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Developing Sustainable Urban Land Use and Transport Strategies

# A Decision Makers' Guidebook



ENERGY, ENVIRONMENT  
AND SUSTAINABLE DEVELOPMENT





Procedures for Recommending Optimal Sustainable Planning of European City Transport Systems

Deliverable N°15

## Decision Makers' Guidebook

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# 1. Outline of the Guidebook

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### Where can I find out more?

This Guidebook was originally published in January 2003 as part of the PROSPECTS project. It has been updated to reflect the work in the other projects in the European Commission's Land Use and Transport Research (LUTR) cluster. Further details of this cluster of projects are given in the references section on page 52.

This Guidebook is supported by two others: a Methodological Guidebook which explains how a particular option can be implemented, and a Policy Guidebook which explains how particular policy instruments work, based on real life experience. We have based this Guidebook on a study of decision-making in European cities, PROSPECTS, conducted under the European Commission's City of Tomorrow and Cultural Heritage programme. This included a survey of some 60 cities, results of which are presented in the relevant chapters. Further details of the project, and of other useful sources of advice, are given in the bibliography. A box at the end of each section suggests key references.

## Our approach

We have designed this Guidebook to help all those involved in decisions on land use and transport, in cities throughout Europe, whether as politicians, professional advisers, stakeholders or individual citizens. Transport and land use planning have become increasingly complex. In section 2 opposite we highlight some of the challenges which cities face. In this brief Guidebook, we suggest a structured approach to tackling these challenges. At each stage we have focused particularly on two questions: why an issue is important, and what the options are for tackling it. We have tried not to be prescriptive, because we appreciate the diversity among the cities of Europe, and we respect the desire of each city to plan its own future. However, we hope that our suggestions will simplify the complex planning task. The original version of this Guidebook, published in January 2003, was based on the work of the PROSPECTS project. In this revised version we have drawn on the output of a further eleven projects in the Land Use and Transport Research (LUTR) programme, and on related research and policy guidance.

## The structure of the guidebook

In Section 2 we review the challenges which cities face. In Section 3 we consider the decision-making context, including the freedom which cities have to develop their own policies. In Section 4 we outline a number of possible approaches to decision-making. We consider the relative merits of each, and encourage cities to choose which suits them best. In Section 5 we look at the options for facilitating effective participation to support all these approaches. In Section 6 we propose a logical structure for decision-making, which can be used with any of these approaches, and identify the key steps in that process.

Sections 7 to 15 follow the logical structure in Section 6. In Section 7 we review the objectives which cities might set for land use and transport strategies, possible indicators of performance against those objectives, and the role of targets. In Section 8 we consider the alternative approach of identifying problems to be overcome. In Section 9 we identify the full range of land use and transport policy instruments which might be used in tackling these problems, and in Section 10 the barriers to be overcome in using these policy instruments. Section 11 outlines ways in which overall strategies can be formulated using packages of policy instruments in ways which overcome the barriers to progress. In Sections 12, 13 and 14 we review the range of analytical techniques available for predicting the performance of these strategies, appraising their performance against the objectives, and developing optimal strategies. In Section 15 we consider good practice in implementation and in monitoring performance.

Section 16 presents four case studies of cities which have adopted some or all of these approaches. Section 17 provides a brief glossary, and Section 18 a bibliography.



## 2. The Challenge of Sustainable Mobility

### Complex decision-making responsibilities

Traditionally, transport and land use decisions have been made solely by elected politicians, advised by expert professionals. Life is now much more complicated. Very few cities are “islands”, so policies are influenced by neighbouring towns and cities, as well as by regional, national and European policy. Fewer policy decisions can now be taken solely by government. The private sector and agencies are increasingly responsible for public transport, road construction and land use decisions. Increasingly, too, those affected as users, businesses and residents expect to be fully involved in decision-making.

### Complex interactions and multiple objectives

Decisions on specific policies can often appear deceptively simple. A new light rail line, for example, seems a good idea because it provides faster public transport, attracts people out of cars, and hence enhances the environment. But will other drivers simply use the resulting road space? Will light rail encourage longer distance commuting? Is it the best solution for the poorest residents? And is it the most cost-effective way of improving conditions? Urban land use and transport are a complex system, and the knock-on effects of any one decision may be difficult to predict and sometimes counter-intuitive. Increasingly, too, cities are concerned with the wider impacts of transport on other social issues, such as health, education and social inclusion. What is best will depend very much on the emphasis which a city gives to reducing congestion, improving the environment, stimulating healthier lifestyles, strengthening the economy and protecting those who are disadvantaged.

### A wide range of options

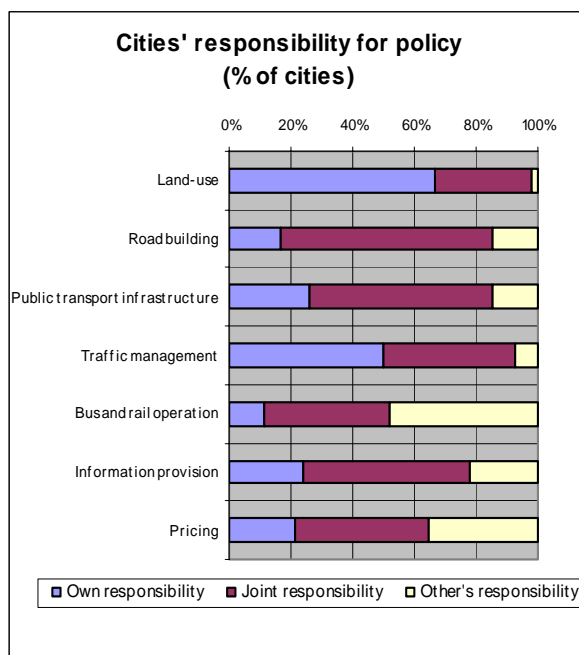
Fortunately, we now have available a much wider range of possible policy interventions, including land use, information technology, management and pricing to add to the conventional provision of new infrastructure. However this, too, brings its challenges. We know much less about the potential of some of these newer instruments, or how well they work in different situations. Increasingly, too, the best solution will be a package of measures, and we need to understand how best to design such integrated approaches.

### Barriers to progress

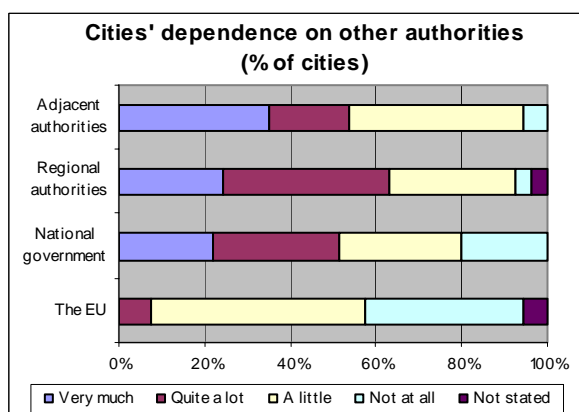
A further challenge is the range of obstacles which limit a city's ability to implement these individual policy instruments. Such barriers include the complex institutional structures mentioned above, but also legal restrictions on the use of certain measures, financial restrictions on the overall budget or the ways in which it can be spent, political and public opposition to certain types of policy instrument, and practical limitations on physical and technological changes. Failure to adopt a logical process for strategy development can also impose a barrier to effective planning. We hope that this Guidebook will help cities to avoid this.



### 3. The Decision-Making Context



Source: PROSPECTS D1



Source: PROSPECTS D1

#### Three types of integration are needed

- Horizontal: between sectors within an authority
- Spatial: between adjacent authorities
- Vertical: between tiers of government

Source: DGENV(2005)

#### What limits cities' ability to make their own decisions?

Cities are rarely able to make decisions on land use and transport strategies on their own, but the constraints on them differ from city to city. We have identified three types of constraint, and found, in PROSPECTS, that it is typically medium sized cities which suffer most from them; smaller cities often have more freedom, while larger ones often have more power.

#### Lack of direct control

Most cities have some division of responsibility for some policy areas. While many have exclusive responsibility for land-use and for traffic management, most share responsibility for road building, public transport infrastructure and information provision. However, a significant number do not have direct responsibility for public transport operations or pricing measures. In some cases the responsibility lies with other levels of government, but increasingly it is the private sector which determines public transport and pricing decisions. Within cities there is the further problem that responsibilities, particularly for land use and transport, are often split between departments. This problem is becoming more serious as the interactions between transport and other policy sectors such as health and social policy become more important. Lack of horizontal integration between these sectors, and their disciplines, can be a significant barrier to progress.

#### Intervention from other levels of government

Even where cities have direct responsibility, they may well be influenced strongly by adjacent authorities, by regional bodies, and by national or European government. As we found in PROSPECTS, all cities' decisions are influenced to some extent by other governmental authorities. The strongest influence comes from adjacent authorities; that from the European Commission is much the weakest.

#### Involvement of other stakeholder groups

Business, environmentalists, transport users, the general public and the media can all have a major influence on decision-making. In the cities which we surveyed in PROSPECTS, business and the general public have the greatest influence, and transport users the least.

#### How should cities respond to these influences?

##### Institutional integration

There is no single answer to this question. Each city will experience different constraints and need to decide how best to handle them. This is one reason for making this guidebook advisory rather than prescriptive. However, some general guidance is possible. The key first step for each city is to understand who can influence decisions and to what extent. The second is to involve them in as many stages of the decision-making process as possible. Where other agencies are directly responsible for specific policy instruments, some form of partnership will be needed, preferably in a form which is legally binding. Where other government bodies have an influence, arrangements for joint working can help. DGENV stresses the importance of horizontal integration between the sectors within an authority, spatial integration between adjacent authorities, and vertical integration between tiers of government. An EU project on

institutional issues, TIPP, makes a series of recommendations both for more effective institutional structures and for working more effectively within existing ones.

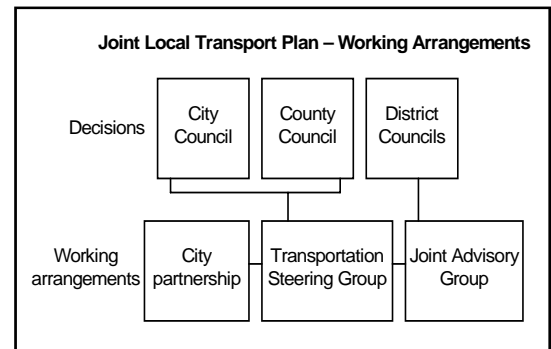
In the UK example shown, two tiers of government (city and county) work together, and adjacent lower tier authorities (districts) contribute advice. In the Norwegian region of Jaeren, 10 municipalities and the county have jointly developed a sustainable land use and transport strategy for the city region, through consensus and with active encouragement from government.

### Stakeholder involvement

Other stakeholders should be encouraged to participate fully in strategy formulation (Section 5). It should thus be possible to develop a common understanding of objectives, the problems to be tackled, and the possible strategies and implementation sequence. However, each group will have its own objectives and priorities, and compromises may be needed. In such situations it is important not to lose sight of the overall goal, and to reach agreements which get closest to meeting the city's objectives. In some cases, it will be possible to have significant impact on the decisions of the other agencies involved; in others, where they are wholly free agents, it may be that their decisions will run counter to the overall strategy. A permanent joint monitoring body can help to maintain cooperation. In the extreme, where an agency prohibits progress towards an otherwise agreed strategy, it may be necessary to seek changes in legislation to permit more effective strategy formulation.

