; national campaigns;</i> economic incentives	Effect of local planning measures; local campaigns
Resource use/waste	Regulation of/agreements with industry; harmonisation of taxation	National targets; national campaigns; economic incentives	Effect of local planning measures; local campaigns
Visual pollution	Dissemination of best practice	National guidelines	<i>Local planning and design</i>
Nature fragmentation and biodiversity	European spatial planning and monitoring of funding	National spatial planning and monitoring of funding	<i>Local planning</i>
Land take	<i>European spatial planning and monitoring of funding</i>	<i>National spatial planning and monitoring of funding</i>	<i>Local planning</i>
Safety	<i>Standards and regulations</i>	<i>National targets and regulations;</i> economic penalties	<i>Local planning and network design</i>
Accessibility	European networks	National networks	<i>Local planning and network design</i>
Mobility	<i>European networks</i>	National networks	Local planning and network design
Severance	European spatial planning and monitoring of funding	National spatial planning and monitoring of funding	<i>Local planning</i>
Congestion	<i>European spatial planning and network design</i>	<i>National spatial planning and network design</i>	<i>Local planning and network design</i>
Free market	Harmonisation and liberalisation	Regulation and economic conditions	-
Free movement of people and goods	<i>European spatial planning and network design; liberalisation</i>	National spatial planning and network design	Local planning and network design

Note:- 1) **Bold** indicates the important policy measures while *italics* represents the level at which the issue is most important.

In order to identify gaps in the existing policy processes, it is necessary to identify the competence of the EU with respect to the various issues. This is shown in Table 1 for the EU, as well as for the Member States and for regional and local government. While much transport policy is a bottom-up process, the EU has a role to play where it is more appropriate for Member States to act as one rather than unilaterally or where there is a need for a European perspective. For example, the EU is better placed than individual Member States to undertake negotiations with industry, such as those involved with the Auto Oil process (see below), or with other third parties. Consequently, safety and environmental standards relating to vehicles and fuel are best set at the European level, in order to address problems such as air quality, acid rain and climate change. The EU is also best placed to deal with issues directly relevant to the single market, such as the harmonisation of national standards, eg driving qualifications, and taxation systems. Many of these measures have no evident environmental effect, and for those that do, this is not always beneficial.

Having said that the EU is best placed to harmonise taxation systems, fiscal policy is an area over which national governments prefer to keep control. Consequently, the EU is severely restricted by the Treaty of Rome with respect to its competence in this area. As a result, competency for taxation and fiscal policy is mainly the responsibility of national and to some extent regional or local governments, depending on the Member State. This severely limits the extent to which the EU can pursue the internalisation of external costs.

The development of international transport networks to improve mobility at the European level is also best undertaken by the EU. Under the control of national and local governments transport networks have evolved to meet national and local needs. With the development of the single market, the need for transport networks to meet European needs is being addressed by the development of Trans-European Transport Networks (TETNs), designated and sometimes partly funded at the Community level. These aim to change the patchwork formed by the national networks into a seamless European network. Around these TETNs, national and local governments will continue to develop and maintain their respective networks. Environmental issues can be addressed through the integration of transport and spatial planning and the monitoring of funding in order to ensure that environmental standards are upheld.

The EU also has a role to play in collating and disseminating best practice throughout Europe as experiences of transport policy measures vary from country to country. This can primarily be done through funding and coordinating networks. Other campaigns, such as those aimed at improving safety or driving behaviour are usually undertaken at the national level, or below.

National government plays a similar role to the EU with respect to planning infrastructure, but have a significantly larger role with respect to fiscal policy and funding, especially the transport policy of local government, but less with respect to the harmonisation of standards and the free market. National governments also provide a framework within which local and regional governments formulate and implement their own transport policy. Increasingly (in more progressive Member States) this framework encourages the integration of transport and land use planning in order to reduce the need to travel and thus reduce the adverse environmental effects of transport. This is a significant difference compared with the EU, as such a framework set at a European level, besides being outside the legal competence of the EU, would be seen by Member States as interference in internal affairs. At the national level, the framework has a significant effect on local policy and effectively dictates the parameters within which local government has competence. National governments also have more comprehensive transport strategies than the EU and in some cases set transport and environment targets.

Local government tends to be more responsible for the implementation of transport policy and the integration of transport and land use policy as much is undertaken at the local level. The degree of competence of the local authority varies between Member States. However, regional and local government are best placed to deal with issues such as congestion, accessibility and environmental and safety improvements resulting from better design of the local network.

The EU, therefore, tends to have more competence to deal with environmental and transport issues which require a European perspective or negotiations with third parties. Local government, on the other hand, is better placed to address issues which arise as a result of the design of the local network. The competence of national governments lies somewhere in between in that they have similar responsibilities to the EU in some respects, but more extensive competence over taxation and fiscal incentives.

Identifying the EU Policy Processes Relevant to Transport and the Environment

The EU policy processes which are relevant to transport and the environment are shown in Table 2. The analysis is undertaken on a modal basis with respect to the three main transport policy areas of land use, economics and technology.

Table 2 is a simplified and schematic review of European policy processes relating to transport and the environment. The information was obtained from a review of European policy. While effort was made to ensure as complete a set of policy processes and measures as possible, the diffuse nature of policy making means that some may have been overlooked. However, the information presented enables us to identify gaps in policy and to indicate the different levels of detail and development of policies.

The first thing of note is that many of processes indicated in both the column and row containing general processes are strategy documents, many of which have few detailed follow-ups in their respective row or column (eg the White Papers on charging for infrastructure use and revitalising the railways). This indicates the extent to which the EU can provide a policy framework, but reveals the limitations of its competence over many areas.

Second, the competence of the EU with respect to the free market, the setting of emissions standards and the trans-European networks can be seen in the way these issues dominate the respective rows or columns on road freight, technology and land use. In contrast with the wide array of measures relating to road freight transport, the lack of competence with respect to road passenger transport can be seen by the limited number and nature of the policy processes in these two rows (apart from measures relating to vehicle standards, that is). The processes that do exist are relatively new (eg the Citizens Network) or are still in the early stages (eg those relating to the EU urban agenda and mobility management), and their real importance is open to question.

Third, policies relating to air and water are also relatively few and, as yet, are not linked together within an overall strategy.

