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Sustainable urban development and transport – a Eurovision for 2020

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One of the major challenges for urban planning at the end of the century is the problem that the continuous growth in traffic has had on the achievement of sustainable urban development. This paper presents the major elements of the debate from a European perspective and it sketches out the choices available to decision-makers, together with the very considerable barriers to implementation. The major issues to be addressed, if transport is to conform to the principles of sustainable urban development, are outlined from an international perspective. The actions available are grouped under the three headings of technology, economic and financial, and regulation and planning. The particular problems in Europe relate to the shortage of space, higher densities and the protection of open space. It is argued that high-quality liveable cities must be the basis for sustainable urban development and policies should be implemented to achieve that objective, so the outward migration of residents is reversed. Sustainable living requires people to want to live in close proximity in an attractive, affordable urban environment. Recent research in Europe on the options available at the strategic and the city level will be cited to illustrate the actions that are now being considered to achieve sustainable transport in 2020. To achieve this objective, action is required on both the technology of transport and decoupling of transport from economic growth. In addition, the commitment and involvement of all affected parties is essential, so that imaginative and effective measures can be implemented.

1. Introduction

Travel patterns in most developed countries are increasingly dependent on the car. Levels of mobility and car ownership have risen substantially over the recent past and that increase seems likely to continue. In the European Union 15 member states (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, Sweden and the UK, called the EU15), there has been an increase of > 34% and the numbers of vehicles owned (1985–95), and it is likely that in the next 25 years (to 2020) that number will increase by a further 50% (OECD 1995). This will bring vehicle ownership levels in many European countries to > 600 cars per 1000 population, similar to the mid-1980s levels in the USA. Road capacity has not increased by a similar amount (+ 10% 1985–95), so congestion has increased, particularly in cities where little new infrastructure has been built. In addition to the growth in congestion, now officially

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estimated to cost ~2% of EU GDP (EUROSTAT 1997), there are other important differences between the two main economic powers (the USA and the EU).

Space is at a premium in the EU15 as population density is a four times that in the USA (table 1). This has advantages as distances between cities are shorter, but it also means that urban sprawl and edge city phenomena are not attractive options. Much of the undeveloped land is safeguarded as open space, green belt or recreational areas that cannot be used for city expansion. The role of public transport has remained important, with the car having a lower level of dominance. Distances travelled per person per car are much lower in Europe—about two-thirds the corresponding levels in the USA.

Table 1. USA and EU15 comparisons.

1994		USA	EU15
Population	(millions)	260.7	372.1
Area	(1000 km^2)	9363	3237
Density	(persons/km^2)	27.8	114.9
GDP	($ billion)	6650	7344
	($ per head)	25 512	19 737
Roads	(km per 1000 km^2)	671	1188
Rail	(km per 1000 km^2)	19	48
Vehicles	(millions)	208	192
Cars	(millions)	134	158
Vehicle Ownership	(vehicles/1000 inhabitants)	0.80	0.52
Car Ownership	(cars/1000 inhabitants)	0.51	0.42
Distance per car	(km per year)	19 000	12 500
Fuel prices	(3.85 litres= 1 US gallon)	$1 per gallon	$1 per litre
Car	(passengers -km)	85.1%	79.9%
Air	(passengers -km)	12.4%	6.1%
Rail and Bus	(passengers -km)	2.5%	14.0%

Source: based on EUROSTAT (1997).

Yet, both of these major economic powers are concerned about the relentless growth in travel, particularly by car and more recently by air. Action is needed to move towards the targets set at the Kyoto Conference (still to be ratified) for CO_2 reductions. In addition, there is probably even greater concern over the potential impacts of local pollutants (carbon monoxide (CO), nitrogen oxides (NO_x), particulate matter under 10 μm in diameter (PM_{10}) and volatile organic compounds (VOC)) on air quality, health and the attractiveness of cities.

Within transport policy, there does now seem to be a new *realism* that has evolved over the past 5 years (Banister 1997):

- Stage I—consensus that projected traffic growth is not sustainable.
- Stage II—proposed road schemes are not going to solve the problem. Even if substantial investment does take place, congestion on the road system would get worse. It can never keep pace with demand.
- Stage III—discussion about limitations on the use of the car and substantially raising the costs of travel so that demand can be matched to

supply. But at the same time giving priority to particular users and modes of transport.

- Stage IV—the catalyst for the renewed interest has been the environmental consequences of unlimited mobility. But even if the environmental issues can be resolved, there is still the underlying problem of congestion.
- Stage V—realization that the only way to improve both environment and congestion is to use the car less—reducing the need to travel.

We have passed through Stages I and II, and there is a general consensus that the road solution is not feasible or desirable. We are now moving from Stage III to IV, and are just beginning to tackle the issues raised in Stage V, which is perhaps the hardest to analyse and develop politically and publicly acceptable strategies.

In Europe, the motorway construction era has ended with most resources now being placed in upgrading and extending the Trans European Rail Network (TERN). It is expected that this new age of the train will allow travel between the main cities of Europe at speeds averaging >200 km per h (maximum speed of 300 km per h). It now takes 2 h 40 min to travel from London to Brussels (400 km) and 3 h from London to Paris (450 km) on the Eurostar. This journey time will be reduced to 2.5 h when the new high-speed rail link is built in the UK from London to the Channel Tunnel. High-speed rail will directly compete with air.