### How far ahead should cities plan?

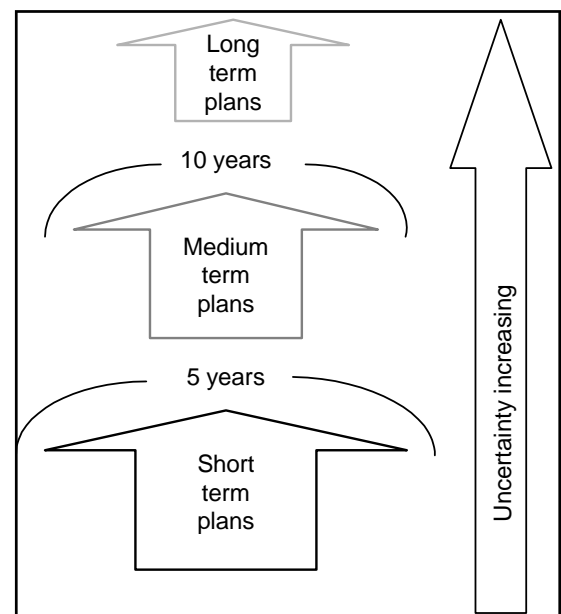
Most countries require cities to produce plans, and specify a time horizon for them. For example, French Plans de Deplacements Urbains are required to look ten years ahead; UK Local Transport Plans are developed for a five year period within the context of a 15 to 20 year strategy. The EC is considering a recommendation that all cities of over 100,000 population should be required to produce Sustainable Urban Transport Plans, covering a five to ten year period, within the context of a 20 to 30 year horizon. In PROSPECTS, we found that most European cities produced short term plans, but there were differing views on the need for medium and long term planning. Most medium term plans cover a five to ten year period, and most long term plans a period of ten to twenty years. Our guidance is aimed at cities which are planning over a five to twenty year period, and should help in responding to any requirements from the EC. Longer term plans are appropriate where land use and infrastructure changes are being considered, since these may take time to implement, and will certainly continue to influence the way in which the city develops over a longer period. However, the further into the future we predict, the less certain will be the circumstances in which our plans will operate. There is therefore a trade-off between need to consider longer term effects and uncertainty in doing so. Two approaches to tackling this are formulating strategies for different scenarios, which we consider in Section 11, and appraisal under uncertainty which we look at in Section 13. Provided that one or both of these are pursued, it makes sense to produce combined land use and transport plans over a 15 to 20 year period, and to develop shorter and medium term plans in that context.



Source: DETR (2000)

### Stakeholder involvement

- Identify who can influence decisions
- Involve them fully
- Form partnerships where possible
- Encourage active participation of others
- Compromise without losing sight of objectives
- Seek changes in legislation where necessary



### Where can I find out more?

DETR (2000)  
ECMT (2002)  
PROSPECTS D1  
TRANSPLUS  
DGENV (2005)  
TIPP (2005)

References... Section 18

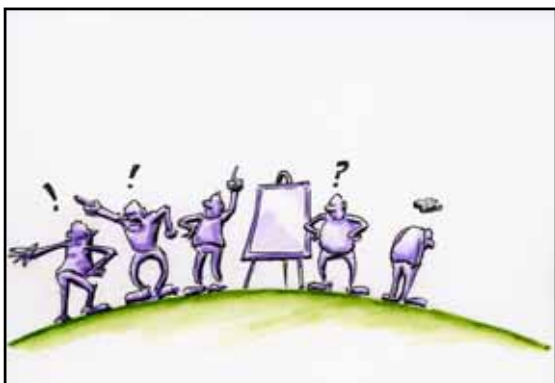
## 4. Approaches to Decision-Making



### The 'muddling through' model

- Objectives implicit, not explicit
- Remedial action incremental
- Frequent policy decisions
- Several centres of power and influence
- Attempts to obtain consensus
- Satisficing rather than seeking the best solutions

Source: Mackie and Nellthorp (2003)



### Rational analysis or “muddling through”?

Early studies of policy making highlighted two extreme approaches to decisions: a rational, analytical approach which leads inexorably to the “right” solution, and a less organised approach, often called “muddling through”, in which objectives are never specified, remedial action is taken when it becomes essential, and more important decisions are dependent on the power struggles between interest groups. While this second model can be seen at work in many of today’s cities, it is unlikely to be effective in tackling the challenges of unsustainability which we face. Equally an extreme reliance on analysis is inappropriate in a situation in which priorities and preferences differ and outcomes are uncertain. We have therefore looked for practical approaches between these extremes.

### Which approaches have been used?

Cities differ in the ways in which they make decisions, but their approaches have often developed over time, rather than being formally prescribed. In our surveys we suggested three broad approaches: vision-led; plan-led; and consensus-led, and asked our cities to indicate which one or two of these best characterised their approach.

Vision-led approaches usually involve an individual (typically the mayor or committee leader) having a clear view of the future form of city they want, and the policy instruments needed to achieve that vision. The focus then is on implementing them as effectively as possible. Relatively few cities have a visionary leader in this sense, but there is evidence that in the past those which do have made the most progress.

Plan-led approaches involve specifying objectives and problems, sometimes in the context of a vision statement, and adopting an ordered procedure identifying possible solutions to those problems, and selecting those which perform best. In the true Objectives-led Approach the city first specifies its broad objectives (Section 7). Problems are highlighted as failure of current or predicted future conditions to meet the objectives. This list of problems can then be discussed with stakeholders to see whether they have different perceptions of the problems. If they do, objectives are redefined accordingly. The main drawback with this approach is that many politicians and members of the public are less familiar with the abstract concept of objectives (such as improving accessibility) than they are with concrete problems (such as the nearest job centre being 50 minutes away). Two variants are the Target-based Approach (Section 8) and the Problem-oriented Approach (Section 8).



Consensus-led approaches involve discussions between the stakeholders to try to reach agreement on each of the stages in the plan-led approach outlined in Section 6. Ideally agreement is needed on the objectives to be pursued and their relative importance; the problems to be tackled and their seriousness; the policy instruments to be considered and their appropriateness; the selection of policy instruments which best meet the objective; and the way in which they should be combined into an overall strategy, and implemented. In practice much consensus-building focuses on the choice of policy instruments, but it can be considerably enhanced by considering objectives and problems as well. Section 5 discusses participation for consensus building more fully.

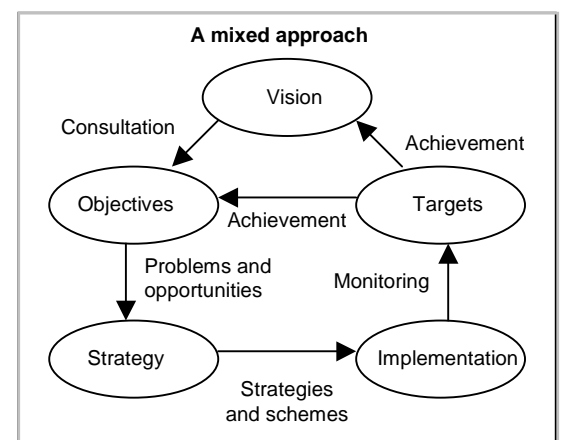
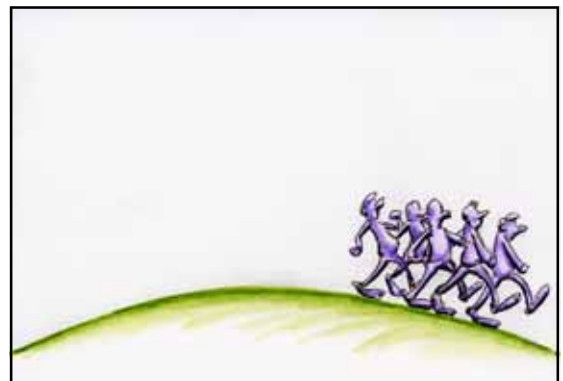
### Which approaches do cities adopt?

Few of the cities in the PROSPECTS survey considered that they adopted any one of these approaches alone. The most common approach is a mix of plan-led and consensus-led decision-making. The least common were those which focus primarily on visions or plans.

### Which approach is best?

There is no simple answer to this question. There are some useful references on decision-making which consider the alternatives, but no clear agreement between them. However, there are some obvious pitfalls. A vision-led approach is critically dependent on the individual with the vision. If he or she leaves office, it may prove very difficult to avoid completely abandoning the strategy. A plan-led approach can become unduly dependent on professional planners, who may lose sight of the needs of politicians and stakeholders. A consensus-led approach may, unless agreement can be quickly reached and sustained, lead to delay and inaction. Not surprisingly, therefore, most cities adopt a mixed approach. The diagram shows an example from UK practice of a cyclical approach, in which vision, objectives and problem specification are determined through consultations, used to develop the strategy, and reviewed in the light of experience with implementation.

It is best therefore to choose the combination of approaches which best suits a city's circumstances but, having done so, maintain it, and hence the future development of the strategy.

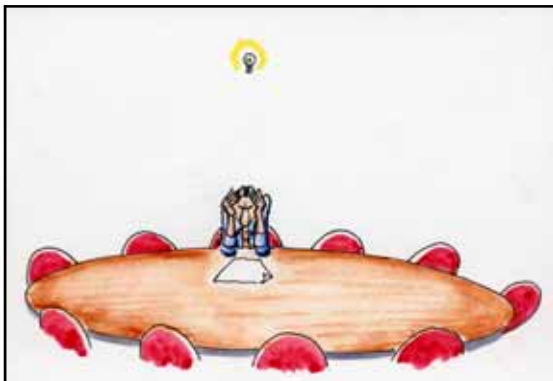


### Where can I find out more?

DETR (2000)  
Mackie & Nellthorp (2003)  
PROSPECTS D1

References... Section 18

## 5. Participation



### Levels of participation

- Information provision
  - Consultation
  - Deciding together
  - Acting together
  - Supporting independent stakeholder groups
- Source: Willcox (1994)



### The benefits of active participation

- Clearer identification of problems
  - Improving the quality of the resulting plans
  - Developing a common basis for action programmes
  - Raising awareness and encouraging changes in behaviour
  - Overcoming conflicts and streamlining implementation
  - Initiating social empowerment of participants
- Source: TRANSPLUS

### What is participation?

Participation involves stakeholders in the development of a transport strategy. This involvement can occur on a number of different levels:

- Information provision: a one-way process to keep those with an interest in the strategy informed
- Consultation: where the views of stakeholders and the general public are sought at particular stages of the study and the results are input back into the strategy formulation
- Deciding together: where the stakeholders become decision-makers and work with the decision-makers and professionals in formulating the strategy. Citizens' forums and Planning for Real® are examples
- Acting together: where stakeholders also become involved in the implementation of the strategy. Public-private partnerships are one example of this approach
- Supporting independent stakeholder groups: where the city enables community interest groups to develop their own strategies

No one level is intrinsically better and different levels are appropriate for different stages in the development of a strategy, or for strategies tackling different scales of problem. Several LUTR projects have reviewed, or developed, methods for participation. TRANSPLUS considered a wide range of methods; ECOCITY carried out an evaluation of selected approaches; ARTISTS developed a method for the redesign of arterial streets involving visioning, focus groups and design workshops.

### Why is participation important?

There is increasing emphasis on public participation in land use and transport planning. In many cases it is now specified as part of the planning process, and in some countries it is required under law. Participation is central to the consensus-led approach to decision-making (Section 4), but it can also increase the success of vision-led and plan-led approaches. Wide participation can ensure that the full range of objectives is considered. It can provide a better understanding of transport problems, help generate innovative solutions and be a key factor in gaining public support and acceptability for the final mix of policies needed to deliver a transport strategy. Participation can save time and money later in the process, particularly at the implementation stage, as potential objections should have been minimised by taking stakeholders' concerns into account. TRANSPLUS, which studied participation in detail, identified the following benefits of active participation:

- Clearer identification of problems
- Improving the quality of the resulting plans
- Developing a common basis for action programmes
- Raising awareness and encouraging changes in behaviour
- Overcoming conflicts and streamlining implementation
- Initiating social empowerment of participants

## When should participation take place?

A decision on whether and how to employ participation is best taken when the strategy formulation process is being designed. It is important to be clear on the objectives of participation at this early stage. For the more inclusive levels of participation, the stakeholders need to agree on the ways in which they are to be involved. As the benefits identified in TRANSPLUS suggest, there is a good case for involving participation at all of the key stages in the development and implementation of a transport strategy, as outlined in Section 6. It can contribute in all the ways shown in the box. DGENv suggests that participation and consultation, covering all of these stages, should be a mandatory element of the preparation of Sustainable Urban Transport Plans.

Participation can also continue beyond implementation, by contributing to monitoring of progress and maintaining the success of the strategy. In some cities, consumers have a continuing involvement in decision-making.

## Who should be encouraged to participate?

A clear understanding of the objectives of participation should help determine who should be involved. The appropriate stakeholders should include those organisations which are directly involved in the implementation of the strategy, and those who are likely to influence it; these broad groups are identified in Section 3. Those involved should include those who are affected by the strategy; help or hinder the public participation process; or have skills or other resources they might be able to devote to the development of the strategy or the public participation process. The box gives an example of the groups included in one guide on participation strategy. DGENv also argues that the wider public should be regularly informed of progress.

## Limits to participation

It is important to consider carefully what level of participation is appropriate and why participation is being sought. It is counter productive to involve the public in decisions which are not negotiable or which have already been made. It is sensible to state clearly at the outset of public participation the extent of the decisions which can be affected by the process. It is important to remember that consultation might not always be appropriate; it is perfectly legitimate for decisions to be taken by elected representatives.