Table 2:- Policy Processes in the European Union

	General	Land use	Economics	Technology
General	<ul style="list-style-type: none"> * Fifth Environmental Action programme: Towards sustainability * Climate change: an European Union post-Kyoto strategy * Integration of environment into Union's policies * Common Transport Policy and promotion of sustainable and safe mobility * Green Paper on future Noise Policy and launch of new noise policy * Developing a Community Approach to transport and CO₂ 	<ul style="list-style-type: none"> * European Spatial Development Perspective * Proposal for the assessment of the effect of certain plans and programmes on the environment * Development of trans-European transport networks 	<ul style="list-style-type: none"> * Environmental Taxes and Charges in the Single Market * White Paper on "Fair Payment for Infrastructure Use" * Proposal to set up a Community Framework for the Taxation of Energy Products * Harmonisation of minimum rates for fuel duties 	<ul style="list-style-type: none"> * White Paper on Renewable Energy Sources * Ambient air quality: limit values for sulphur dioxide, oxides of nitrogen, particulate matter and lead
Road, passenger private	<ul style="list-style-type: none"> * Forthcoming Communication on Mobility Management * Promoting road safety in the European Union:- the programme for 1997-2001 * End of life vehicles 		<ul style="list-style-type: none"> * Road infrastructure charging directive 	<ul style="list-style-type: none"> * Strategy for the control of atmospheric emissions from road transport taking into account the results of the Auto/Oil Programme with respect to the quality of fuel and air pollution * Strategy to improve fuel efficiency of cars * Monitoring and reducing carbon dioxide from new passenger cars and energy labelling * Reduction of noise emitted by tyres of motor vehicles
Road, passenger public	<ul style="list-style-type: none"> * The Citizen's Network: Why good local and regional passenger transport is important 	<ul style="list-style-type: none"> * "Towards an urban agenda in the European Union" * passenger transport intermodality 		<ul style="list-style-type: none"> * Directives on emissions and safety of PSVs
Road, freight	<ul style="list-style-type: none"> * Harmonisation of social legislation relating to transport * White Paper on solving the environmental problems caused by traffic of heavy goods vehicles * Financial assistance to promote combined goods transport * "Intermodality and Intermodal Freight Transport in the European Union - A system approach to freight transport. Strategies to enhance efficiency, services and sustainability" 	<ul style="list-style-type: none"> * Rules for the granting of community financial aid in the field of trans-European networks * Communication on connecting the Union's transport infrastructure to that of its neighbours * Driving restrictions on heavy goods vehicles on designated roads 	<ul style="list-style-type: none"> * Eurovignette * Cabotage * Proposal on the charging of heavy goods vehicles for the use of certain infrastructures 	<ul style="list-style-type: none"> * Strategy and a framework for the deployment of road telematics in Europe together with proposals for action * Directives on emissions and safety of HGVs * Speed limiters on HGVs

	* Roadworthiness testing, at the roadside, of goods vehicles travelling within the community			
Rail, passenger			* Forthcoming proposal for railway infrastructure charging	
Rail, freight	* Trans-European Freight Freeways * White Paper on revitalising the Community's Railways and proposal for a directive on the development of the Community's railways * Financial assistance to promote combined goods transport * "Intermodality and Intermodal Freight Transport in the European Union - A system approach to freight transport. Strategies to enhance efficiency, services and sustainability"			
Air	* Forthcoming Communication on aviation and the environment * Safety assessment of third countries aircraft using Community airports		* Third liberalisation package ('Open skies') * Airport charges * Discussions with respect to taxation of aircraft fuel	* Limitation of the emission of oxides of nitrogen from civil subsonic jet aeroplanes * Limitation of the operation of certain aeroplanes * Communication on "Air transport and environment: civil subsonic jet aeroplanes, registration and use"
Water	* Communication "The Development of Short-Sea Shipping in Europe: Prospects and Challenges"	* Policies on seaports, inland ports and intermodal terminals; Green paper on sea ports and maritime infrastructure	* Proposal for charges to cover costs of waste reception facilities at ports	
All modes	* Collation and dissemination of best practice			
Other issues	* Agenda 2000 * "Actions to be taken in the Community regarding the accessibility of transport to persons with reduced mobility"		* White Paper on "Growth, Competitiveness and Employment" * Enlargement: Agenda 2000 and structural policies for pre-Accession aid for applicant countries * Cohesion: Agenda 2000	* Reduction of the sulphur content of certain liquid fuels

Note:- While the majority of these are European Union initiatives, the European Spatial Development Perspective is an initiative of the Member States as such issues are outside of the competence of the EU.

Mapping the Issues to the Policy Processes

Table 3 maps the issues presented in Table 1 to the major policy processes identified in Table 2. It is an attempt to identify whether the various policy processes have direct, indirect or adverse effects on the environmental and social issues raised in the previous section. In many cases the extent of the effect is debatable. In some cases whether the effect would be beneficial or adverse is also unclear as this is dependent on the context of the measure and whether other measures were introduced to negate any potentially adverse environmental effects of the original measure.

The use of telematics on roads is an obvious example in this respect. There would be a beneficial effect on congestion and accessibility if drivers were warned in advance of problems on the roads. However the environmental effect of this is unclear. The energy wasted while cars are caught in traffic jams would be reduced, but the measure would improve the efficiency and therefore, in effect the capacity of the road network, and thus potentially increase levels of traffic, fuel use and pollution.

Similarly the effect of the trans-European networks is again unclear. While they increase mobility, reduce congestion and therefore the efficiency of resource use, they increase the capacity of the European transport network. Even though the extra capacity in terms of road space is added by the development of these networks is minimal, they are likely to have a larger, disproportionate effect on long distance traffic movements due to increased accessibility throughout the network. Similarly, the increase in capacity implied by funding infrastructure on the basis of cohesion or enlargement will also increase the adverse environmental effects of transport. However, some of these improvements will inevitably be beneficial for other reasons. Other policies and processes are directed at a specific environmental or social issue, eg Auto Oil and safety policies. This is clearly indicated in Table 3.

There are four main ways to improve the environmental performance of transport:

- improve environmental performance of existing vehicles (eg through cleaner vehicles or fuels);
- improve environmental performance of existing traffic composition (reduce congestion and optimise speeds);
- improve environmental efficiency of travel by changing composition (eg by increasing the modal share of public transport); and
- reduce the amount of travel or transport of goods.