In this paper, we mainly concentrate on the urban scale as the city is seen as being fundamental to sustainable development. The city allows people to have high levels of access to services and facilities, it promotes proximity and social interactions, it permits the provision of a range of public transport services, and it is generally less consumptive in terms of resource use per person. However, in Europe (as in the USA), people are moving out of the cities. There seems to be complex patterns of migration, related to stage in lifecycle. People move from the city centre to the suburbs, from the suburbs to the countryside, and eventually back to the city centre—which is a cascading process. The city is seen by many as a hostile, dirty, dangerous and insecure environment within which to live. Yet, the city has all the potential to provide the highest possible quality of life with a friendly, clean, safe and secure environment. The underlying rationale for the sustainable city must be to recreate the liveable city.

There are five main parts to this paper. First, the links between transport and sustainable urban development will be discussed, then the constraints and visions of the future will be explored, and the scenario-building process will be outlined. In the fourth part the implications for cities in Europe are discussed, and the paper will end with some conclusions and unresolved issues. The focus in primarily on European and US cities, as it is in these countries that most non-renewable resources are consumed and a lead role is expected in moving towards sustainable urban development.

2. Transport and sustainable urban development

In addition to the growth in the numbers of vehicles, the development of more complex travel patterns (based on the car) has been seen as one of the major limitations to the achievement of sustainable urban development. Conventionally, there are seven key issues to be addressed if transport is to conform to the principles of sustainable urban development (EFTE 1994, Banister 1997).

(1) *Congestion* in many urban areas has been increasing in its duration and intensity. On average, speeds in cities have been declining by ~5% per decade (EFTE 1994) and the severity of congestion increases with city size (Dasgupta 1993).
(2) *Increasing air pollution* has resulted in national air quality standards and those recommended by the World Health Organisation (1997) being exceeded in many cities. Air pollution affects health, impairs visibility and damages buildings and local ecology—it reduces the quality of urban life.
(3) *Traffic noise* affects all city life. It is estimated by the OECD (1995) that ~15% of the population in developed countries is exposed to high levels of noise, mainly generated by traffic. Disturbance is also caused by vibration, particularly from heavy lorries and night-time deliveries.
(4) *Road safety* is a major concern in cities and elsewhere. Worldwide, traffic accidents result in 250 000 deaths and ~10 million injuries each year (Downey 1995). The numbers of deaths from road accidents in the EU15 is 44 000 (1995). Accident rates are now declining in some countries (with high levels of motorization), but increasing in others (with low levels of motorization). This is a very high cost 'accepted' by society.
(5) *Degradation of urban landscapes* through the construction of new roads and transport facilities, the demolition of historic buildings and reductions in open space. Transport contributes to the decaying urban fabric and neglect of central city areas, as well as urban sprawl (Ewing 1997).
(6) *Use of space by traffic* facilitates the movement of the motorist, but reduces the accessibility of others as transport routes become barriers, as parked vehicles form obstacles for pedestrians, cyclists and those with disabilities. Car dependency results in traffic domination in urban areas.
(7) *Global warming* results from the use of fossil fuels. Transport now accounts for 25% of CO_2 emissions and this level is rising in relative terms as well as in absolute quantities. Transport is almost wholly dependent on oil, and this is a non-renewable energy source.

In addition, transport has also facilitated changes in the city, and these land-use and development factors need to be added to the list above.

(8) *Decentralization of cities* has been facilitated by the car in combination with efficient public transport. This has resulted in a substantial growth in trip lengths and the development of travel patterns that are dispersed rather than concentrated on the city centre. This in turn increases car dependence and reduces the possibilities of promoting efficient public transport. So transport has acted both as the facilitator of change and as a limiting factor on its resolution.
(9) *Development pressures* have taken place around car accessible locations that are not accessible to all people (including the edge city developments). The spatial segregation of activities in urban areas again increases trip lengths and has strong distributional consequences. High land and property prices are symbolic of a buoyant economy, but they are also socially exclusive, particularly in terms of access to low cost city centre housing.
(10) *Globalization* and the relocation of industry (including the information economy) have resulted in new patterns of distribution and the transport intensity of freight has increased globally, regionally and locally.

Sustainable urban development is dependent upon the city being a centre of vitality, opportunity and wealth. Solutions are required that can encourage the most efficient use of space and reduce the amount of additional land that can be allocated to development. There is some agreement over the problems and to a great extent the range of strategies available is familiar, but progress has been disappointingly slow in integrating sustainability into everyday decisions.

3. Constraints and visions of the future

The rapid growth in demand for travel, the increase in car ownership and the high external costs of transport all mean that trend-based visions of the future cannot find the solution to a sustainable urban transport system. Scenarios allow visions of the future to be described within a specific framework and under specific assumptions. Decision-making has never been based on certainty or complete knowledge—there are always trade-offs. Scenarios can give insights into some of the uncertainties in decision-making, they can stimulate thinking and mobilize people into making changes, and they can demonstrate the consequences of taking or not taking particular decisions (Kahn and Wiener 1967, Robinson 1990). They do not present solution strategies but give a clear view on the possible solutions strategies to be used as a basis for discussion. Within the context of sustainable urban development and transport over the next 25 years (to 2020), there are two clear lines of action.