It can be tempting to put together high quality materials and design a sophisticated participation strategy, but an approach which looks too professional can create barriers, may make issues appear too complex, and can often give the impression that the decision has already been made. Those involved need to be reassured that they have a genuine role to play. In some US cities, citizens' groups are given financial support to this end.

It can be particularly difficult to involve those who are less articulate and less involved in community affairs and there is a danger as a result that the strategy will not meet their needs and increase their isolation. In the extreme, it may be fairer to limit participation, rather than attempt a public participation exercise which might exclude significant elements within society.

### Participation can contribute to

- Determining objectives
- Assessing problems
- Identifying possible solutions
- Appraising alternatives
- Choosing a preferred strategy
- Implementation

### Groups typically included in a participation strategy

- Regional partners
- Local authorities
- Transport providers
- Business
- Transport users
- Statutory bodies
- Residents

Source: IHT (1996)



### Where can I find out more?

IHT (1996)  
Willcox (1994)  
PROSPECTS D2  
TRANSPLUS  
DGENV (2005)  
ARTISTS  
ECOCITY

References... Section 18

## 6. A Logical Structure



### Is a logical structure needed?

In Section 4, we argued that a practical approach to decision-making, between the extremes of rational analysis and “muddling through” was needed, and suggested three types of approach: vision-led, plan-led and consensus-led. We also indicated that most cities use a mix of these approaches. In the extreme, a vision-led approach does not need a logical structure for its development. The vision is clear, and all that is needed is to implement it. However, few cities can rely solely on such an approach. Where any element of the plan-led approach is involved, it is important to have an agreed sequence for the process. Where a consensus-led approach is adopted, the logical structure allows consensus to be reached at all the stages raised in Section 5. We make no excuse, therefore, for suggesting a logical structure which should help all cities to develop their strategies in a convincing and defensible way. While this part of the Guidebook is therefore prescriptive, the structure which we recommend still permits considerable flexibility in the decisions taken at each stage.

### What is the logical structure?

The diagram opposite presents the logical structure. In it:

Section 7

Section 8

Section 8

Section 9

Section 10

Section 11

Section 12

Section 13

Section 14

Section 15

Section 15

- A clear definition of objectives & indicators is the starting point
- They are used to define problems, now and in the future
- Scenarios can be used to identify alternative futures
- An alternative is to start with identifying problems, while checking that all objectives have been covered
- Possible instruments are suggested as ways of overcoming the problems which have been identified
- Barriers to implementation will arise for certain policy instruments
- Strategies are developed as combinations of instruments, packaged to reduce the impact of the barriers
- The impacts of the individual instruments or the overall strategies are then predicted using a model
- The results for these options are then compared using an appraisal method based on the objectives
- This process may well identify ways in which the instruments or strategies can be improved
- It is possible at this stage to use optimisation techniques to help identify better strategies
- The preferred instrument or strategy is then implemented, and its performance assessed against the objectives; these results may help improve future predictions
- On a regular basis, a monitoring programme assesses changes in problems, based on the objectives



## Why are all these steps necessary?

This process may seem somewhat idealised, but it has several virtues. It provides a structure within which participation can be encouraged at all the key stages in decision-making. It offers a logical basis for proposing solutions, and also for assessing any proposals suggested by others. If the answer to the question “what problems would this strategy solve?” is unconvincing, the solution is probably not worth considering. It ensures that the appraisal of alternative solutions is conducted in a logical, consistent and comprehensive way against the full set of objectives. It provides a means of assessing whether the implemented instruments have performed as predicted, and therefore enables the models used for prediction to be improved. It thus provides the essential source material for our Policy Guidebook. Finally, regular monitoring provides a means of checking not just on the scale of current problems, but also, through attitude surveys, on the perception of these problems.

## How closely is this structure adopted in practice?

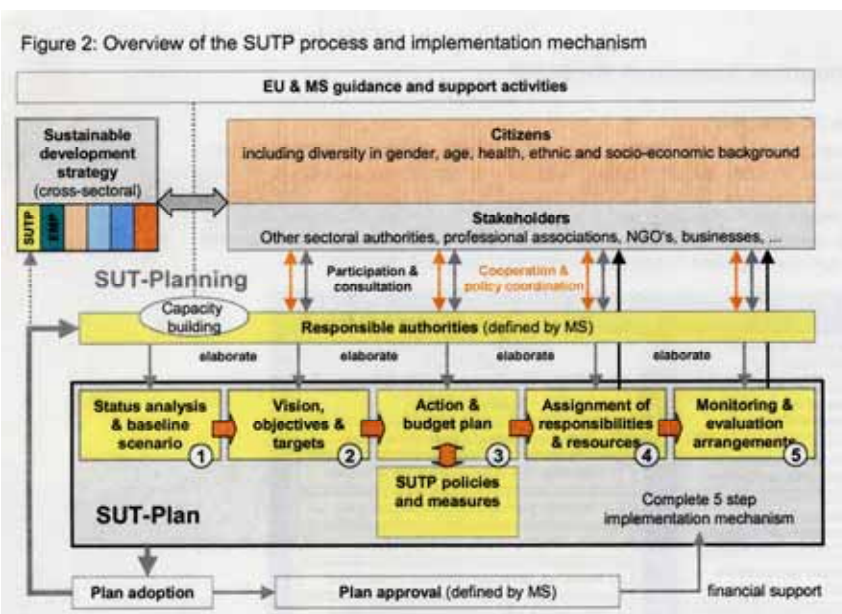
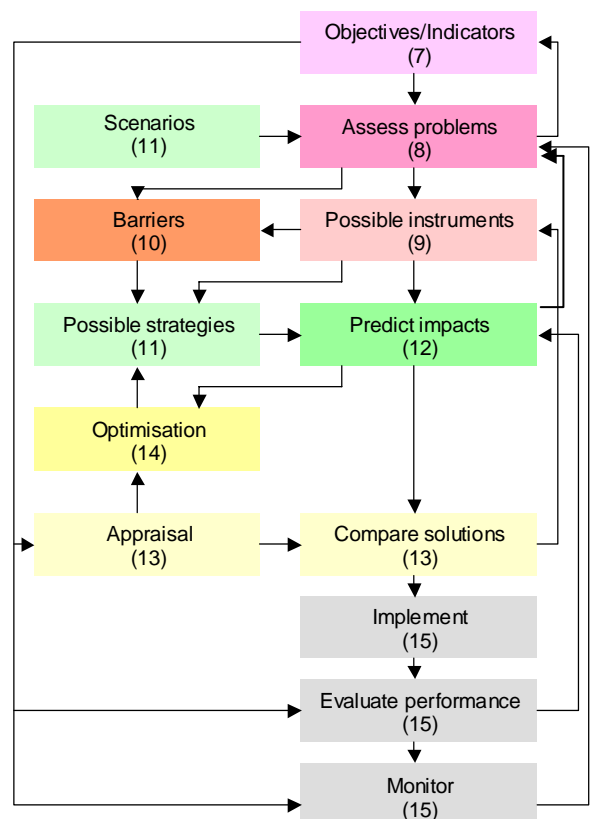
It is important to stress that few cities follow this logical approach in its entirety. This is clear in the four case studies which we present in Section 16. However, where they have not done so this has often led to weaknesses in their overall strategy:

- Policy instruments suggested without being clear which problems they would overcome or whether they are the best solution
- Strategies developed without considering the likely barriers to their implementation
- Appraisal against selected objectives, thus overlooking some adverse impacts
- Implementation without checking afterwards whether the strategy is operating as planned

It is to avoid these pitfalls that we recommend that the full sequence be followed where possible. However, a few elements are optional; we identify these in later sections.

The structure which we advocate matches closely that proposed by DGEEnv for Sustainable Urban Transport Plans, as shown in the diagram, which also indicates the linkages with citizen and stakeholder participation and with wider urban strategies.

**The logical structure**



Source: DGEEnvironment (2005)

MS: Member States



## 7. Objectives, Indicators and Targets



### Clear objectives can

- Help to identify the problems to be overcome
- Provide guidance on the types of solution
- Act as constraints, in clarifying what should be avoided
- Provide the basis for appraisal of alternative solutions
- Enable progress in implementation to be monitored



### A sustainable transport system

- Provides for basic access and development needs
- Supports safety and human and ecosystem health
- Promotes equity within and between successive generations
- Is affordable, fair and efficient
- Offers choice of transport mode
- Supports a competitive economy and balanced regional development
- Limits emissions and waste within the planet's ability to absorb them
- Uses resources at rates which permit renewal or substitution
- Minimises impacts on the use of land and the generation of noise

Source: EC (2001) in DGENV(2005)

### How can cities formulate a vision?

Whether they have a visionary leader or not, many cities develop a statement of vision as a basis for developing their strategies for transport and other sectors. As with other elements of strategy development, these vision statements are likely to be more acceptable, and effective, if they are generated in partnership with the city's stakeholders. These vision statements may well not mention transport at all, but instead focus on aspirations such as economic competitiveness and opportunities for all. The key will be to determine how a transport strategy can contribute to such a vision. The answers to this question may well help in specifying the objectives of the transport strategy.

### Why do we need to specify objectives?

In developing a land use and transport strategy, it is essential to be clear what the strategy is designed to achieve. Objectives are broad statements of the improvements which a city is seeking in its land use and transport system. They are thus the starting point for our logical structure (Section 6). They serve several functions (see box).

Objectives specify the directions for improvement, but not the means of achieving them. In setting objectives, it is therefore important to avoid including indications of preferred solutions (e.g. 'improving the environment through better public transport'); this may cause other and better policy instruments to be overlooked.

### How should objectives be determined?

It is important that decision-makers determine the objectives which they wish to pursue. However, it is preferable to reach agreement on them with other stakeholders; this is often a key first stage in participation (Section 5). In some countries, local objectives are specified by national government; even so, cities should check whether these represent the full range of their aims. In practice many cities adopt rather similar objectives, and we set out below the ones which we have identified. For many cities, these objectives all contribute to a higher level goal of increased sustainability.

### What do we mean by sustainability?

There is ample evidence that European city transport systems are unsustainable, in terms of their growing levels of congestion, pollution, fuel consumption and accidents, the adverse effects on the economy, and the increasing polarisation of opportunities to travel. Sustainable development was defined by the Brundtland Commission as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Most cities transport systems would fail this test.

In 2001 the EU Transport Council adopted the definition of sustainable urban transport shown in the box.

## Which objectives are relevant to the pursuit of sustainability?

This definition of sustainability provides a basis for identifying eight more specific objectives, all of which should contribute to sustainability.

### Economic efficiency

Economic efficiency involves maximising the benefits which users can gain from the transport system, after taking account of the resource costs of provision and operation of the transport system.

### Protection of the environment

This objective involves reducing a number of adverse impacts of the transport and land use system: regional pollutants such as  $\text{NO}_x$  and  $\text{SO}_2$ ; local pollutants such as particulates, and their impacts on health; noise and vibration; visual intrusion; fragmentation and severance of settlements and biodiversity; urban sprawl; and loss of cultural heritage and natural habitats.

### Liveable streets and neighbourhoods

This objective is focused on streets and outdoor conditions in residential areas. It includes the positive external effects on social, cultural and recreational activity in neighbourhoods, increased freedom of movement on foot and bicycle, and reduced sense of danger for these modes. It is linked to, but separate from, the environmental and safety objectives.

### Safety

This objective straightforwardly involves reducing the numbers of accidents for all modes, and reducing the severity of those which occur. However, since some locations, age groups and modes have higher accident rates than others, the safety objective also has equity implications.

### Health

Pollution, noise and accidents affect health, but so does the stress of living and working in congested cities. Increasingly the lack of exercise offered by an increasingly motorised transport system is being seen as an even greater threat to health. Once again, these impacts affect some groups in society more than others.

### Equity and social inclusion

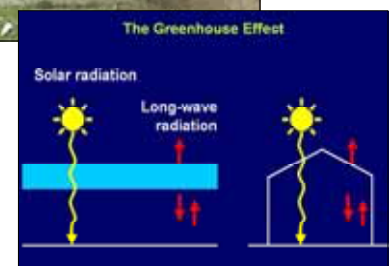
Under equity the principal concerns are the need for reasonably equal opportunities to travel, costs of travel and environmental and safety impacts of travel. Within social inclusion we include accessibility for those without a car and accessibility for those with impaired mobility. True equality of opportunity will never be feasible, but consideration needs to be given to compensating those with the fewest opportunities or the greatest costs.

### Contribution to economic growth

Land use and transport policies should support economic growth. Transport improvements which improve access or enhance the environment can lead to increased economic activity and possibly to sustained economic growth.