Of these Table 3 shows that EU policy has actively focused on the first one (eg the Auto Oil process). There have also been limited attempts to improve the environmental performance of traffic composition (speed limits and relieving inter-regional congestion through the development of TETNs) and to change the composition of traffic (development of trans-European rail networks in parallel to the road networks and improved intermodal transport). However the policies aimed at congestion have been limited to European routes and have not

Table 3:- Mapping of issues to policy processes

Issues:- Policies/ processes:-	T/E	AQ	Acid	CC	Nse	EU	RU/W	VP	NF	LT	Sf	Acc	Mb	Sv	Cg	FMkt	FMvt
5th Action Plan: Towards sustainability	I	D	D	D	D				D				D				D
Climate change: post-Kyoto	I			D		I											
Policy integration	D	I	I	I	I	I		I	I	I	I			I			
Common/sustainable transport policy	D	D	D	D	D	D		D		D	D	D	D	D	D	D	D
Spatial development perspective	D	I	I	I	I	D			D	D		D	D	D			
Educational/best practice measures	I	I	I	I	I	D					D				D		
Trans-European networks			X	X		X	X	X	X	X			D	X	D	D	D
Internalisation of Costs/Infras charging		D	D	D	I	I						X	X		D	D	X
EU road safety/aircraft safety											D						
Auto-Oil		D	D													I	
Ambient air quality		D	I													I	
Transport/Cars and CO ₂				D		I										I	
Reducing sulphur in fuel		D	D													I	
Fuel efficiency of cars		D	D	D		D											
HGV environmental problems		D	D	D	D	D					D					I	
Roadworthiness of goods vehicles		D	D	D	D	D					D						
End of life vehicles		I	I	I	I	I	D										
NOx from planes			D	D													
Operation of aircraft			D	D	D	D					D					I	
Mobility management/urban agenda		I	I	I	I	I						D	D		D		I
Citizen's Network		I	I	I	I	I				I		D	D		D		I
Social legislation: drivers hours											D					I	
Speed limits		I	I	I	I	D									D		
Use of telematics on roads		I/X	I/X	I/X	I/X	I/X	I/X					D	D		D	I	
Action for mobility-impaired												D	D				
Revitalising rail network		I	I	I	I	I						D	D		D	I	I
Development of short-sea shipping			I	I		I										I	I
Intermodality/Combined Transport		I	I	I		I	I	I		I			D			I	I
Freight Freeways		I	I	I	I	I						D	D		D	I	
Cabotage/market liberalisation			X	X		X										I	I
Enlargement	I		X	X		X		X		X		D	D	X		I	
Cohesion	I		X	X				X		X		D	D	X		I	
Renewable energy	I	I	I	I		D											
Other harmonisation measures																I	
Transport of dangerous goods											D						

Note:- 1) T/E - Transport/ environment, general; AQ - Air quality; Acid - Acidification; CC - Climate change; Nse - Noise; EU - Energy Use; RU/W - Resource Use/Waste; VP - Visual pollution; NF - Nature fragmentation; LT - Land Take; Sf - Safety; Acc - Accessibility; Mb - Mobility; Sv - Severance; Cg - congestion; FMkt - Free Market; and FMvt - Free movement.
 2) D - direct effect; I - indirect effect; X - potentially negative effect.

yet been agreed, while the development of a trans-European rail network in parallel to a trans-European road network in practice merely increases the capacity on both rather than encouraging a change in the composition of travel. Therefore, measures aimed at addressing the second and third ways of improving the environmental performance of the transport sector have focused on ‘carrots’, without the necessary ‘sticks’ to encourage behavioural change. Consequently, no significant moves have been made with respect to reducing the amount of travel - the fourth way of improving the environmental performance of transport. The latter would be achieved by imposing taxes or charges, but for reasons outlined above, little progress has been made in this area at Community level.

4 Transport Policy and IEA: Experience to Date

Integrated Environmental Assessment

Haigh (1998), while acknowledging that in reality policy formulation is a complicated process involving iteration and feedback, presents a simplified model (after Ashby, 1978). The model had three stages:-

- i) the ignition phase. This involves the flagging of an environmental problem as an issue to be dealt with by the public, scientists and academics or other interested party;
- ii) the objective phase. In this phase, the governing institution obtains a range of objective scientific and economic opinion regarding the scale of the problem; and
- iii) the decision. This involves combining the objective information with subjective considerations in order to identify the appropriate policy response.

After two case studies, Haigh concludes that IEA has a role to play in the second stage of this model. Its role in the other two stages is not as clear, but if IEA was limited to stage 2, its contribution and therefore its impact would be restricted. Consequently, in order that IEA addresses public opinion and is politically relevant, it must be framed to cover as much of the three stages as possible.

On the basis of a range of examples of definitions of integrated assessment (IA), Tol and Vellinga (1998) conclude that “‘integrated’ conveys a message of multi- or inter-disciplinarity, and ‘assessment’ a message of policy relevance” (page 2). They stress that the whole if an IA should be greater than the sum of its parts. They suggest that an IA involves three stages:

- i) structuring the problem. First it is necessary to identify the problem or define the question. They suggest that one of the roles of IEA could be to do this with the participation of scientists, policy-makers and other stakeholders, especially as the issues involved are complex. In this stage it is also important to identify the various interests from the scientific and academic community, the decision-makers and other stakeholders (eg NGOs).
- ii) the Integrated Analysis. They argue that the analysis could range from a purely participatory exercise (panels of experts, focus groups) to an analysis undertaken by an

Box 1:- Case Study of the Auto Oil Programmes

Background

Historically, the EC legislative programme on vehicle emissions has concentrated on new vehicle standards for a limited range of pollutants (carbon monoxide, hydrocarbons, nitrogen oxides and smoke/particulates). Evidence of the health impacts of air pollution has been accumulating for some time, leading to pressure to reduce emissions from vehicles in particular. The initial approach, which naturally precedes EC involvement, was based on requiring the best available technology, but with only limited assessment available of the likely impact of measures on air quality and related problems. Fuel quality was addressed rather later and in a limited and piecemeal way (eg by reducing lead and sulphur content of fuels). This early approach was based ultimately on political compromise between Member States, the automotive and oil industries, and other stakeholders, and some consideration of the likely costs of measures.