3.1. *The eco-car*

In the longer term, the eco-car will be built primarily for use in urban areas. Although resources (mainly renewable and the recyclable) will still be needed to construct the vehicle, it would be powered by hydrogen fuel cells. The car will probably be available within 10 years, but will not have had a major impact on the total stock of vehicles for a further 10–15 years given the current turnover levels. This means that the eco-car would only be in standard used by the end of our period (2020). One set of policy actions must be to facilitate the research and development of the eco-car and to give clear signals to the motor manufacturing industry to invest in the small city-based vehicle.

This would include the following measures:

- to increase the research and development budgets on the eco-car and associated technologies (EU role);
- to develop the necessary supporting infrastructure so that it can be used when available (regional and city role);
- to provide tax incentives for companies to invest in the appropriate technology and to take it to the production stage (national government role);
- to provide tax disincentives for purchasing large, inefficient vehicles for city use (national government role); and
- to phase out all forms of subsidy to the private car (e.g. company cars) (national government role), and, at a later stage, to have a scrappage programme to encourage people to purchase the eco-car (national government role).

The purpose of these actions will be to speed up the process of innovation, and to give clear signals to industry and people that the eco-car is the replacement

technology for the current car stock. From the list of 10 key issues (see Section 2), the eco-car will have a substantial impact in reducing air pollution (2), noise (3) and global warming (7). It may also have some impact on congestion (1) and the use of space by traffic (6), through the use of smaller vehicles. It may even help maintain higher density cities (8). But other measures are also needed.

3.2. *Reducing the need to travel*

Even if the 'technological solution' is promoted, there still remains the historic problem of increases in transport demand (congestion). Additional actions are required to reduce the need to travel through local provision of services and facilities, through the increased use of technology (e.g. for tele-activities), and through the greater priority allocated to public transport. This is necessary because technology on its own is not sufficient to solve the problem of sustainable transport (POSSUM 1998), and there is the transition problem of the 'gap' between now (1999) and when the eco-car is in common use (2015–20). This means that other complementary measures have to be taken to reduce traffic demand within cities, so that the other components in our list of 10 key issues can also be addressed (see Section 2).

The city has a crucial role in maintaining high levels of accessibility and proximity (table 2). Sustainable living for most people would be in settlements that are of a sufficient size (> 50 000 population) so that the full range of facilities can be provided within walking, cycling or public transport distance (< 5 km). These settlements would be at a medium density (at least 40 persons per hectare), have mixed land-uses and high levels of accessibility to the public transport network (for inter-urban travel). It also means that these areas have to provide a high-quality environment within which people wish to live. This includes access to open space, a safe and secure environment, peace and quiet, a wide-range of social and recreational opportunities, as well as the other benefits of urban living. Most services and facilities can be provided locally, but the most difficult to provide is local employment. Even here, in the time-scale given, services and technology-based employment can be dispersed to where people live.

The argument is not for megacities or for very high levels of density, but for a range of city sizes above these thresholds with medium levels of density—some 75% of the EU15 population is already living in settlements of the size indicated here. These values have been derived from extensive empirical research on data from Europe to establish critical thresholds for numbers of trips, trip lengths and modal split (Banister 1997).

These constraints concern the framework within which transport policy options can be placed. Most require a strong planning system at the city and regional levels that will direct development to achieve larger, high-density, mixed-use and accessible cities. Although the planning system is not immediate in its effect, in the medium-term it is one of the most important determinants of travel patterns. As a general rule, the shorter the journey, the greater the probability that it will be walk-, cycle- or public transport-based. The planning system should be seeking to ensure proximity between where people live and the services, jobs and facilities they wish to gain access to (table 2).

A second set of constraints is the role that technology (in its widest sense) will have on travel demand. There has been much debate over the potential for substitution of travel through telecommuting, teleconferencing, teleshopping, telebusiness and other forms of teleactivities (NERA 1997, Salomon and

Table 2. Context and constraints.

Context of technology and growth in transport	
Transport technology	• Eco-car in mass production by 2010 • Measures to promote rapid replacement of existing fleet • Research funding increased substantially from EU and other sources • Industrial support for new energy and environmentally efficient technology • Tax incentives to buy eco-cars and scrap old vehicles
Transport demand	• Traffic still increasing as car ownership rises • Capacity limited so congestion increases • Measures required for demand management • High levels of accessibility and proximity
Constraints related to the city	
Physical	• Size> 50 000 • Density> 40 persons per hectare • Mixed land-use • Proximity to public transport interchanges and corridors
Quality	• Open space • Safe and secure environment • Peace and quiet • Social and recreational opportunities • Full range of services and facilities

Mokhtarian 1997). It is clear that the scale and nature of change induced by technology will be substantial and complex, with adaptations to existing patterns of activity. It will not affect all people in the same way, but will provide greater choice and flexibility to many 'computer-literate' people. In the Visions being put forward here, it is assumed that technology will have an impact, but more at the margins rather than fundamentally changing the demand for travel in cities (Rienstra *et al.* 1997).