### Intergenerational equity

While all of the above objectives are important for today's cities, many of them will have implications for future generations also. But three impacts of today's activities will particularly impact on future generations: greenhouse gas emissions, and particularly  $\text{CO}_2$ , which will affect longer term climate change; consumption of land; and depletion of non-renewable resources, of which oil is perhaps the most important.





**PROPOLIS Indicator System**

	Theme	Indicator
Environmental indicators	Global climate change	Greenhouse gases from transport
	Air pollution	Acidifying gases from transport Volatile organic compounds from transport
	Consumption of natural resources	Consumption of mineral oil products, transport Land coverage Need for additional new construction
	Environmental quality	Fragmentation of open space Quality of open space
Social indicators	Health	Exposure to PM from transport in the living environment Exposure to NO <sub>2</sub> from transport in the living environment Exposure to traffic noise Traffic deaths Traffic injuries
	Equity	Justice of distribution of economic benefits Justice of exposure to PM Justice of exposure to NO <sub>2</sub> Justice of exposure to noise Segregation
	Opportunities	Housing standard Vitality of city centre Vitality of surrounding region Productivity gain from land use
	Accessibility and traffic	Total time spent in traffic Level of service of public transport and slow modes Accessibility to city centre Accessibility to services Accessibility to open space
Economic indicators	Total net benefit from transport	Transport investment costs Transport user benefits Transport operator benefits Government benefits from transport Transport external accident costs Transport external emissions costs Transport external greenhouse gases costs Transport external noise costs

Source: PROPOLIS

## Why is it important to decide which objectives are most important?

Usually it is not possible to satisfy all of the objectives which may be desirable, as some of them will conflict; for example it is often difficult to improve accessibility without intruding into the environment. Therefore it is helpful to be able to trade off performance against different objectives, so that these conflicts can be more easily resolved. Priorities between objectives are a matter for political judgement which is exercised by the decision-maker, but other stakeholders' views can be judged as part of an effective participation campaign (Section 5).

## Why is it helpful to specify indicators?

Objectives are abstract concepts, and it is thus difficult to measure performance against them. Indicators are ways of quantifying objectives or sub-objectives. For example, casualty numbers would measure the overall safety objective; locations exceeding a pollution threshold a part of the environmental objective. This type of indicator is often called an outcome indicator (see box), in that it measures part of the outcome of a strategy. It is also possible to define input indicators, which measure expenditure and resources provided for transport, output indicators which measure what has been done (e.g. length of bus lanes implemented) and intermediate outcome indicators, which describe how the transport system is responding (e.g. number of bus users). Of these, outcome indicators are the most informative, since they measure directly performance against the specified objectives. However, output and intermediate outcome indicators may be helpful in understanding how a change in performance has been obtained. To be effective, outcome indicators must be exhaustive, in that they cover the whole range of objectives, provide sufficient information to decision-makers, and be sensitive to changes in the strategies that are tested.

The PROPOLIS project used a number of indicators to measure performance of the strategies which it tested against a range of objectives, which in turn reflected the economic, environmental and social aspects of sustainability (see box). It used no input indicators (although cost of the strategy tested was included in the economic indicators), and no output indicators, but focused specifically on outcome indicators which covered all its key objectives, and intermediate outcome indicators, such as trip-km and modal shares, which helped explain the changes which were taking place.

### Types of indicator

- Input indicators: expenditure, resources consumed
- Output indicators: actions taken
- Intermediate outcome indicators: changes in travel patterns
- Outcome indicators: impacts on the strategy objectives



## Why is it useful to specify performance targets?

Objectives and indicators generally indicate the desired general direction of change; for example: to reduce the environmental nuisance caused by traffic. They may also be couched in more specific terms which include the notion of a target, for example:

- To reduce traffic noise to below 68dB(A) in residential streets; or
- To reduce nitrogen dioxide levels to below 60mg/m<sup>3</sup>

There are advantages in this kind of more specific target. It is clear when any one objective has been achieved and the degree of achievement can be measured by the extent to which conditions differ from the target. It is also possible to specify targets for both output and intermediate outcome indicators; for example a target for the number of bus lanes or for the number of bus users. These can also help in measuring progress, but are a less direct indication of performance against objectives. Several governments are now linking finance for transport strategies to the achievement of targets, and this is an approach recommended by DGENV for use in the preparation of Sustainable Urban Transport Plans. Such links make it essential that targets are set for the right indicators, and at appropriate and consistent levels. The DGENV report makes a number of recommendations for the selection of targets (see box), and advocates selecting both a few high level ones for use by citizens and a wider set of operational ones.

## What are the potential risks in setting performance targets?

If targets are only set for some objectives, this may result in less emphasis on the other objectives. Conversely, setting performance targets for all objectives can give a misleading indication of their relative importance. Using the example in the previous paragraph, the two objectives imply that a noise level of 68dB(A) and a nitrogen dioxide level of 60mg/m<sup>3</sup> are equally important.

Targets for output and intermediate outcome indicators present further problems. The level of intervention specified by an output target may not be required in order to meet the underlying objectives, and a given target reduction in car use may be excessive. It is therefore better to set targets for outcome indicators, and determine any output or intermediate outcome targets to be consistent with them.

## How might performance targets be set?

It is difficult, therefore, to specify targets which are appropriate and internally consistent. Where some targets are imposed nationally, it can be even more difficult to specify ones for other objectives which are consistent. However, targets are a very effective way of encouraging action and monitoring performance. It may be best, therefore, to determine the overall strategy (Section 11), and then calculate the targets for the horizon year (Section 3) for all outcome indicators, and selected intermediate outcome indicators which are consistent with that strategy. These can then be used to monitor performance.

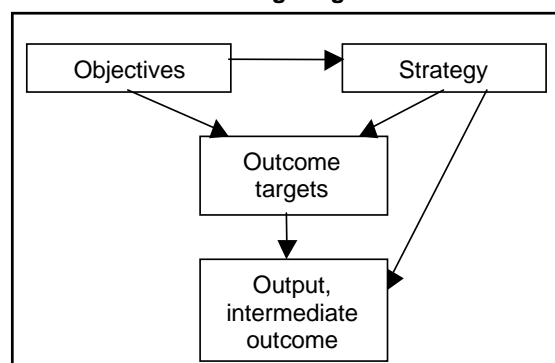


### Requirements for targets:

- Few in number
  - Representative of the policy objectives
  - Technically measurable
  - Long term and short term
  - Reflecting the integrated nature of sustainability
- Source: DGENV(2005)



### Setting Targets

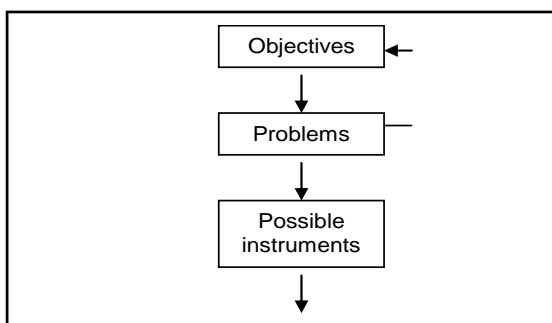


### Where can I find out more?

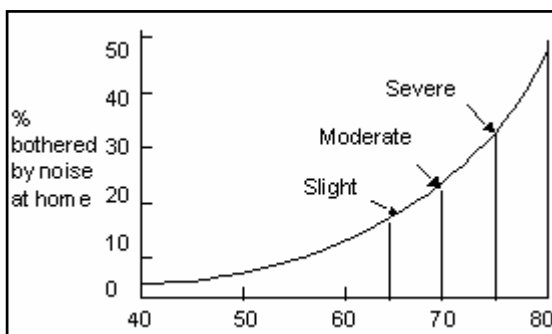
Brundtland (1987)  
DETR (2000)  
IHT (1996)  
PROSPECTS D2  
PROPOLIS  
DGENV (2005)

References... Section 18

## 8. Problem Identification



The use of thresholds for noise



### Why do we need to identify problems?

A clearly specified list of problems is the most suitable basis for identifying potential solutions. Problems can be identified, both now and in the future, as evidence that objectives are not being achieved. However, objectives are often rather abstract, and it may be easier for members of the public to understand a strategy based on clearly identified problems. This problem-oriented approach to strategy formulation is an alternative to starting with objectives, but does still need to be checked against the full list of objectives.

### What types of problem are we concerned with?

One of the easiest ways of specifying problems is by reference to a set of objectives (Section 7). This enables the question 'how do we know we have got a problem?' to be answered more easily. For example, the efficiency objective relates to problems of congestion and unreliability; the safety objective to accidents. The two concepts, objectives and problems, are two sides of the same coin. We can start either with objectives or problems and come to the same conclusions.

### How can we decide if a problem is occurring and how serious it is?

Problems may be identified in a number of ways.

#### Consultation

People can identify the problems that they encounter when travelling and which result from other people travelling. Transport providers can be consulted about the operational problems which they face. This is a key element of the participation process (Section 5). People will naturally have more reliable views about current problems than those predicted to occur at some future date. Problem identification through consultation is therefore of most use for current problems.

#### Objective analysis

Objective analysis of problems requires the adoption of an appropriate set of indicators and targets (Section 7). When a condition is measured or predicted to differ from a threshold, then a problem is said to exist. A range of thresholds can be set, so that problems may be graded by severity. Thus, for example, noise levels which exceed, say, 65dB(A), 70dB(A) and 75dB(A) could be classed as 'slight', 'moderate' and 'severe' noise problems. When thresholds are defined, they can be used, with current data, to identify current problems. Given an appropriate predictive model, a similar exercise can be conducted for a future year. This is shown in the feedback loop from Predict Impacts to Assess Problems in Section 6.

#### Monitoring

Regular monitoring of conditions, using similar indicators to those for objective analysis, is another valuable way of identifying problems, and is covered further in Section 15. As well as enabling problems, and their severity, to be specified, a regular monitoring programme enables trends to be observed, and those problems which are becoming worse to be singled out for treatment.



## Why is it useful to determine the severity of problems now and in the future?

If problems are identified through consultation, the city authority is able to determine the areas of concern for citizens. This will in turn help to confirm that they have selected the right objectives, and to indicate the basis on which targets might be set. Identification through objective analysis and monitoring enables cities, and citizens, to compare problems in different areas and in different years on a consistent basis. Comparison of predicted problems if nothing further is done with predictions of the impacts of possible solutions provides an immediate indication of the scale of the predicted improvement, and also highlights any possible adverse effects.

## What are the weaknesses of this approach?

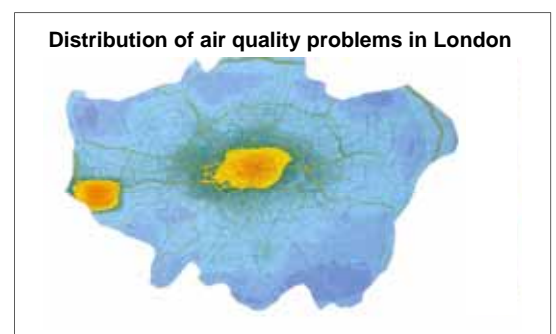
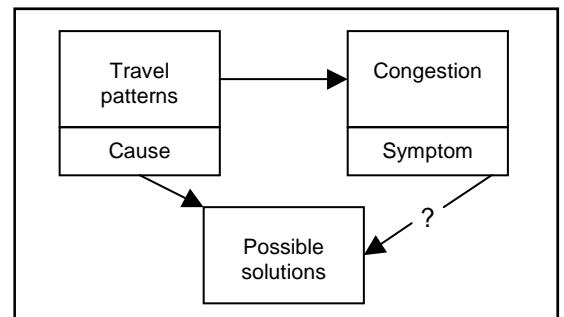
It is essential to start with a comprehensive list of indicators which cover all the objectives. Without this, some types of problem will be overlooked. If problems are judged analytically by reference to thresholds, there is a danger that the thresholds set will be somewhat arbitrary. It will be important to check that problems are not occurring at levels below the threshold. Where thresholds are set for different indicators, this will imply that problems of that severity are equally serious. Thus, for example: if a noise level in excess of 65dB(A) and a carbon monoxide level in excess of 8.5ppm were both to be classed as 'slight' problems, this would imply an equivalent severity.

The approach may only show problems as symptoms. Some analysis of the underlying causes of the problems should always be considered. For example, it would not be safe to assume that a congestion problem should be solved by adding extra capacity at the location concerned. It may be that land use patterns are encouraging longer distance travel, or that inadequate public transport is forcing people to drive. Other solutions, such as travel demand management or public transport improvements, may be more appropriate and may only be revealed by analysis of the causes of the problem.