This process culminated in Directives 91/441/EEC and 94/12/EC, which had the effect of requiring catalytic converters on new petrol-engined cars. This measure proved highly controversial, and resulted in complaints from the motor industry in particular that neither the costs nor the benefits of the proposals had been properly or rationally assessed.

The First Auto-Oil Programme

In response to these criticisms the Commission embarked upon a significant new approach to Community air pollution policy, by setting up the so-called European Auto-Oil Programme. Central to this programme was a tripartite initiative of the Commission, the motor industry and the oil industry to address road vehicle emissions and air quality in a more holistic way. In this process the participants sought to pool their information and to set a rational framework for assessing the most cost-effective contributions from a range of measures to meeting future air quality standards.

This in itself was a major departure, in that the objective now was to achieve an explicit and quantified environmental objective at the lowest overall cost. The policy areas covered were to include not only new vehicle emissions standards, but also a framework of fuel quality specifications, evaporative emissions controls, and inspection and maintenance programmes. Non-technical measures such as pricing policies and provision of public transport were considered in order to evaluate the correct balance of technical and non-technical measures. This set the framework for the 'objective phase' under Ashby's framework.

Other environmental impacts were taken account of only to a very limited extent. For example, technical measures to reduce regulated pollution emissions were required to be CO₂ neutral, but no attempt was made to explore the interactions between controlling regulated pollutants and CO₂ emissions.

Auto Oil II

The second Auto Oil programme (Auto Oil II) was established in order to make recommendations for further emission limits to be applied from the year 2005. It was in many ways a broader and more ambitious programme than the first, and set out to rectify what were seen as weaknesses in the first programme. For example, representatives from Member States

and NGOs were included in the programme from the outset. It also included an inventory of pollution from stationary sources in order to attempt a cross-optimisation of emission reductions from different economic sectors.

Seven working groups have been established to oversee the main areas of the analysis, as set out in the Table below.

Group No	Title	Outline of Tasks
WG1	Environmental Objectives	Establishing relationship between vehicle and other emissions and the stated air quality targets.
WG2	Vehicle Technology	Estimating emission reduction potential and costs for the range of available or potential vehicle technology options.
WG3	Fuel Quality	Estimating emission reduction potential and costs for the range of available or potential fuel quality options.
WG4	Inspection and Maintenance	Estimating emission reduction potential and costs for the range of available or potential inspection and maintenance options.
WG5	Non-Technical Measures	Estimating emission reduction potential and costs for a broad range of non-technical measures, eg enhanced public transport, use of non-motorised modes and alternatives to physical transportation.
WG6	Economic Instruments	Estimating costs and behavioural responses (technical and non-technical) for the range of economic instruments available (eg fuel taxation, graduated purchase taxes, road pricing etc).
WG7	Cost-Effectiveness Analysis	Consolidating data from WG 1-6 to undertake cost benefit analysis of policy packages.

Consultants have been contracted to undertake the many and various analytical tasks involved in the overall analysis. These include:

- establishment of technology and emissions base cases;
- air quality modelling;
- estimating emissions reduction potential and cost of measures; and
- analysis of cost-effectiveness of measures.

Although the scope of the analysis is broad, it nonetheless continues to focus on technical measures. This is largely because the best data is available in these areas, and it continues to prove difficult to compare technical and non-technical measures in a coherent analytical framework.

Outcomes

The 'decision phase' of the first Auto-Oil programme has now resulted in proposals for vehicle emissions limits (amending Directive 70/220) and new fuel standards for the years 2000 and 2005. Further measures on heavy goods vehicles, and on in-use inspection of vehicle emissions performance, are in progress.

The Commission departed from the recommendations which came from the programme even in presenting its own proposals for legislation. Further major changes were made during the complex legislative proposal, most notably because the European Parliament insisted on far tougher measures for the year 2000, and the inclusion of mandatory standards for the year 2005. These political manoeuvres are outlined in Friedrich, Tappe and Wurzel (1998), along with the differences between the final outcome and the initial proposals resulting from the Auto Oil analysis.

The second programme continues, but the inclusion of mandatory standards for the year 2005 in the first round of legislation has undermined a large part of the rationale of Auto Oil II. Work on the assessment of the air quality implications of the agreed legislation will continue, but beyond this, the scope of the programme are currently under review.

Assessment

The Auto Oil programmes have established a model which is likely to have a profound influence on the future development of vehicle emissions and fuel quality legislation at EC level, and possibly on other areas of emissions control policy as well. They represent a significant step forward in creating a 'rational' and scientific assessment within the transport and environment field. They have also been quite ambitious in terms of the scope of their analysis. From the IEA perspective, however, they have still fallen far short of a comprehensive and integrated approach. In particular:

- they have been largely confined to analysis of regulated pollutant emissions and air quality;
- they have focused on in-use emissions rather than a full life cycle analysis;
- non-road emissions sources have been incorporated, but a comprehensive assessment of cross-sectoral policies has not been undertaken;
- incorporation of policies affecting travel behaviour and modal choice has been limited;
- results have informed the policy process, but have in some cases been overridden by the usual political negotiations before decisions can be reached.

A key feature of Auto Oil II has been the conscious effort to adopt a more participatory model during the analytical phase. This has clearly rendered the process more time-consuming and resource intensive, but may overcome some of the objections to Auto Oil I. However, the outcomes which will result from this remain far from clear.

integrated, computer-based model. In practice, most IAs lie somewhere between these two extremes, ie a combination of modelling for the modelable aspects and participation for the softer aspects of the problem. There are advantages and disadvantages to both approaches, so the aim should be to obtain the best of both worlds. They suggest that one of the purposes of EFIEA is to identify the most appropriate mix of these two tools to enable IEA to best contribute to policy-making.

iii) communication of the results. This can be undertaken in two main ways: directly or indirectly. The first way consists of reporting the results directly to the policy-maker. This has the advantage that it is more likely to be a two-way process in which the needs of the policy-maker are taken into account. The major risk is that the policy-maker does not have the time to understand all the caveats which accompany the results or these are obscured by the desire of the modeller to make the results policy relevant. The second method is through a general dissemination of the results in the relevant literature and subsequent comment by peers and commentators. A drawback with this approach is that the decision-maker is not able to communicate their needs to the modeller. Further, the speed with which a political decision often needs to be made is at odds with this approach. This model covers Ashby's stage 2 and overlaps into stages 1 and 3.