4. Scenarios for the future

There are three main stages to the scenario-building process (figure 1). First, there are issues related to definitions, the external and strategic elements, targets and the reference situation. These targets relate to the desire for sustainable mobility, defined as using no more non-renewable resources in 2020 than is currently being used in 1995. The External Elements relate to the level of political intervention, with one Vision assuming strong local action and the other Vision assuming strong central action. These factors are not the main focus of the scenario building, as they represent different future paths over which the analysis process has no control. The Strategic Elements relate to the relative importance given to technological solutions (discussed in Section 3.1) and decoupling policies. Decoupling is a key concept defined as maintaining levels of economic growth, but with lower levels of transport intensity—breaking the historic link between GDP growth (desirable) and traffic growth (undesirable). A reference case has also been developed (table 3) to establish the nature and scale of change required to achieve the overall target of using no more non-renewable energy in the transport sector in 2020 (as compared with 1995).

The second stage involves the construction of the Visions of the Future 2020, in a qualitative description at the city level (table 5). In each case, targets have been set to achieve the necessary changes for the conditions of sustainable mobility to be met (tables 3 and 4). Two Visions have been developed that concentrate on particular aspects of the city. The statements concentrate on four main issues: the general scale

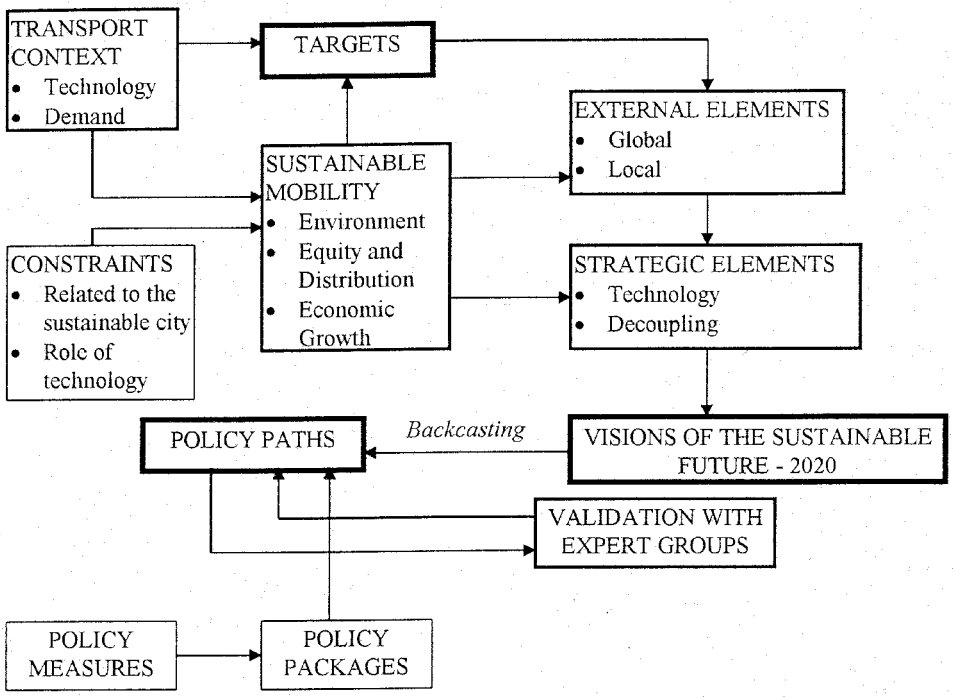

Figure 1. The scenario-building process.

Table 3. Reference case for growth in travel (1995–2020) as compared with the two Visions.

Billion passenger km	Volume 1995	Volume 2020: reference case	Volume 2020: Vision 1	Volume 2020: Vision 2	Growth 1970–95
Car (fossil)	3594	5388 (+ 50%)	2190	3650	+ 125%
(methanol)			0	100	
(electric)			540	0	
Aircraft	274	918 (+ 235%)	700	930	+ 500%
Bus	361	469 (+ 30%)	700	540	+ 38%
Rail	271	325 (+ 20%)	629	680	+ 25%
Total	4500	7100 (+ 58%)	4750	5900	+ 113%

Figures are national ones (not cities) for all EU countries. Volumes for 1995 and trends 1970–95 are based on ECMT (1997). The reference case is a relatively cautious estimate compared with most forecasts and the historic development between 1970 and 1995 (see column 5).

Source: ECMT (1997), Banister *et al.* (1998)–summarized in EUROSTAT (1997).

of change required, the impact on the city, the increasing role that technology should play, and the broader organizational and financial instruments that can be used. The focus is primarily at the urban scale and concentrates on the passenger sector. Many of the measures would apply equally to the freight sector.

Table 5 attempts to summarize in broad terms the changes necessary to achieve the three sets of targets relating to environment, equity and efficiency (table 4). There is a difference of emphasis between the two Visions, with one having slightly lower levels of political involvement in the process of change—people are expected to adopt green attitudes and values, with the catalyst for change coming from

Table 4. Targets to achieve sustainable mobility.

Environmental targets
25% reduction of CO_2 emissions from 1995 to 2020
80% reduction of NO_x emissions from 1995 to 2020
No degradation of open space in cities
Minor increase of net infrastructure in cities
Regional development targets
Improve relative accessibility and proximity in cities
Improve quality of life in cities for residents and workers
Efficiency targets
Full cost coverage (including external costs) of transport
Under market or equivalent conditions
Reduce public subsidies to all forms of transport to zero, except where there are clear social/equity objectives to be met

Table 5. Visions of the sustainable city 2020.