## How can we compare problems that are city-wide with those that are more serious in some areas for some people?

Problems should be classed by both severity (see above) and impact, in terms of the numbers of people affected. In the interests of equity, it will be important to consider whether a severe problem which affects few people is more or less important than a less severe problem which affects many people.

Thresholds can be used with current data, to identify the locations, times of day, and groups of traveller or resident for which problems currently occur. This level of detail is an important input to the specification of problems, but it will add to the complexity of the appraisal process (Section 13).



## Where can I find out more?

DETR (2000)  
IHT (1996)

References... Section 18



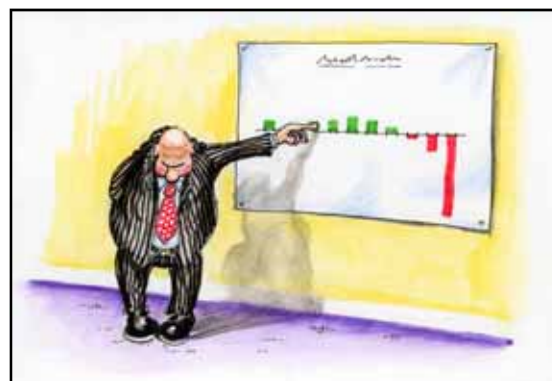
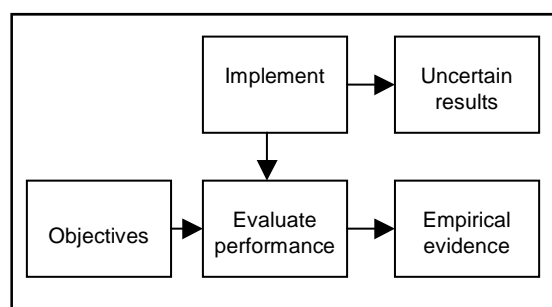
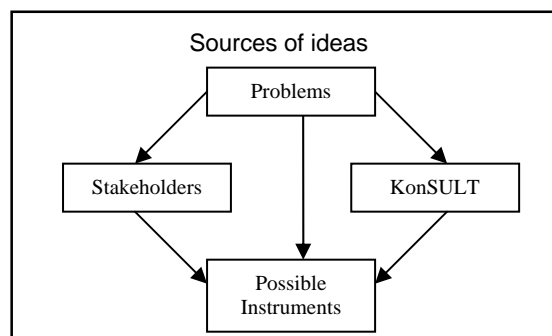
## How can problem-oriented planning help?

The list of problems is the most useful starting point for this, but context will also be important. We have designed our Policy Guidebook, KonSULT, to enable users to seek a shortlist of instruments which are likely to be of most interest in their circumstances. We are also investigating new techniques for option generation which will be added to KonSULT as they become available. Experience in other successful cities is also useful; our case studies in Section 16 help with this. This is also an area in which participation can be valuable. Users, providers and other stakeholders may well have ideas which would otherwise be overlooked. Once a first set of possible instruments has been identified, they can be tested using the approach described in Sections 12 and 13. Our optimisation procedures, outlined in Section 14, offer a more rapid way of selecting the best combination of policy instruments from a longer initial list.

## Why is it difficult to assess which policy instruments will be best?

Unfortunately the evidence which is available on the performance of many of these policy instruments is very incomplete. In some cases this is because the policy instruments are novel, and experience is still limited; this is true, for example, for car clubs. In others we have simply failed to collect the evidence on what impact key policy instruments have had. This is particularly true of road building; the realisation, too late, that new roads could generate new traffic is one reason for policy on road building in some countries changing so abruptly. It is important, therefore, that all of us take the opportunity, when we implement significant changes, to measure and evaluate their impacts, and make that information available to others. This is particularly true of policies which have been less successful than planned; even though we may want to keep such experiences to ourselves, we can help others avoid making the same mistakes. We consider this further in Section 15.

Even where experience is available it may not be directly relevant in another context. Light rail will work better in larger cities than in smaller ones. Walking and cycling provision are more important in high density areas than in lower density ones. Parking controls are likely to be more effective in city centres than elsewhere. Regulatory controls will be more acceptable in some cultures than in others. For all of these reasons it can be difficult to judge how transferable experience with successful policy instruments will be. This is a further reason for encouraging as much experience as possible to be recorded.







### Changes in demand

When faced with a new policy instrument, or with a change in an existing one, such as a fare increase, the individual traveller has a number of options as shown in the box.

The scale of response will depend on the circumstances. Those who are directly exposed to a change will respond more strongly than those for whom the impact is indirect. Those who have fewer alternatives will be more reluctant to change. Longer term responses may well be stronger, as people have more time to respond, but the more dramatic responses such as changing work or home will depend on how permanent the change in policy appears to be. There is a substantial literature on such responses, typically measured by elasticities of demand.

### Changes in supply

Changes in the supply of transport can take a number of forms as shown in the box, some of which will have a direct influence on travellers, while others will only affect them if they are perceived.

For most policy instruments, it will be clear how they affect supply, but the scale of their impact may be difficult to assess.

### Changes in costs

The principal types of costs are capital costs of new infrastructure, operating and administration costs, and costs of maintenance and replacement. These will be offset for some instruments by income from users and from taxes. Changes in these costs and revenues are crucial in determining whether an individual policy instrument, or the overall strategy, is affordable. It is often the case that low cost instruments will offer greater value for money than major infrastructure projects.

Causal chain diagrams, as illustrated on page 30, are particularly helpful in understanding the interaction of these processes.

### Which policy instruments are likely to contribute most to particular objectives?

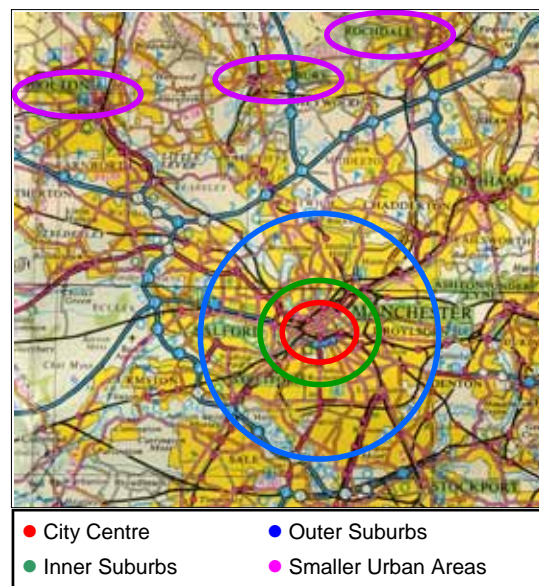
Given the comments above, it is impossible to suggest a set of policy instruments which will meet the needs of all cities. So much depends on each city's priority objectives, the scale of the problems to be overcome, the policy instruments which are already in place, the combination of new policy instruments, the context within which they might be implemented, and the barriers to be overcome in doing so. However, it is possible to give general guidance on the types of policy instrument which are likely to have the greatest impact on specific policy objectives in four different types of area: city centres; inner suburbs; outer areas; and smaller urban areas. The tables show the extent to which each of the six types of policy instrument is likely to contribute to each of the eight objectives listed in Section 7.

#### Possible user responses

- Continue as before
- Change the number of journeys made
- Combine journeys
- Change destination
- Change departure time
- Change mode (including mixing modes)
- Change route
- Change ownership of vehicles
- Change home

#### Possible supply changes

- Changes in the capacity of the road or public transport network
- Changes in the allocation of road capacity
- Changes in permitted speeds
- Changes in the access cost or time to public transport
- Changes in the costs of use
- Changes in the information available





### Contribution of policy instruments in City Centres

	Efficiency	Environment	Liveability	Safety	Health	Equity	Economy	Future generations
Land use	◆	◆	◆◆		◆		◆◆◆	◆◆◆
Infrastructure	◆◆	◆◆	◆◆	◆◆			◆◆	◆
Management	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆	◆◆◆	◆	◆◆
Information	◆◆	◆		◆		◆		◆
Attitudes	◆	◆◆	◆	◆	◆◆			◆
Pricing	◆◆◆◆◆	◆◆◆◆	◆	◆◆	◆◆	◆◆	◆◆	◆◆◆◆◆
Key: ◆ Minor contribution ◆◆◆◆◆ Major contribution								

#### City centres

In city centres, there will often be less opportunity for rebuilding to reflect better land use patterns, and new development will usually focus on economic growth. New infrastructure will be difficult to provide. Better management of the road network and improved public transport services can reduce congestion, protect the environment, improve residential streets and reduce accidents; improved services will also help reduce inequalities. Information and attitudinal measures will have limited impacts. Pricing, particularly of road space, will produce the single largest improvement in efficiency, and may also help protect the environment.

### Contribution of policy instruments in Inner Suburbs

	Efficiency	Environment	Liveability	Safety	Health	Equity	Economy	Future generations
Land use	◆◆	◆◆	◆◆◆		◆◆	◆	◆◆◆◆	◆◆◆◆
Infrastructure	◆◆◆	◆◆◆	◆◆◆	◆◆◆	◆	◆◆	◆◆◆◆	◆◆
Management	◆◆◆◆	◆◆◆	◆◆◆	◆◆◆◆	◆◆◆	◆◆◆	◆◆	◆◆
Information	◆◆◆	◆◆	◆	◆◆	◆	◆		◆
Attitudes	◆◆◆	◆◆	◆	◆	◆◆			◆
Pricing	◆◆◆◆	◆◆	◆	◆	◆◆	◆◆	◆	◆◆◆◆
Key: ◆ Minor contribution ◆◆◆◆◆ Major contribution								

#### Inner suburbs

There will often be more opportunity for rebuilding in inner suburbs, and a greater need to assist the economy in this way. Effective land use strategies can help reduce congestion and pollution, and in particular enhance liveability. Infrastructure in inner suburbs is often outmoded, and their denser development can benefit from new public transport infrastructure. Inner suburban streets are often less well managed, and improved traffic management, reallocation of road space and enhanced service levels can contribute substantially. Information and attitudinal measures may have a greater role to play in encouraging public transport use and avoiding congestion. Pricing of road space will be important to avoid congestion spreading from city centres.

### Contribution of policy instruments in Outer Suburbs

	Efficiency	Environment	Liveability	Safety	Health	Equity	Economy	Future generations
Land use	◆◆◆◆	◆◆◆◆	◆◆◆◆	◆◆	◆◆◆	◆◆	◆◆◆	◆◆◆◆◆
Infrastructure	◆◆	◆◆	◆◆	◆◆			◆◆◆	◆◆
Management	◆◆◆	◆◆	◆◆◆	◆◆	◆◆	◆◆◆	◆◆	◆◆
Information	◆◆◆	◆◆	◆	◆◆	◆	◆		◆◆
Attitudes	◆◆◆◆	◆◆◆	◆	◆	◆◆			◆◆
Pricing	◆◆◆	◆◆	◆	◆	◆	◆◆	◆	◆◆◆◆

Key: ◆ Minor contribution ◆◆◆◆◆ Major contribution

#### Outer suburbs

Outer suburbs are growing fastest, and effective land use planning is essential here to avoid unnecessary travel and to encourage less use of cars. Lower densities reduce the benefits of dedicated infrastructure. Management measures can help to ensure that roads are used efficiently and safely, while protecting liveability; good public transport services can help avoid over-reliance on the car. Information can help in promoting efficient travel, but attitudinal measures may be more effective in encouraging alternatives to the car. Pricing will be less important, but still needs to send consistent signals to car and public transport users.