While the potential for IEA has not been fully realised in the transport sector, there have been significant developments towards a more strategic framework for environmental assessment. Obvious examples include initiatives for the strategic assessment of the trans-European transport network and the assessment frameworks of the Auto-Oil programmes (see Box 1).

5 Exploring the Opportunities for IEA

Analysis of Potential for IEA

The prioritisation of issues for which IEA would be relevant in the transport sector at the European level depends on a number of issues. One major criterion must be the scale of the issue involved. For example a major global issue such as climate change is relatively more important in this context than, say, visual pollution. A second consideration must be the scale of EU political attention to date. If IEA is already playing a role in contributing to a particular issue, while an issue of similar importance in every other way was receiving no attention, then it would make sense to give the latter a higher priority for future work. Similarly the effectiveness of EU policy to date with respect to the issue is also important. If two otherwise equally important issues have both been addressed, and one was making extensive progress towards its goals, while the other was having limited effect, it would make sense to prioritise the latter over the former. Once each of these factors has been addressed for an issue, it is possible to assess whether there is the potential to better address the issue at a European level, with reference to the competence of the EU over the issue (see Table 1). Finally, the relevance of the issue for IEA can be assessed in the light of the complexity of the issue and the need for a multi-disciplinary solution. This analysis is undertaken, albeit in a fairly subjective way, in Table 4.

Table 4:- Prioritising the issues with respect to the potential for IEA

Importance:- Issues:-	Scale of effect/ concern	Scale of EU political consideration to date	Effectiveness of EU political reaction to date	Assessment	Relevance for IEA
Transport and environment, general		Strategically addressed, but limited within this.	Positive in some cases, potentially adverse in others.	Progress in some areas, but lack of consideration of environment in others.	Yes, in certain areas.
Air quality	Major, localised.	Largely addressed.	Trends are moving in the right direction.	Standards could be stricter, but progress is being made.	An IA was used to identify new emission standards. Potential for continued use.
Acidification	Significant, inter-regional.	Addressed, but potentially undermined if traffic resulting from policy towards TETNs, cohesion, enlargement and air travel continues to increase.	Trends are moving in the right direction.	Standards could be stricter, but progress is being made.	Already contributes to general acidification strategy. Adverse effect of transport addressed by Auto Oil.
Climate change	Potentially major, global	Being addressed with forthcoming White Paper. Transport aspects addressed in part; air travel largely ignored.	Limited, as yet.	Agreement with manufacturers to reduce CO ₂ emissions, but softer measures will also be needed.	Complex and difficult to address and therefore relevant, especially with respect to identifying softer policy measures.
Noise	Major, localised.	Being addressed (Green Paper and recent directive).	Limited effect as yet.	Potential for more agreements with industry.	Yes. Potential for an Auto Oil style approach to noise.
Energy use	Long-term, global/regional.	Partially addressed, but in a piecemeal fashion; air travel not really addressed.	Limited, as yet.	Potential for more fuel efficiency measures and agreements with industry. Dissemination of best practice.	Potential for an Auto Oil style approach. Investigation of softer measures.
Resource use	Long-term, global/regional.	Addressed indirectly and reactively.	Limited, as yet.	Potential for more agreements with industry.	Potential for Auto Oil style approach. Investigation of softer measures.
Visual pollution	Significant, local.	No specific measures.	Limited.	Limited scope for progress at EU level as a local issue.	Limited as largely addressed at local level.
Nature fragmentation and biodiversity	Significant, mainly local.	No specific measures.	Limited.	Limited scope for progress at EU level as a local issue.	Limited as largely addressed at local level.
Land take	Significant, local, regional, national.	Potentially adverse as a result of lack of integration with infrastructure construction (TETNs, cohesion, etc.)	Limited.	Need for greater integration of European transport infrastructure projects and spatial planning.	Yes. Complex issue linked with mobility, the free market and free movement.
Safety	Significant, local.	Addressed by harmonisation of standards; framework.	Limited.	Limited scope for progress at EU level as partly a local issue.	Limited as largely addressed at local level.
Accessibility	Significant, local.	Indirectly.	Limited. Provision of Euro networks may not have beneficial effect.	Limited scope for progress at EU level as a local issue.	Limited as mainly a local issue.
Mobility	Minor, European.	Directly addressed.	Extensive. Main policy objective, supported with TETNs, cohesion policies and funding.	Need to integrate with environmental objectives as risks undermining these.	Yes. Complementary to free market and free movement, but insufficient environmental consideration.
Severance	Significant, local.	No specific measures.	Limited, as yet.	Limited scope for progress at EU level as a local issue.	Limited as largely addressed at local level.
Congestion	Significant, local/regional.	Partially.	TETNs/cohesion aim to have beneficial effects on cross-border routes/ routes to peripheral areas. Locally, effects limited.	Need to integrate with environmental objectives as risks undermining these.	Linked to mobility, land take, free movement and free market.
Free market	Minor, European.	Directly addressed.	Beneficial on free market, but potential negative on environment in terms of increasing cross-border freight movements.	Need to integrate with environmental objectives as risks undermining these.	Yes. Complementary to increasing mobility and free movement, but insufficient environmental consideration.
Free movement	Minor, European.	Directly addressed.	Beneficial on free movement, but potential negative on environment in terms of increasing cross-border passenger movements.	Need to integrate with environmental objectives as risks undermining these.	Yes. Complementary to increasing mobility and free market, but insufficient environmental consideration.

Air Quality and Acidification

As was discussed in the previous section, the Auto Oil programme is addressing the issue of air quality. Progress has been made in recent years with respect to reducing a wide range of pollutants emitted by motor vehicles and the successful conclusion of the Auto Oil programme should see these trends continue. Arguably, IEA has limited further potential in addressing air quality other than continuing the work which is being undertaken already. It might, however, contribute to integrated assessment of technical and non-technical measures. Similarly, IEA already contributes to the general acidification strategy and the emissions from transport which contribute to acidification are addressed by the outcome of the Auto Oil programme. Consequently, with respect to acidification, there is again limited scope for further application of IEA other than continuing the work which is already being undertaken.