Targets (1995–2020) (see table 4)	High-quality urban living low levels of political intervention—bottom-up	High-quality urban living high levels of political intervention—top down
Environmental	*General*	*General*
Reduce CO_2 emissions by 25%	Total mobility the same as 1995, but lower than reference case (66% RC)	Total mobility more than 1995 but lower than reference case (82% RC)
Reduce NO_x emissions by 80%	Some electric vehicles, but technological innovation moderate—20% of market electric	Methanol the principal alternative fuel—20% of all fuel, particularly lorries
Protect open spaces	Lower car ownership	Car ownership increases moderately
Limited new infrastructure	Niche vehicles, car rental, smart card technology	Battery cars are niche vehicles, but not many sold
	Public transport competitive in price, but not fast—information on home computers, internet etc.	Public transport commercially organized—information through personal communicators
	Car use for commuting reduced but increased for leisure	Telecommuting widespread

(*continued*)

Table 5 (*concluded*)

Targets (1995 – 2020) (see table 4)	High-quality urban living low levels of political intervention — bottom-up	High-quality urban living high levels of political intervention — top down
Equity and distribution	*Impact on city*	*Impact on city*
Improve proximity and accessibility in cities	Concentration of development in cities and corridors	Urban decentralization continues, but at a slower rate
Improve quality of life in cities for all residents	Telecottages and teleshopping	Telecottages and teleshopping, together with high use of teleconferences, telebusiness and other teleactivities
		Local multimedia centres
	Reductions in work and shop travel	Reductions in travel for all purposes
	Shift to public transport and bike — higher occupancies	Some shift to public transport
	Less space for cars — limited parking	Space still allocated to the car
	Lower speed limits — priority to public transport	Lower speed limits and some priority for public transport
Efficiency	*Technology*	*Technology*
Full internalization of all costs	Cars 15 – 20% lighter	Cars 25% lighter
	Feebates related to weight and efficiency	Common technical standards agreed internationally
Reduce subsidies to all forms of transport to zero, except where there are clear social/ equity objectives to be met	Diesel vehicles phased out due to emissions problems	Diesel fuel use reduced in all cities
	Limited use of cars in cities — as public transport is so good	All purpose cars — hybrid electric with gas turbines, fuel cell power
	City bus and lorry are hybrid drives with gas turbine and Otto engines	Fuel cells introduced in buses and lorries
	Organization, investment and finance	*Organization, investment and finance*
	Market incentives — limited road pricing	Strong market incentives — road pricing
	Public transport publicly owned but independent of government	Private sector runs all transport — roads privately managed
	Limited investment in urban rail systems, most in the bus priority	High speed rail investment in corridors – city development at stations

Source: based on Banister *et al*. (1998).
The reference case (RC) is set out in table 3.

'bottom upwards'. The other suggests that political intervention takes place from above ('top down') and that clear action comes from national (and supra-national) politicians.

The final stages is the means to get from where we are now to the Vision of the Future. This is achieved through a backcasting procedure (Dreborg 1997) where the policy measures are packaged together to establish the possible means by which the

Vision of the Future can be achieved, together with an assessment of the costs and benefits, and the crucial points in time when particular decisions have to be made (Banister and Steen 1999). This stage is discussed below.

5. Policy paths

From these Visions, there are many different paths that can be followed. But in all cases, the city is seen as being instrumental in achieving sustainable development and the principal goal is to achieve a high quality of urban living.

5.1. *Low political intervention*

The low political intervention works from the 'bottom up' with a trend towards more 'local life-styles' and green values among the general public. People increasingly take responsibility for the common good and attitudes towards collective actions are positive, especially at the local and regional levels. People are pushing the politicians to adopt stricter environmental regulations and standards, especially at the urban level. At the global level no agreement on harmonizing standards is achieved. People are willing to pay for greener products as well as for locally produced goods—there are changing patterns of demand. Settlement patterns and location of workplace and service functions are also affected. Many urban subcentres have developed to a higher degree of self-sufficiency and city centres are being re-urbanized. There is an increased acceptability for urban public transport, bicycles, and electric urban cars (as an intermediate stage eco-car).

Production is more local and mainly serves local markets, but it is based on licences and the know-how of the big international firms and networks (global production). There is also an increasing share for the service sector, with traditional manufacturing industry showing a declining share of total production. GDP grows at a moderate pace, green GDP develops faster. Freight transport volumes have actually levelled off, as the value-to-weight ratios of freight has increased (dematerialization; Schleicher-Tappeser *et al.* 1998).

A tax base reform has taken place in the EU, shifting taxation from labour to the use of natural resources and energy, with the aim of stimulating conservation of resources. This tax reform combined with green demand has made producing firms reduce their use of energy, materials and hazardous substances.