### Contribution of policy instruments in Smaller Urban Areas

	Efficiency	Environment	Liveability	Safety	Health	Equity	Economy	Future generations
Land use	◆◆◆◆	◆◆◆	◆◆◆	◆	◆◆	◆◆	◆◆◆	◆◆◆◆◆
Infrastructure	◆	◆	◆	◆			◆◆	◆
Management	◆◆◆◆	◆◆◆	◆◆	◆◆◆	◆◆	◆◆	◆◆	◆◆
Information	◆◆◆	◆◆	◆	◆◆	◆	◆		◆
Attitudes	◆◆◆◆	◆◆◆	◆	◆	◆◆			◆
Pricing	◆◆	◆		◆		◆		◆◆◆

Key: ◆ Minor contribution ◆◆◆◆◆ Major contribution

#### Smaller urban areas

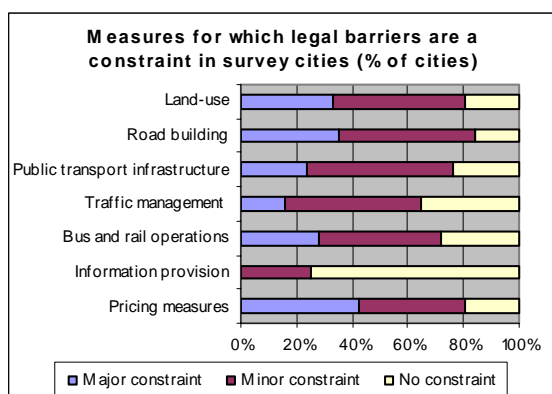
Smaller urban areas are often a microcosm of the conditions found in cities. Land use planning will be important for the reasons given for outer suburbs above. Infrastructure provision will often be less important because of the smaller population base. Management measures will offer significant contributions; roads and public transport in smaller towns may be less well managed, giving considerable opportunities for greater efficiency, a better and safer environment and more equitable provision. Information and attitudinal measures are important for the reasons given for outer suburbs above. Pricing may be less important, though as congestion grows the need for a balance between car and public transport costs will become more important.

#### Where can I find out more?

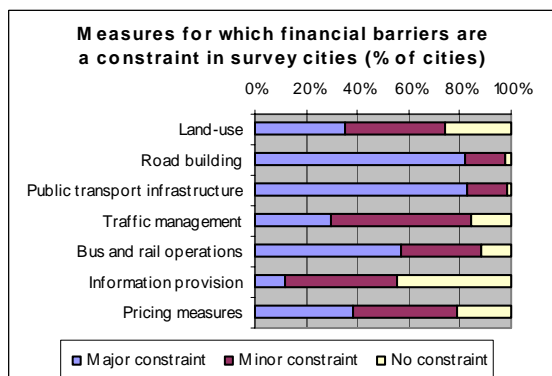
Konsult.leeds.ac.uk  
VTPI (2005)  
PROSPECTS D4  
ARTISTS  
City Freight  
Velo Info

References... Section 18

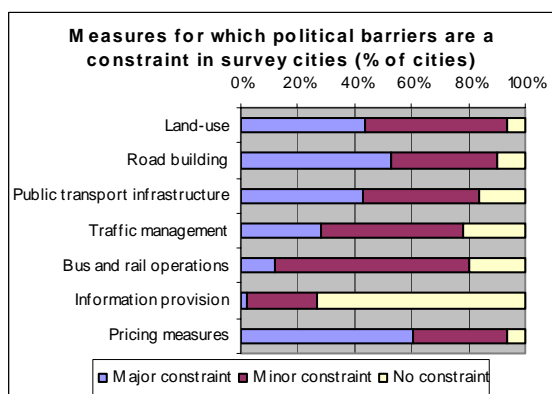
## 10. Barriers to Implementation



Source: PROSPECTS D1



Source: PROSPECTS D1



Source: PROSPECTS D1

### Why are barriers important?

A barrier is an obstacle which prevents a given policy instrument being implemented, or limits the way in which it can be implemented. In the extreme, such barriers may lead to certain policy instruments being overlooked, and the resulting strategies being much less effective. For example, demand management measures are likely to be important in larger cities as ways of controlling the growth of congestion and improving the environment. But at the same time they are often unpopular, and cities may be tempted to reject them simply because they will be unpopular. If that decision leads in turn to greater congestion and a worse environment, the strategy will be less successful. The emphasis should therefore be on how to overcome these barriers, rather than simply how to avoid them. ECOCITY provides a useful illustration of the ways in which such barriers arise, and of how obstacles have been overcome, in case study cities.

### What are the principal barriers?

In our work in PROSPECTS, we grouped barriers into the four categories listed below. More recent work in TIPP has demonstrated that failure to adopt a logical approach to the process of strategy development can also impose a barrier to effective planning. This Guidebook is designed to help cities avoid this happening. TIPP also provides a set of recommendations.

#### Legal and institutional barriers

These include lack of legal powers to implement a particular instrument, and legal responsibilities which are split between agencies, limiting the ability of the city authority to implement the affected instrument (Section 3). The survey of European cities in PROSPECTS indicates that land-use, road building and pricing are the policy areas most commonly subject to legal and institutional constraints. Information measures are substantially less constrained than other measures.

#### Financial barriers

These include budget restrictions limiting the overall expenditure on the strategy, financial restrictions on specific instruments, and limitations on the flexibility with which revenues can be used to finance the full range of instruments. PROSPECTS found that road building and public transport infrastructure are the two policy areas which are most commonly subject to financial constraints, with 80% of European cities stating that finance was a major barrier. Information provision is the least affected.

#### Political and cultural barriers

These involve lack of political or public acceptance of an instrument, restrictions imposed by pressure groups, and cultural attributes, such as attitudes to enforcement, which influence the effectiveness of instruments. The surveys in PROSPECTS show that road building and pricing are the two policy areas which are most commonly subject to constraints on political acceptability. Public transport operations and information provision are generally the least affected by acceptability constraints.

### Practical and technological barriers

While cities view legal, financial and political barriers as the most serious which they face in implementing land use and transport policy instruments, there may also be practical limitations. For land use and infrastructure these may well include land acquisition. For management and pricing, enforcement and administration are key issues. For infrastructure, management and information systems, engineering design and availability of technology may limit progress. Generally, lack of key skills and expertise can be a significant barrier to progress, and is aggravated by the rapid changes in the types of policy being considered.

### How should we deal with barriers in the short term?

It is important not to reject a particular policy instrument simply because there are barriers to its introduction. One of the key elements in a successful strategy is the use of groups of policy instrument which help overcome these barriers. This is most easily done with the financial and political and cultural barriers, where one policy instrument can generate revenue to help finance another (as, for example, fares policy and service improvements), or one can make another more publicly acceptable (for example rail investment making road pricing more popular). These principles are discussed more fully in Section 11. A second important element is effective participation, as outlined in Section 5, which can help reduce the severity of institutional and political barriers, and encourage joint action to overcome them. Finally, effective approaches to implementation can reduce the severity of many barriers, as discussed in Section 15.

### How can we overcome barriers in the longer term?

It is often harder to overcome legal, institutional and technological barriers in the short term. There is also the danger that some institutional and political barriers may get worse over time. However, strategies should ideally be developed for implementation over a 15-20 year timescale (Section 3). Many of these barriers will not still apply twenty years hence, and action can be taken to remove others. For example, if new legislation would enable more effective instruments such as pricing to be implemented, it can be provided. If split responsibilities make achieving consensus impossible, new structures can be put in place. If finance for investment in new infrastructure is justified, the financial rules can be adjusted. TIPP makes a number of recommendations for longer term institutional change. Barriers should thus be treated as challenges to be overcome, not simply impediments to progress. A key element in a long term strategy should be the identification of ways of resolving these longer term barriers.



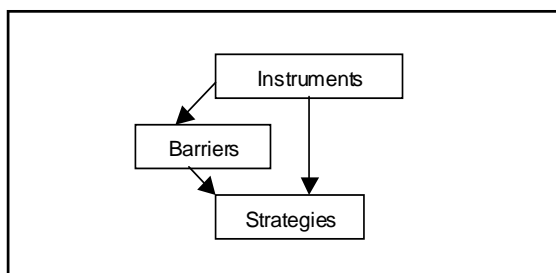
#### Where can I find out more?

ECMT (2002)  
PROSPECTS D1  
ECOCITY  
TIPP (2005)

References... Section 18



# 11. Strategy Formulation



## Levels of integration

- Operational integration
- Strategic integration
- Transport and land use
- Transport and other sectors
- Organisational integration



## Instruments can complement others by

- Reinforcing the benefits
- Overcoming financial barriers
- Overcoming political barriers
- Compensating losers

## What is a strategy?

A land use and transport strategy consists of a combination of instruments of the kinds outlined in Section 9. More importantly, it involves the selection of an integrated package of instruments which reinforce one another in meeting the objectives (Section 7) and in overcoming barriers (Section 10).

## What do we mean by an integrated approach?

Many policy documents advocate an integrated approach, but integration can be thought of at five different levels:

- Operational integration of different services, fares structures and information, usually in public transport
- Strategic integration between instruments affecting different modes and between those involving infrastructure, management, information and pricing
- Policy integration between transport and land use
- Policy integration between transport and land use on the one hand and other policy areas such as health, education and society
- Organisational integration of government bodies and agencies with different responsibilities for transport.

Though, as PROPOLIS has demonstrated, all of these are important, we are concerned in this guidebook largely with the second and third of these levels. The fourth and fifth are mentioned briefly in Sections 2 and 10, and relate to what DGENv refer to as horizontal, vertical and spatial integration.

## How can integration achieve greater benefits?

As noted above, integration at the strategic level can potentially achieve benefits both by using instruments (Section 9) which reinforce one another, and by overcoming the barriers to implementation (Section 10). Among the barriers, it will be difficult, through the instruments themselves, to overcome either legislative and institutional or technical barriers. However, both financial and political barriers can be reduced by careful choice of combinations of instruments. All of the objectives can in principle be achieved more effectively by using pairs of instruments which intensify each other's impacts on demand. One difficulty, however, is that individual instruments can have adverse impacts on certain groups of users. A careful choice of other instruments can help compensate the losers.

For all of these reasons, a package of instruments is likely to be more effective than selecting any one instrument on its own. In these ways, synergy, or at least complementarity, can be achieved between instruments; that is, the overall benefits are greater than, or at least equal to, the sum of the parts. The identification of instruments which might achieve such synergy or complementarity is at the core of successful transport planning.

The combination of light rail and road pricing illustrates all of these; road pricing encourages greater use of light rail and generates revenue to pay for the light rail infrastructure. Conversely the use of revenue to invest in light rail makes road pricing more acceptable and provides an alternative for those no longer able to drive.

#### Instruments which reinforce the benefits of one another to achieve synergy or complementarity

Obvious examples are the provision of park and ride to increase rail or bus patronage; the use of traffic calming to reinforce the benefits of building a bypass; the provision of public transport, or a fares reduction, to intensify the impact of traffic restraint; and the encouragement of new developments in conjunction with rail investment.

#### Instruments which overcome financial barriers

Parking charges, a fares increase or road pricing revenue may all be seen as ways of providing finance for new infrastructure.

#### Instruments which overcome political barriers

Enhanced service levels or provision of new facilities may well help to make demand management more acceptable; so, in a different way, can attitudinal measures.

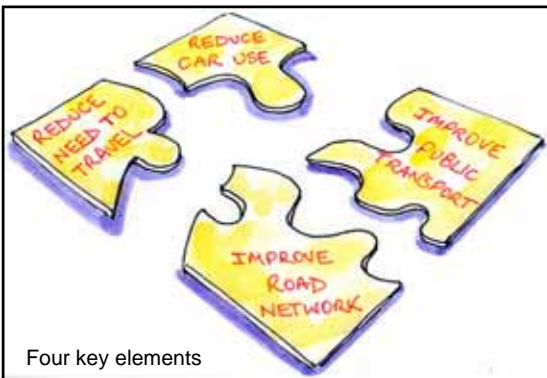
#### Instruments which compensate losers

The selection of these depends on the side effects which arise from other elements of the package. For example, road pricing could lead to extra traffic outside the charged area, which could be controlled by traffic management measures, and could adversely affect poorer residents, who could be assisted by concessionary fares.

The diagram shows, in matrix form, instruments which are particularly likely to complement one another in one of these ways. Those in the rows support those in the columns in the ways shown. This table is intended to be used as a broad design guide only.



An Integration Matrix						
These instruments	Contribute to these instruments in the ways shown					
	Land use	Infrastructure	Management	Information	Attitudes	Pricing
Land use		●				●
Infrastructure	● ●		●			●
Management	● ●	● ● ●			●	● ● ●
Information	●	● ●	● ● ●		●	● ● ●
Attitudes	● ●	● ●	● ●	●		● ●
Pricing	● ●	● ● ●	● ● ●	●	●	
Key:            ● Benefits reinforced            ● Financial barriers reduced            ● Political barriers reduced            ● Compensation for losers						



#### The most important policy instruments

- Improvements to public transport, through faster, more reliable services and lower fares
- Charges for car use, through road pricing or higher parking charges
- Land use plans which reinforce these two measures
- New infrastructure, but **only** if it is cost-effective and supports the other three instruments

Source: PROPOLIS

#### Second stage issues

- Freight
- Walking, cycling
- Minority modes
- Disabled users
- Policies from other sectors



### Why is it important to commit to the whole strategy?

The sequence in which instruments are to be implemented is at least as important as the overall strategy. Clearly those which need to be implemented to facilitate others are required first. It will also be essential at least to be committed to those instruments which generate income before investing in those which depend on that revenue for finance. Commitments are needed to publicly attractive instruments before embarking on those which on their own are less attractive. However, there is always the risk that the less attractive instruments will still not be implemented, for fear of public criticism. It is preferable if both positive and negative instruments are implemented together. Whichever sequence is adopted, it will be essential to implement all the measures in the strategy if it is to be fully effective.