Climate Change

Climate change has also been the subject of extensive modelling in respect of atmospheric effects and impacts. However limiting the emissions which contribute to climate change is more difficult than those which contribute to air quality and acidification due to the scale of the change necessary in the absence of economically-feasible technological solutions. Consequently, progress has been slow, even though it has received relatively high political prominence due to the (potentially large and uncertain) environmental, economic and social effects. Consequently, there is still a need for the development of policy to address the issue. The integrated assessment so far has been 'hard', in that it has been based on modelling and there has been a reluctance to include lay views (Tol and Vellinga, 1998). Clearly this has not been sufficient to develop the necessary policy, so there is a need to incorporate softer aspects into the assessment in order to move the debate forward. Similarly, the policy measures used so far have also been 'hard' in that they are based on technology, eg reducing CO₂ emissions from passenger cars. The use of softer measures is yet to be properly addressed. There is, therefore, the potential for increased use of IEA to incorporate the softer elements of the debate and to investigate softer policy options.

Noise

Noise is a major problem in urban areas. However, like air quality, noise pollution is related both to the technical design of the range of sources of noise, including road traffic and trains, and to local conditions, such as through traffic using residential roads. So, while there are aspects of the problem which could be dealt with at the local level, such as removing through traffic from residential roads, there are aspects which are best addressed at the European level through the formulation of technological standards. The EU has now started to tackle this issue (see Box 2).

Energy Use, Resource Use and Waste

Energy and resource use are being addressed by EU policy to some extent. Policies addressing climate change or encouraging the use of renewable energy resources will have an effect on energy use, but there is no overall strategy to influence energy consumption. Similarly with resource use, the major policy with respect to transport, ie those aimed at end-of-life vehicles, is reactive and will have an effect on waste streams and the mix of resources used, but need not influence the amount of resources used. On the other hand, both of these issues are long-term in

their potential effects which suggests that neither is a priority in the short-term. However, there is a major trade-off between moves to improve fuel efficiency through the introduction of lightweight vehicles and the recyclability of the materials used in these vehicles. Further, as there is no agreed life cycle analysis framework within which both resource use and CO₂ policy can be set, then they may conflict. Consequently, while in the short-term, the existing reserves of resources suggest that neither energy use or resource use is a priority for IEA, in the long-term, there is the potential for the use of IEA to cover all policies, modes and impacts of transport, in order that policy measures do not conflict.

Box 2:- Recent Developments in EU Noise Policy

In response to such concerns, the European Commission is in the process of formulating a noise policy which began with the publication of the Green Paper in 1996. Prior to this, the focus of EU noise policy was generally aimed at limiting noise from specific products, including motor vehicles. A commitment was made in 1992 in the Fifth Environmental Action Plan to address the problem of urban noise, but the Green Paper was the first attempt at developing an EU noise policy.

As a result of the consultation which followed the Green Paper, there was a realisation of the need for an EU noise policy which provided a coherent and coordinated approach to noise policy. This was launched at a recent Conference in Copenhagen. In addition to the existing Working Groups on noise emissions which cover road transport, aircraft and outdoor machinery, the Commission has created a Working Group to look at railway noise, as well as five groups to look at the perception, description and abatement of noise. In addition to these, two more Working Groups - on Costs & Benefits and Research & Development - have been created to examine the horizontal aspects of noise policy.

The Working Groups consist of experts in the various fields and will have with the preparation of a coherent system of directives, including a Framework Directive which will include the harmonisation of measuring units and assessment techniques. Such an approach provides a suitable basis for the development of noise policy, but arguably, there is still room for a further application of IEA. This could be undertaken by an Auto Oil style approach to noise or maybe by a different approach.

Air Transport

Of the major modes of transport, the adverse effects of air travel, especially on climate change, energy use and the implications for land take and transport generation, have not been addressed. This is important as air travel is the fastest growing mode in Europe in recent years and the trend is expected to continue. Barrett and Fergusson (1995) undertook one of the few outline assessments of EU air transport policy with respect to the environment, focusing in particular on the implications of the liberalisation of civil aviation in Europe for emissions from aircraft engines.

They argued that, to date, policy in the EU as elsewhere has been concerned primarily with catering for growing demand, and in some respects is fostering that demand. This is partly through regulatory changes such as the Third Liberalisation Package which fosters competition between air carriers. Liberalisation in this context is characterised by relaxation of the regulatory regime; fewer price controls; reduced state subsidies to national carriers; open access to routes;

and other measures to encourage competition between airlines. It has been claimed that improved economic efficiency will in itself result in improved environmental performance.

Barrett and Fergusson's analysis did not provide conclusive answers on the environmental consequences of air transport liberalisation, but made clear that there are potential conflicts between liberalisation and environment policy agendas, as is the case with the TETNs (see below). Liberalisation policy is well established within the EU's institutions and is supported by a wide range of other actors. Environmental policy, by contrast, has been brought to bear on air transport relatively recently, and has been 'bolted on' to existing priorities in a piecemeal way.

The potential for efficiency gains in the air transport sector is limited, so the further growth that is predicted will increase the detrimental effects of air travel. As a result of the international and often intercontinental nature of this mode, environmental and other concerns have become secondary to commercial competitiveness. The IPCC is in the process of undertaking a review on the effects of aircraft emissions on ozone depletion and climate change. However, as with climate change, the approach taken is relatively hard in that it focuses on assessing the chemical effects and modelling future emissions scenarios. There is little focus on potential policy responses other than improving the efficiency of fuel use and the use of cost-benefit analysis to evaluate the mitigation of emissions. However, as has been the case in the road transport sector, improvements in efficiency are especially likely to be outweighed by the growth in air travel. Future air transport policy, therefore, appears to be a high priority for an IEA. The first step at the European level may be taken by the forthcoming Communication on aviation and the environment.

Visual pollution, nature fragmentation, safety and accessibility and severance

In relation to European transport policy, issues such as visual pollution, nature fragmentation, safety, accessibility and severance have limited relevance as they are best dealt with at the local level. Consequently, the potential for significant policy development at the European level is limited. While there is an action programme on road safety, this is more of a social issue and its environmental effects are minimal. Nature fragmentation, visual pollution and severance are all best addressed by the design of the local network and infrastructure. The EU can undertake research and disseminate information with respect to the designing infrastructure, but its competence is limited. Accessibility is also more of a local issue. Although infrastructure developments do influence accessibility, especially in relation to freight, the majority of journeys will not be affected by these developments as most journeys are undertaken on local or national roads.