5.1.1. *General approach to transport policy*

The shift in values and lifestyles has led to a higher acceptability for changes in residential and travel patterns, providing an opportunity of bringing the growth of transport volumes under control. Therefore, the prime political strategy *vis-à-vis* the environmental goal, is to promote a decoupling of transport growth from GDP growth. As mentioned above, the shift in demand has in itself led to a considerable degree of decoupling regarding freight. This is complemented by policy measures intended to reduce structurally enforced travel, such as commuting to work and service trips. Here, urban land-use planning and measures to facilitate telecommuting are important.

A policy for cleaner transport is important as measures are taken to promote a shift in modal split towards a higher share for cleaner modes (e.g. more public transport, a higher share for freight by rail, etc.), to make each mode cleaner through the use of new technologies, and to increase load factors. Cleaner technologies are supported by research and development funding, niche markets are developed for the

introduction of new vehicles, and systems such as car pooling with specialized vehicles are all created. The EU has an important role in coordinating regional and national policies and in harmonizing targets and standards in Europe.

To sum up, the main elements of the transport policy cover measures to reduce structurally enforced travel, through measures such as land-use planning, the promotion of telecommuting, etc. (decoupling), through measures such as standards and pricing, intended to achieve a shift from private cars and lorries to public transport and freight by train and ship (modal shifts), through measures for funding research and development and the promotion of market uptake (e.g. by creation of niche markets for novel systems—cleaner technologies), and through measures to provide greater accessibility to services and facilities (social equity).

5.2. *High political intervention*

The high political intervention works from the 'top down' with a certain degree of 'green consciousness' and an acceptance of policy measures intended to mitigate the environmental problems related to transport. However, these issues are not pushed by a broad opinion among the public. Rather, it is the politicians that are at the forefront, trying to find solutions at both the EU and global level. Politicians are relatively successful in forming opinions and there is an understanding that transport must in principle pay its full costs. But most people are not inclined to accept a major change of travel behaviour. Also, there is some green demand, but of a modest size.

The international lifestyle has gained strength. Many people prefer the broader international linkages to the more narrow local lifestyles. Also, there is a trend towards segmentation of society into different lifestyles that go across the world. Many enterprises have specialized on a specific segment of customers and provide their specific brand across the world.

Production is increasingly characterized by 'flexible specialization', and economic development is generally dynamic with a relatively high average GDP growth. Some parts of Europe tend to lag behind. Despite a trend towards dematerialization, transport volumes continue to grow due to increasing distances. A high degree of accord has developed in the relations between the EU, the USA and Japan as regards international regulations and standards in order to cope with global environmental problems.

5.2.1. *General approach to transport policy*

The widespread environmental consciousness among leading politicians at the world stage makes it possible to reach agreements on international standards and norms for cleaner vehicles, reductions of CO_2 emissions and similar levels of taxation of externalities, at least in the OECD area. The accord among world leading politicians impress the general public and makes it possible to gain popular support for such measures. However, as mentioned above, people will not accept measures that interfere with their habitual ways of living, such as using private cars and a preference for living in low-density residential areas.

Consequently, the prime policy regarding the environmental goal in Europe is to make transport cleaner. Although some measures are directed towards raising the share of cleaner modes (per person-km), the emphasis is on promoting the development and introduction of cleaner technologies and fuels. As people adhere to the private car, much of research and development is directed towards improving the technology of the conventional all-purpose car. However, also more far-sighted

policies exist and are promoted by the EU, such as the creation of niche markets for fuel cell vehicles (the eco-car). This is achieved by experiments with environmental zones. Policies to reduce transport intensity and volumes (decoupling) are also employed, but mainly by the use of pricing. This strategy has led to a somewhat more uneven distribution of accessibility that may be one of the major obstacles for realising this Vision.

To sum up, the main elements of the transport policy are international agreements on CO_2 emissions and other regulations, the internalization of transport externalities by means of taxation and feebates (charges raised by polluting vehicles then reallocated to less-polluting vehicles or other non-polluting transport), substantial funding of research and development for cleaner technologies, the promotion of new markets by the creation of niche status for novel systems, and the privatization of the operation of transport systems (funding of new infrastructure would remain as a public sector responsibility). Owing to the political goal of social equity, transport services to particular disadvantaged groups would be the only form of subsidised transport.

5.3. *Policy actions*

The final stage in the scenario-building process is to describe in detail the range of policy actions necessary to achieve the Visions set out here as a set of policy packages discriminated by time (paths). It should be noted that these policy actions are not prescriptive, but give an indication of the scale and nature of change required. In each of the two Visions it is estimated that the targets set at the beginning of the analysis can be achieved if these policies are introduced, so a scale of change in policy can be envisaged. It should also be noted that although different starting points have been taken in terms of the levels of political intervention and the balance between technological policies and decoupling policies, there is a substantial overlap between the policy measures actually used (table 6). In addition to the policy actions highlighted here for the city, there are other complementary actions that need to be taken by national and international governments on taxation, pricing, research and development, and emissions. For example, most of the actions under the technological heading (table 6) are the responsibility of government. All actors at all levels need to be fully involved if sustainable transport in cities is to become a reality.

In the scenario-building process (figure 1), experts are presented with the Visions and the policy packages and paths, for discussion and modification. Validation by experts is an important part of the development of targets, visions and policy paths, as this process allows changes to be made in the elements of the scenario-building process, and it also helps to identify where barriers to implementation are likely to occur.