### What are the key elements of a strategy?

There are four key elements to any transport strategy as shown in the box. None of these is an objective in its own right, but between them they will help to achieve all of the objectives.

Some success can usually be achieved with the last two of these alone. However, if car use is not reduced, the opportunities for improving the road network will be severely limited, and hence so will the ability to improve bus-based public transport. Moreover, if the growth in need to travel is not curtailed, improvements achieved in the short term will soon be lost. The strategy should thus contain instruments to address all four of these elements, and a key element of an integrated strategy is the determination of the way in which these elements are integrated, and the balance between them determined.

PROPOLIS provides a clear specification of the policy instruments which are likely to be most effective in making cities more sustainable:

- Improvements to public transport, through faster, more reliable services and lower fares
- Charges for car use, through road pricing or higher parking charges
- Land use plans which reinforce these two measures.

Conversely, the provision of new infrastructure may be less cost-effective, and needs to be designed carefully to be consistent with these three key policy instruments. A recent UK study has confirmed these findings.

### What other issues need to be considered?

Once this highest level strategy is clear, it will be possible to address other issues. In particular, this second stage can establish the strategy for the second stage issues in the box.

These issues are no less important, but their treatment will not significantly influence the balance to be sought between the four key elements. For example, the ability to improve freight access will be determined primarily by the extent to which car use can be curtailed and the road system's performance improved. Within that context steps can be taken to allocate more strategic road space to commercial vehicles, and to control their use in sensitive areas. This in turn will improve the performance of the overall strategy, but it will



not affect significantly the overall balance to be struck between restraint and network enhancement. City Freight provides helpful guidance on the development of freight management strategies within this context. Equally, while walking and cycling are important modes, there is little evidence that steps to improve them will encourage much transfer from car use, and hence reduce the need to control it. Velo Info and PROMPT provide guidance on strategies for these two modes.

### How do the individual types of policy instrument contribute to the overall strategy?

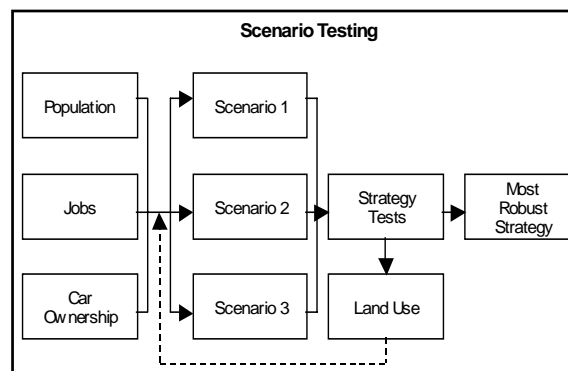
Each type of policy instrument (Section 9) contributes to one or more of the key strategy elements, as shown in the diagram. Land use measures contribute most to reducing the overall need to travel, but pricing measures are the most effective way of reducing the level of car use. Management instruments offer the most cost-effective way of improving public transport and road network performance, but infrastructure, information provision and pricing policies all have an important role to play. This table reinforces the message that there is no one solution to transport problems; an effective strategy will typically involve measures from many of these types of policy instrument.



Contribution to strategy				
Key strategy element	Reducing the need for travel	Reducing car use	Improving public transport	Improving road network performance
Instruments				
Land use	●●●●●	●●	●●	●
Infrastructure		●●	●●●●●	●●●
Management	●	●●	●●●●●	●●●●●
Information	●●●●	●●	●●●	●●●
Attitudes	●●	●●●●		
Pricing	●	●●●●●	●●●	●●
Key: ● Minor contribution ●●●●● Major contribution				

### How should the strategy reflect future uncertainties?

As noted in Section 3, it is appropriate to develop strategies for a 15 to 20 year period, but one disadvantage of this is that the context becomes less certain. The principal uncertainties typically relate to changes in economic and demographic factors, which are largely external to the transport system. The best approach, therefore, is to develop a number of scenarios, which reflect a range of levels of factors such as economic growth, changes in population and household size, and income and car ownership. While these can result in a large number of different combinations, they can often be grouped into three or four which reflect combinations which place more, or fewer, demands on the transport system. Each strategy can be tested against the different scenarios, with the best being that which is the most robust. The principles for doing this are outlined further in Section 13, and described more fully in the Methodological Guidebook. One limitation of this approach is that the scenarios are not wholly external; transport strategies can influence both economic activity and car ownership, and land use strategies will have an even greater effect. Ideally a land use—transport interaction model (Section 12) would reflect these effects.



#### Where can I find out more?

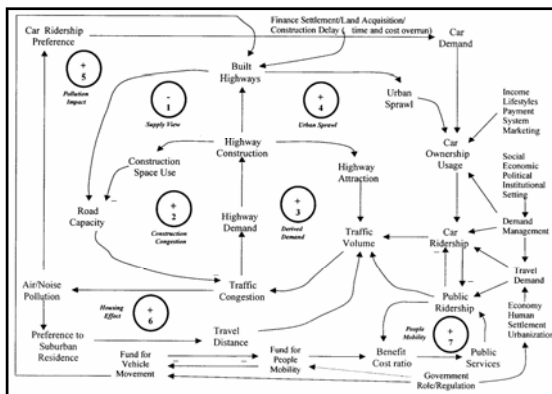
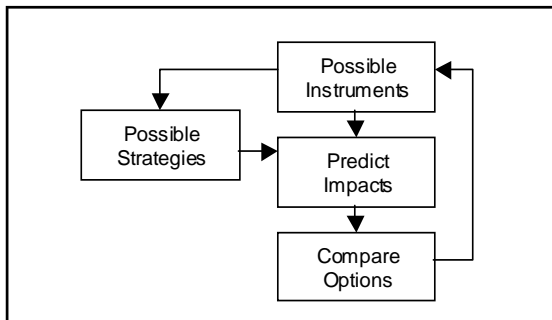
DETR (2000)  
 DETR (2000a)  
 IHT (1996)  
 KonSULT.leeds.ac.uk  
 PROPOLIS  
 May, Kelly and Shepherd (2004)  
 May et al (2005)  
 City Freight  
 PROMPT  
 Velo Info

References... Section 18



## 12. Predicting Impacts

### Predicting Impacts



### Instruments can complement others by

- Reinforcing the benefits
- Overcoming financial barriers
- Overcoming political barriers
- Compensating losers



### Why is it important to predict impacts?

As we indicate in Sections 9, 10 and 11, it is difficult to state in advance what will be the effect of introducing a particular policy instrument or strategy. Individual policy instruments may have a wide range of impacts on demand and supply, some of them immediate and others arising as users change their habits. In the extreme, with land use policies, some effects may take a decade or more to occur. At the same time we need to understand these impacts, not just on demand and supply, but on our seven underlying objectives. Such analyses are often helped by using a model of the land use and transport system.

### What is a model?

A model is a formal mathematical representation of a real world system. A land use and transport model could represent how people's travel behaviour responds to changes in the transport system provided; how the performance of the system changes as patterns of use change; how these changes affect indicators such as congestion, pollution and accidents; how land use changes affect patterns of use; or how land use is itself influenced by changes in the cost of using the transport system.

### Why do we need models?

The answers to these questions are complex, and it can thus be difficult to estimate how the transport and land use system will change in the medium and long term (Section 3) without some analytical tools to provide those estimates. Moreover, the range of policy instruments (Section 9) and of ways in which they can be combined (Section 11) makes it particularly difficult to decide what is the best strategy. Authorities need information on likely effects on their land use and transport systems for a range of scenarios. Computer-based mathematical models of the urban land use and transport system can provide this.

### What types of model are available?

Any model is supposed to be a simplification of the system being studied. It is not, and should not try to account for, everything. It should instead be a well-made caricature, where the characteristics of the modelled system are brought out with no more brush strokes than necessary. This makes it easier for the modeller to understand the system, and for others to use it. This in turn means that the results are more likely to be trusted. However, simplicity cannot be the main objective. The key to a good model is to drop unnecessary detail and complexity. This will be a greater challenge when dealing with integrated strategies in which more elements need to be modelled.

In the PROSPECTS Methodological Guidebook we provide advice on three types of model, in order of increasing complexity and the specialist skills required:

- Policy explorers, which provide a very simplified representation of a hypothetical city, and help users to understand the types of impact which a policy might have
- Sketch planning models which represent the main interactions between demand, supply and land use at a strategic level for the city in question, without giving detailed information on

transport networks or land use patterns; and

- Land use—transport interaction (LUTI) models, which represent transport networks and land use patterns and their interactions in greater detail, while still focusing on strategic issues.

In addition, there are conventional network and transport planning models, which are less complex than full LUTI models, but which typically ignore the land use effects.

PROPOLIS provides a valuable example of the use of a range of LUTI models to test a common set of strategies in seven cities, and argues that such models are essential for understanding the complex interactions between transport and land use in larger cities. ISHTAR has developed a suite of programs which go further in assessing the impacts of transport on pollution and the built environment.

### What are the limitations on models?

There are dangers both in over-use and under-use of models. The traditional rational, analytical approach to planning (Section 4) can all too easily lead to over-reliance on models, and a failure to realise that other issues are important, and that others will mistrust the experts and their results. Model-based analysis therefore needs to be used as a contribution to strategy formulation, rather than being seen as the whole process. Model assumptions need to be made clear, and results need to be able to be presented in a user-friendly way to decision-makers and to stakeholders as part of the participation process (Section 5). Ideally models should also be available for non-experts to use, as a tool to support “deciding together”. However, most current models are unfortunately not well designed for this.

Many cities do not use models themselves, often because they do not have the resources or expertise to do so. Cost, and the need for specialist skills, have often been a barrier, but the sketch planning models which we describe are now much less expensive, and much simpler for those without specialist expertise to use. Another concern is that models may be unreliable. It is certainly the case that, because models are simplifications of reality, they will omit some of the interactions in the real system, and approximate others. In our review of the requirements and capabilities of models we identified the limitations in the box as of particular importance.

There are also approaches that do not depend on mathematical models; for example, the EU project ASI has developed a qualitative ‘tool box’ to assess the effects on ‘life quality’ of urban transport and mobility policies. In practice it may be sensible to combine mathematical modelling to predict indicators which can be quantified with qualitative approaches for those indicators (such as ‘life quality’) which cannot.

These are all areas for further research and development. Even so, it will be easier to plan a land use and transport strategy for a city with a model, in the knowledge of these imperfections, than to estimate the effects without one. Indeed, there is a need for further research to develop guidance for the prediction of impacts when models are not available.

Complexity ↓	Types of model <ul style="list-style-type: none"> <li>• Policy explorers</li> <li>• Sketch planning models</li> <li>• Network models</li> <li>• Transport planning models</li> <li>• Land use—transport interaction models</li> </ul> See <i>Methodological Guidebook</i> for those in blue	Ease of use ↑
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#### Limitations of models

- Representation of freight traffic
- Measurement of journey reliability, quality and information
- Responses to journey reliability, quality and information
- Effects of air pollution on health
- Distributional and equity impacts
- Responses to telecommunications
- Transport supplier responses

#### Where can I find out more?

DETR (2000a)  
Mackie & Nellthorp (2003)  
Minken *et al* (2003)  
PROSPECTS D2  
PROSPECTS D3  
PROPOLIS  
ECOCITY  
ISHTAR

References... Section 18

# 13. Appraisal

## Appraisal and Evaluation

Appraisal: how well will a strategy perform?

Evaluation: how well has a strategy performed?

## Roles of appraisal

- Assessing seriousness of problem
- Comparing possible solutions
- Improving a solution
- Choosing between alternative designs
- Choosing the best policy instruments
- Deciding how best to combine policy instruments
- Evaluating how well a scheme has performed

## An appraisal framework

Options

Objectives <sup>1</sup>	Do Nothing	Scheme 1 <sup>2</sup>	Scheme 2	Etc.
Efficiency				
Environment				
Liveability				
Etc.				