However, there are obvious interactions between air quality, climate change, noise, nature fragmentation etc which have never been explored in a coherent way. In order to address these issues within an interconnected and holistic framework, an IEA would seem to be an appropriate tool. However, it would need to cover all policies, modes and impacts of transport, within an IEA for the entire transport system.

Land Take, Spatial Development and Transport Planning

As was discussed in Section 3, transport and land use policy is starting to be integrated at the national and local levels. The aim of this approach was to reduce the adverse environmental effects of transport by reducing the need to travel. While competence for such policy areas is shared between Member States and the EU, in practice the application of subsidiarity means that planning policy is generally left to national and local government. However, with the designation and development of the trans-European networks, the EU is contributing to the development at a European level of transport networks without direct consideration of the spatial implications. Outside of the auspices of the EU, the Member States have set up the European Spatial Development Perspective in an attempt to bring a European dimension to spatial issues (Inter-governmental Committee on Spatial Development, 1997). It includes the spatial dimension of transport from the European to the local level. However, the initiative is still in its early stages, so is yet to result in any specific or concrete policy responses. Consequently the spatial effects of transport activities and the potential to integrate transport and spatial planning at the European level could be an issue to which the application of IEA would be beneficial.

Mobility, the Free Market and Free Movement

The main transport policy process focused on increasing mobility, enabling free movement and improving the operation of the free market is the development of trans-European transport networks (TETNs). As was discussed in Section 3, the environmental effect of these is not clear. According to EU policy documents, TETNs are good for the environment in that they ease congestion and improve the efficiency of energy use and therefore reduce unnecessary pollution (CEC, 1992). In order to take into account other environmental aspects, it was a requirement that all new projects developed within the TETN framework should conform to the requirements of the EIA Directive. However, there was also a growing recognition that project-level assessment would not reflect the cumulative or total environmental impact of the programme. Consequently, in 1996 a Council Decision included an undertaking that the Commission should develop methods for strategic assessment both of the overall environmental impacts of the TETNs, and of major corridors with an intermodal dimension.

Work on these new assessment techniques is ongoing, and results have not yet been published. Analysis is greatly complicated by the need to assess a range of modes together rather than in isolation, and to estimate the effects of the networks both on total demand for travel and on modal split. However, it is clear that a policy aimed at encouraging free movement and increasing mobility is likely to increase the amount of travel undertaken which would have detrimental environmental effects. The current approach does not amount to a full IEA, so there is potential for the application of IEA to the development of the TETNs. A similar argument could be made with respect to the development of infrastructure for purposes of cohesion and with the development of the transport networks of Central and Eastern Europe in the light of EU enlargement.

This section has reviewed the potential applications of IEA at the EU level. The next section identifies potential actors in the transport policy formulating process for which IEA could be an important tool.

6 The Potential Actors

The aim of this report is to investigate the use, and the potential for further use, of IEA in the formulation of transport policy at the EU level. Consequently, it is necessary to identify the actors involved in the formulation of policy at this level. The categories of player can be identified with reference to the models of IEA which were discussed in Section 5. Two obvious categories of player are the policy formulators and their objective advisers. Further, anyone who could potentially ‘flag up’ a problem could be considered to be a potential actor. With respect to transport and environment, this could be transport users and environmental groups, as well as scientists and academics.

The Policy Formulators

As the principal focus of the report is the formulation of European policy, those involved with the European institutions are evidently key players. This would include officials from the respective DGs (eg Environment, Transport) and MEPs of the respective EP committees. The inclusion of politicians in the list of key players is not as important as they will not have as direct a need for IEA, only for its recommendations. However, representatives of Member States, in the form of national civil servants, should be included at this level in order that national interests are represented as, ultimately, it is the Council which has to agree EU policy. National civil servants from the appropriate national ministries (eg transport, environment) should be included. However, the inclusion of national ministers and members of parliament in the list of key players is probably not necessary as dealings with national governments are undertaken with civil servants, who pass on the results to national politicians.

At the local level, again the inclusion of politicians in the list of key players is unlikely to be beneficial. Further, officers of local or regional authorities are probably too remote from the EU level to offer views about the use of IEA in transport. Consequently, it may be useful to include a representative of a regional European office, the Committee of the Regions or other body that represents local and regional interests at the European level. A potential list of policy formulators could be as in Table 5.

Table 5: Players from the decision-making community

Player	Description	Example
European civil servant	Commission officials from relevant DGs	Official from DGVII, DGXI and others
European policy formulators	MEPs on relevant EP committees	Chair of Environment and/or Transport Committees
National civil servant	Relevant officials in national transport and environment departments	Official(s) from national transport and environment ministries
Regional/local civil servant	Regional/local authority officers	Official from European office of a region; Representative of Committee of the Regions

The Objective Advisers/Experts

The expert advisers mentioned in Ashby’s model were scientific and economic. These could be from independent research institutes, consultancies or universities. Tol and Vellinga suggested that the softer version of the analysis could be undertaken by focus groups or

panels of experts. Focus groups could consist of users or other groups, which are discussed in the next section. Panels of experts would also be drawn from the research and academic communities. With respect to transport, therefore, specialists could include economists and people with knowledge of pollution, vehicle technology, spatial development and regional studies (see Table 6). The table only lists specialisms as opposed to institutions or individuals as the choice of the latter would vary according to the issue for which the IEA was to be undertaken. In this category it is also worth including those whose role it is to monitor the European environment and the effectiveness of environmental protection measures, which at the European level is the responsibility of the European Environment Agency (EEA).