6. Conclusions

The logic of the argument presented here can be summarized as follows:

- Growth in transport, particularly by car, is not sustainable.
- The eco-car will, in the next 10 – 15 years, begin to reduce the environmental impact of the car.
- However, the problem of congestion will remain as the capacity of the road system will not increase at a sufficient rate to meet the growth in demand.

Table 6. Possible policy actions to 2020.

	Vision 1	Vision 2
Technology		
Efficiency	Increase real fuel prices by 7% pa	Increase real fuel prices by 5% pa
	Insurance and tax related to efficiency of vehicles and charged on fuel	
	Targets to industry to achieve 19 km per litre for all new vehicles	
	Research into fuel cells funded by the EU and industry	
	Targets to industry to produce a commercial fuel cell vehicle by 2005	
Weight	Research on new lighter materials for vehicles	
Fuel	Raise deisel fuel prices by 50% in real terms over 5 years	
	Agreement to phase out diesel in cities	
	Hybrid diesel vehicles for city (electric) and non city (diesel) use	
	No new car tax on electric vehicles	
Scrapping	Scrap non-catalytic vehicles — completed by 2005	
	Research on new add on technology — next generation introduced by 2005	
Demand management		
Financial	New car tax levied at 10% of total cost increasing to 50% by 2020	Road pricing introduced in all cities — to double the real cost of using the car in the city
	Parking charges on all non residential parking spaces — 1000 ecu pa rising to 2000 ecu pa in 2020	
	Company car benefits eliminated by 2005	
	Elimination of subsidy to public transport by 2005	
Regulation	All main routes into the city with HOV lanes	
	Clear zones and no cars in city	Clear zones, but some clean car centre access to city centre
	Reallocation of road space to public transport and walk/bike	Remote sensing of emissions and efficiency tests with fines
	Bus and cycle networks	Limited bus and cycle networks
	Speed limits — 20 km/hr	Speed limit — 30 km/hr
	Extensive traffic calming and green spaces created	Some traffic calming
	Company transport plans — produced by all shops, employers, schools, hospitals, to reduce use of the car — clear targets for reductions 10% by 2005, 25% by 2020	
	Concentration of new development — mixed uses and compact	Less control over development — some peripheral development, but lower city densities
Technology	High quality real time information available on all public transport in home, local centres and through communicators	
	Investment in local telecentres, videoconferencing facilities	All banking and other services remote
	Smartcards available for all travel transactions	Interactive multimedia for conferences and distance learning

(*continued*)

Table 6 (*concluded*)

	Vision 1	Vision 2
Lifestyles and attitudes	Local schemes for car sharing Community based car rental schemes All cities to have park/bike and ride schemes Access to cities limited to those with clean vehicles and high occupancy levels Local communities involved in monitoring traffic and pollution levels	Personal communicators to journey match and link activities Market for public transport Roads managed privately

- Additionally, in Europe, space is at a premium and most of the available open land is protected—cities are at a higher density and the use of public transport is still significant—so there is an opportunity for positive action.
- The city is seen as being central to sustainable development as people live in close proximity to services and facilities, and levels of accessibility are high. The majority of people will continue to live in cities. The quality of life in the city must be seen as being instrumental to sustainability—it must be maintained and improved so that the public choose to live there,
- The starting point here has been sustainable mobility—no additional use of non-renewable resources to be consumed in transport 1995–2020.
- Through a sophisticated scenario-building process two Visions of the Future 2020 have been described, given certain targets, external and strategic elements.
- Policy packages and paths have been developed that emphasize technology and decoupling policies to achieve the targets set.
- The backcasting elements of the scenario building suggest that actions are required now to achieve the targets that have been set.

Within the US literature, similar arguments have been promoted, but from very different starting points and through different methodologies. The two most important contributions have come from Downs' vision (1994) of Bounded High Density cities and Calthorpe's (1993) Transit-Oriented Development. Downs has taken as his model the growth patterns in many EU cities where expansion has been limited to strongly enforced planning controls within which nearly all growth takes place. Densities are maintained at overall levels of $\sim$40 persons per hectare (similar to current levels in London—4300 persons per km^2). Higher job and residential densities permit greater reliance on public transport. The key to success is strong regional governance, similar to the conditions used in the two Visions constructed here. Calthorpe (1993) tries to promote the use of public transport and walking through controls of urban development and the encouragement of mixed land-uses, walkable spaces, infilling and re-development along public transport corridors, and high-quality urban spaces. Transit-oriented developments (TOD) are organized at the regional level as compact and public transport supportive. His three types of TOD consist of Urban TOD near to interchanges, Neighbourhood TOD farther

away from Public transport, and Secondary Areas with lower-density residential developments. These concepts are similar to the Dutch ABC location policy which is based on accessibility criteria and mobility requirements.

There does at least seem to be emerging consensus that sustainable transport must depend on people wanting to live at medium densities in cities so that journey lengths can be reduced. The imperative seems to be much stronger in the EU than the USA for the reasons discussed here, but substantial barriers to action still remain.

(1) *Selling the visions*—the key to successful implementation must be the acceptability of action and the involvement of all parties in that process. Central to the debate here is the use to which revenues from transport-related taxes and charges will be put. Whether they will be invested in public transport, in improving the quality of the urban environment, in promoting research and development, in setting up innovation funds to assist particular projects or merely adding to exchequer revenues remains to be seen.
(2) *The car and the city*—by reducing the levels of congestion in cities and making cities liveable, will the need to own a car also be reduced? High-quality public transport, the use of paratransit and taxis, together with imaginative forms of rental, may all lead to a reduction in the levels of car ownership (table 5). If there is a general reduction in car use, then the potential market for the eco-car may also be reduced, thus making it less attractive for the motor manufacturers and governments to invest heavily in research and development.
(3) *Carbon taxes*—there may be a general move to switch taxation away from employment-based to consumption-based measures. Substantial increases in fuel taxes have taken place in some countries to achieve target reductions in CO_2 emissions, but there are distributional issues that need to be addressed, particularly as they relate to low income car owning households. The possibilities of tradable permits were discussed at Kyoto, but fundamental differences were apparent between the cities. Rich countries want to buy the pollution allocation not used by the poorer countries, or they want to invest in clean technology in the poorer countries, as this is seen to be the cheapest way to reduce global emissions.
(4) *Transferability*—the basic thinking here has been to develop Visions of the Future appropriate to European cities as to how a sustainable transport strategy can be pursued. Although different starting points and assumptions have been made, a clear commonality of paths (and individual measures) has been established. At this level, the alternatives available seem both consistent and practical, given the underlying commitment of governments, business, interest groups and individuals. Yet there is still the unresolved question of transferability, as there are many institutional and organizational differences, as governments have their own agenda, as there are variations in the environmental context, and as the powers and controls available to governments vary, even between cities in the EU. The underlying rationale here is that these differences are acknowledged, but the aim is to discuss the range of possibilities. In that respect, it is concluded that realistic Visions of the transport-sustainable city 2020 is desirable, possible and achievable in all contexts.

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References

Banister, D., 1997, Reducing the need to travel. *Environment and Planning B*, **24**, 437 – 449.

Banister, D. and Steen, P., 1999, Policy scenario building for sustainable mobility. Paper presented at the ESF/NSF TransAtlantic Research conference on Social Change and sustainable Transport (SCAST), University of California at Berkeley, CA, March.

Banister, D., Dreborg, K., Hedberg, L., Hunhammer, S., Steen, P. and Akerman, J., 1998, Development of transport policy scenarios for the EU: images of the future. Paper presented at the 8th World Conference on Transport Research, Antwerp, July; to be published in *Innovation*.

Calthorpe, P., 1993, *The Next American Metropolis: Ecology, Community and the American Dream* (New York: Princeton University Press).

Dasgupta, M., 1993, Urban problems and urban policies: OECD/ECMT study of 132 cities. Paper presented at the International Conference on Travel and the City—Making it Sustainable, Dusseldorf, June (Paris: OECD).

Downey, M. L., 1995, Transportation trends. Paper presented at the Symposium on Challenges and Opportunities for Global Transportation in the 21st Century, Cambridge MA.

Downs, A., 1994, *New Visions for Metropolitan America* (Washington, DC: Brookings Institute).

Dreborg, K., 1997, The essence of backcasting. *Futures*, **28**, 813 – 828.

European Conference of Ministers of Transport, 1997, *Trends in the Transport Sector* (Paris: ECMT).

European Federation for Transport and the Environment (EFTE), 1994, *Green Urban Transport: A Survey*. Preliminary report 94/2, January (Brussels: EFTE).

EUROSTAT, 1997, *EU Transport in Figures—Statistical Pocketbook*, 2nd issue (Luxembourg: European Union).

Ewing, R., 1997, Is Los Angeles-style sprawl desirable? *Journal of the American Planning Association*, **63**, 107 – 126.

Kahn, H. and Wiener, A. J., 1967, *The Year 2000: A Framework for Speculation on the Next Thirty-three Years* (Stockholm: Beckmans).

National Economic Research Associates (NERA), 1997, *Motor or Modem*? Report prepared for the UK Royal Automobile Club, London, November.

OECD, 1995, *Motor Vehicle Pollution: Reduction Strategies Beyond 2010* (Paris: OECD).

OECD/ECMT, 1995, *Urban Travel and Sustainable Development* (Paris: OECD/ECMT).

POSSUM, 1998, *Final Report on Policy Scenarios for Sustainable Mobility*. December (Brussels: CEC).

Rienstra, S., Stead, D., Banister, D. and Nijkamp, P., 1997, Assessing the complementarity of common transport policy objectives: a scenario approach. *Innovation* **10**, 273 – 287.

Robinson, J. B., 1990, Futures under glass; a recipe for people who hate to predict. *Futures*, **22**, 820 – 842.

Salomon, I. and Mokhtarian, P., 1997, Coping with congestion: reconciling behavioural responses and policy analysis. *Transportation Research* D, **2**, 107 – 123.

Schleicher-Tappeser, R., Hey, C. and Steen, P., 1998, Policy approaches for decoupling freight transport from economic growth. In *Proceedings of the 8th World Conference on Transport Research*, Antwerp, July.

World Health Organisation (WHO), 1997, *Creating Healthy Cities in the 21st Century*. Background paper prepared for the Dialogue on Health in Human Settlements for Habitat II (Geneva: WHO).