Table 6: Areas from which experts could be drawn

Subject area
Environment
Pollution
Social science
Economics
Regional/European studies
Technology
Spatial development

Non-governmental organisations

The public (or at least their representatives) have an important role to play in flagging up the issues, or even being involved with focus groups, as well as influencing the subjective issues on which decision-makers will base their final decision. Also, groups representing

Table 7: Non-governmental organisations who could be potential players

Mode/interest	Non-governmental organisation
Pedestrians	Federation of European Pedestrians Association (FEPA)
Cyclists	European Cyclists Federation (ECF)
Public transport users	??
Car users	Alliance Internationale de Tourisme/Federation Internationale de l'Automobile (AIT/FIA)
Airline users	??
Maritime users	??
Freight hauliers	IRU Road Haulage Liaison Association with the EC
Rail freight operators	??
Public transport operators	International Union of Public Transport (UITP)
Railway operators	Community of European Railways (CER)
Airline operators	Association of European Airlines (AEA)
Inland waterway operators	Permanent International Association of Navigation Conferences (PIANC)
Maritime operators	International Council of Marine Industry Associations (ICOMIA)
Transport/environment groups	European Federation for Transport and the Environment (T&E)
Environmental groups	European Environmental Bureau (EEB); FoE Europe
Countryside groups	Birdlife; WWF Europe
Conservation groups	European Environmental Advisory Councils
Motor industry representatives	Association of European Automobile Manufacturers (ACEA)
Oil industry representatives	European Petroleum Industry Association (EUROPIA)

industry can be important as shown by the Auto-Oil process (see Box 1). So, in this respect, the key players with respect to transport and the environment are transport users groups, the transport industry and environmental groups (see Table 7).

As noted by Tol and Vellinga (1998), the disciplinary mix involved in any IEA should be tailored to the problem at hand and the solution should be tailored to the question. In other words, the key players relevant for a particular IEA depend on the issue being analysed.

7 Summary and Discussion

Prioritisation of the Issues

This report has mapped the issues with respect to transport policy and the environment at the European level and has identified priorities for the further application of IEA. In summary, these priorities are:

- the need for more measures to combat climate change;
- a more comprehensive noise policy;
- the environmental effects of air travel and air transport policy;
- integration of transport and spatial planning at the European level;
- the environmental implications of more trans-European road building, including those related to cohesion and enlargement; and
- an overall assessment bringing all policies, modes and impacts into a truly global IEA.

Other possible issues for consideration include the use of energy and other resources in the transport sector, continued improvements to emissions standards and the potential for European policy to beneficially affect localised issues, such as accessibility, road safety and congestion.

A further issue which could be considered by EFIEA, which is relevant to many of these priority issues, is the potential conflict between liberalisation of air and rail freight and the environment.

Criteria which could be used to prioritise which of the six issues identified above could be considered for an IEA are potentially wide-ranging. One could argue that noise should be a priority because of the number of people who live in urban areas and who are adversely affected by noise on a daily basis. On the other hand, the potential scale of the effects of climate change and of the emissions reductions to be achieved might be sufficient to make softer policies to combat climate change a priority. Alternatively, policies which enable the use of certain modes to grow without sufficient consideration of the environment, such as air transport policy and TETNs, could be considered to be a priority as growth in demand for transport could negate any improvement obtained in environmental performance. Finally, the lack of integration of spatial planning and transport at a European level is a continuing failure to make use of a policy tool which could have environmental benefits in terms of encouraging modal shift and reducing the distances travelled. Consequently, this could be considered to be a priority, particularly at the European level.

However, we suggest that a potential prioritisation of the issues could be as follows:

1. the need for more measures to combat climate change;

2. the environmental implications of more trans-European road building, including those related to cohesion and enlargement;
3. the environmental effects of air travel and air transport policy;
4. integration of transport and spatial planning at the European level;
5. a more comprehensive noise policy; and
6. an overall assessment bringing all policies, modes and impacts into a truly global IEA.

Measures to combat climate change was placed first as a result of its current high political prominence and the pressing nature of the issues involved. Even though a voluntary agreement has been reached between the EU and the motor industry on reducing CO₂ emissions from new cars, this would only amount to a 25% reduction if entirely successful. Considering that a 60% reduction is needed globally to stabilise atmospheric concentrations of CO₂ - which would imply a larger reduction in Europe taking into account issues of global equity - there is evidently still a need for significant improvements to be made in reducing CO₂. The environmental impacts of trans-European road building was placed second as it was considered to typify a major conflict in sustainability: that between environmental protection and economic development. The provision of infrastructure to provide for increased mobility and encourage economic development underlies European transport policy, yet the link between the provision of infrastructure and economic development is far from being understood, let alone proven. While the economic benefits are not proven, the environmental impacts of the policy are potentially large. The integration of environmental considerations into the consideration of Trans-European road building at an early stage could lead to a significantly different approach to the provision of transport infrastructure.

While air transport policies are also aimed at catering for growth in demand, air travel was placed third because the scale of the problem is currently small compared with the effect of providing for increased mobility on the roads. However, air travel is the fastest growing mode and is a potentially intractable problem because of the need for international solutions. It also presents distinctive environmental and social problems. The integration of transport planning and spatial development would follow naturally from efforts to integrate the environment into climate change and road building. Consequently, it was placed fourth. Despite the number of people affected by noise on a daily basis, a more comprehensive noise policy was placed fifth. This was partly due to the fact that it is now being addressed by EU policy and partly because the long-term impacts of noise are significantly less than the four issues which were given a higher ranking. A global IEA was ranked sixth because progress would have to be made in all other areas before such an analysis could even be considered.

Research Challenges

The IEAs that have been undertaken in the transport sector to date have been based on, if not a single mode and impact, then a small subset of modes and impacts. Further, the policy approaches which have been analysed to address the problem tend to focus on a particular set of approaches rather than the range of approaches available. For example, the Auto Oil Programme (see Box 1) focused on reducing emissions from road transport through the use of technological measures. As road transport is the largest source of emissions, it could be

argued that the focus of the programme on these modes is appropriate. However, there was limited consideration of the potential to reduce emissions through softer measures such as encouraging the use of other modes, integrating transport and land use planning or using economic incentives. In the context of the Auto Oil programme a discussion of the potential use of other measures would not have been appropriate as the oil and motor industries have no responsibility over these measures. Further, the Commission itself has little responsibility over many of these measures as they are the responsibility of Member States.

This highlights a major problem with integrating policy in the transport sector as a fully integrated analysis would need the participation of a wide variety of actors and the various levels of government which are responsible for different aspects of transport policy. A major challenge for research is therefore to create a framework for integrating the various modes, impacts and policy approaches. Ultimately the goal would be to develop a fully integrated approach to the analysis of transport and its environmental, social and economic impacts. However, practically the development of a fully integrated approach must be incremental. A challenge for research in this area would be to provide a framework through which a course could be charted to achieve greater integration between the analytical approaches taken towards modes, impacts and policy approaches. If IEA was to increase the degree of integration in this way it would provide a significant contribution to the integration of environmental considerations into transport policy.

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