<sup>1</sup>Indicators can be used instead

<sup>2</sup>Or strategy options

## Reflecting objectives and problems:

- Include each objective
- Indicators to represent objectives
- Impact groups to assess equity
- Disaggregate information to reflect problems

## What do we mean by appraisal?

The terms ‘appraisal’ and ‘evaluation’ are often used interchangeably. However, in this guidebook we use them to refer to two different forms of assessment. Appraisal is the *ex ante* process of deciding how well a scheme or strategy will perform. Evaluation is the specific application of appraisal to the *ex post* assessment of completed projects. In both cases the question is: “How well does this scheme or strategy meet the objectives which we have set?” Appraisal and evaluation need to be conducted in a consistent way. We consider evaluation in Section 15.

## Why do we need appraisal?

Choices in transport policy are rarely easy. One scheme may offer a greater reduction in congestion, but at the expense of the environment; another may be environmentally more effective but restrict access for key groups of residents. Appraisal is a means of assisting the decision-maker to make effective choices between such options. As shown in the box, appraisal can contribute to a number of the steps in the logical structure (Section 6).

## What is an appraisal framework?

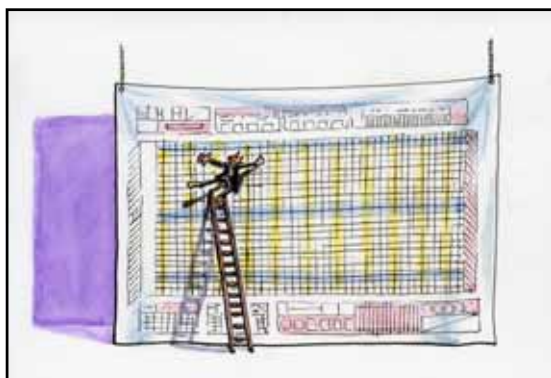
It is essential to assess the problems, solution or strategy being considered against the full set of policy objectives (Section 7). Since these objectives represent different commodities and concepts, it is simpler to consider them separately. An appraisal framework enables this; at its simplest it is a table in which each column is a scheme or strategy option, and each row is an objective. One option should be doing nothing, to provide a base for deciding whether doing something is worthwhile. Other options can be variants of a particular scheme (e.g. light rail), different policy instruments (e.g. light rail, bus service increases, fares) or different combined strategies.

## How are objectives and problems reflected in the appraisal framework?

All objectives should be represented in the framework, and each should be covered in a similar way. One of the easiest ways of doing this is to use the indicators selected for assessing performance against objectives (Section 7). These also provide a means of assessing the scale of problems, at least in aggregate. However, problems are usually associated with particular places or times, and this requires a more detailed framework. Treatment of equity issues also requires more detail and disaggregation. A choice is therefore needed on whether the framework is to be a relatively simple, aggregate one for the whole city, or one which provides more detail for different locations, times of day and groups of individual.

## How can an appraisal framework be used to help make decisions?

Appraisal is a technical process, but it is also a key input to participation and decision-making. Decision-makers can simply choose between options using detailed appraisal framework tables of this kind. However, the choices and trade-offs become increasingly complicated as the framework gets larger. Two techniques are available to help overcome this.



Cost-benefit analysis uses money as the comparator. Changes in amounts of travel, travel time, accidents and the environment are assigned money values, based on observations of the choices which people make. Costs and benefits are each calculated, relative to doing nothing, for each future year. The net benefit is then discounted to the present day and summed over all years in the appraisal period to give, as a single indicator of performance, a net present value of the benefits. The appraisal period will normally be longer than the plan period, to allow for longer term impacts. A scheme with a positive net benefit is worth building; the option with the highest net benefit is the best. The main weaknesses in this approach are the assumptions required to value attributes like noise and accidents, the difficulty of appraising impacts on future generations, and the fact that the final value appears to determine the decision, rather than encouraging discussion.

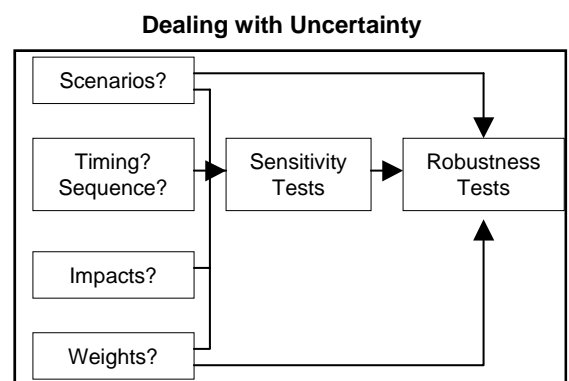
Cost-benefit analysis of a road scheme	€
<b>Costs</b>	
Construction cost	2491
Maintenance cost	102
Total	2595
<b>Benefits</b>	
Time and operating cost savings	4218
Accident savings	417
Total	4635
<b>Net Present Value</b>	<b>2040</b>

Multi-criteria appraisal overcomes some of these problems by allowing the decision-maker to assess the weights to be assigned to different indicators, objectives and impact groups. In this way, differing views on the relative importance of, say, noise and accidents can be reflected. At its simplest, this can be used to generate a single weighted score for each option, allowing the user to decide which is the best option, given the weights they have selected. It is also possible to test sensitivity to variations in weights, and thus identify the solution which is the most robust to changes in weights, or which is least likely to be rejected by someone who takes a very different view on the relative importance of the objectives. ECOCITY developed a multi-criteria appraisal method based on a mixture of qualitative and quantitative indicators and benchmarks, which could be generated without recourse to models. Further guidance on appraisal methods is given in the PROSPECTS Methodological Guidebook.

Multi-criteria appraisal of a road scheme	
Construction cost	xxxx
Maintenance cost	x
Time and operating cost savings	✓✓✓✓
Accident savings	✓✓
Environmental gains	✓✓✓
Environmental losses	xx

### How can appraisal methods deal with uncertainty?

Uncertainty can arise in the scenarios against which strategies are being tested (Section 3), the structure, timing and sequence of the elements of the strategy (Section 11), the predicted impacts of the strategy (Section 12), and the weights to be assigned to the individual indicators (see above). One of the simplest ways of treating appraisal is sensitivity and robustness testing. A strategy is tested against variations in a scenario, or with the model assumptions varied, or with differing weights. If the performance of a strategy is very sensitive to these changes, it is less robust, and therefore more risky. If other strategies (or schemes) perform better than it when the assumptions are varied, it may be better to select them. As with other elements of appraisal, there are more complex ways of analysing uncertainty.



### Where can I find out more?

DETR (2000a)  
 Dodgson *et al* (2000)  
 May *et al* (2005)  
 Minken *et al* (2003)  
 ECOCITY

References... Section 18



## 14. Optimisation



### What do we mean by optimisation?

Strictly optimisation means finding the best solution to a given set of transport problems, or the best strategy to meet a given set of objectives. In practice, cities will not often be free to implement the combination of policy instruments which is theoretically best for them, either because they do not have overall control on all policy instruments (for the reasons given in Section 3) or because they face barriers of finance or acceptability (Section 10). In practice, therefore, optimisation involves identifying the best solution within a given set of constraints.

### Why should we use optimisation methods?

Traditionally, cities and their consultants have attempted to determine the best strategy through a process of identifying a possible solution, testing it (Section 12), appraising it (Section 13) and then seeking improvements. These improvements could either be straightforwardly to increase performance, or to overcome barriers such as lack of finance or limited public support. However, this process can be inefficient; time will be wasted on testing inappropriate strategies, and there is no guarantee that the best strategy will be found. Thus the benefits of optimisation are both in developing more effective strategies and in doing so more rapidly. In an early example in Edinburgh, an initial study used some 70 model runs to develop a "best" strategy; a subsequent study using optimisation methods found a combination of policy instruments, after 25 model runs, which increased economic efficiency by a further 20%.

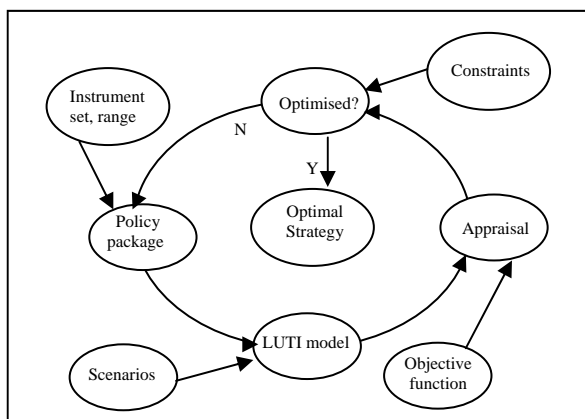
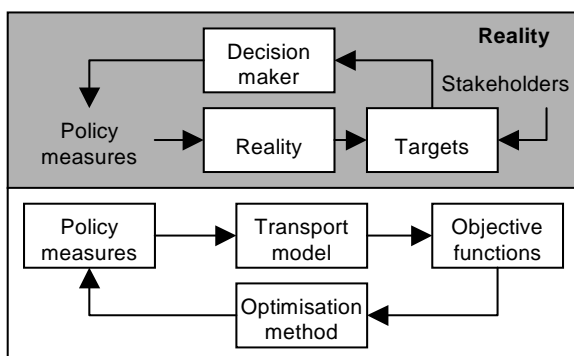
Optimisation is thus a very elegant way of choosing the best strategy. Even if we do not often want to automate the decision making process in this way, experience shows that it produces interesting new strategies that would not otherwise have been thought of.

### How does optimisation work?

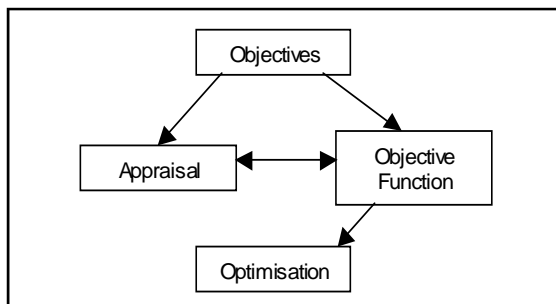
Formal optimisation is a relatively new concept in the analysis of integrated land use and transport strategies. We describe it further in the PROSPECTS Methodological Guidebook, and in a more recent report on the generation of optimal strategies for UK cities. It involves maximising a quantified objective function within a given scenario, and subject to a given set of targets and constraints, by using a given range of land use and transport policy instruments.

### How are objectives represented?

At the heart of this policy optimisation process lies the definition of the objective function, which is a quantified measure of the policy-makers' objectives and the priorities between them. The objective function should be consistent with the appraisal framework (Section 13), and can thus be based on either a Cost Benefit Appraisal or a quantified Multi-Criteria Appraisal, in which weights are assigned to the individual objectives. The value of the objective function for each set of instruments and their associated levels is derived by running a land-use transport interaction model (Section 12).



#### Optimisation based on objectives



## How are scenarios and constraints reflected?

Scenarios can be selected based on the principles in Section 11. Often the strategy is optimised against one scenario, and the optimal strategy is then tested for robustness against other scenarios. In due course methods may permit optimisation to be pursued for all scenarios, with techniques of appraisal under uncertainty being used to minimise the risk of poor performance under more demanding scenarios.

Constraints can be dealt with in two ways. Political barriers can act as a constraint on which instruments may be considered and within which ranges; for example parking charge increases of above a given level may be considered unacceptable. Financial barriers and outcome targets can be incorporated within the optimisation process; for example a restriction on capital investment could be used to rule out those strategy options which exceeded it. In either case the optimisation can be repeated without the barrier to demonstrate the benefit of removing it. This can help in making the case for changes in legislation (Section 10).

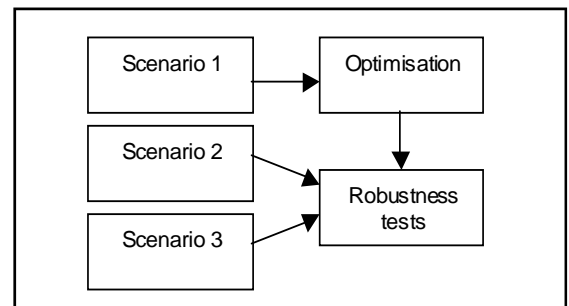
## How are policy instruments selected?

Policy instruments can be chosen from the list in Section 9. In due course, new approaches to option generation may help to suggest which policy instruments should be considered. A formal optimisation process is most useful in considering a package of strategic instruments which are expected to have a significant impact on the city. They will reflect the key strategy elements in Section 11. Most strategic instruments have some level which may be varied (e.g. a price) which can be optimised. The diagram shows an optimum for a range of levels of fares and frequencies. Some, such as discrete road and rail projects, are either included or not. Once an optimal set of strategic instruments has been selected, other second order elements of the strategy (Section 11) may be added in ways which enhance the overall policy.

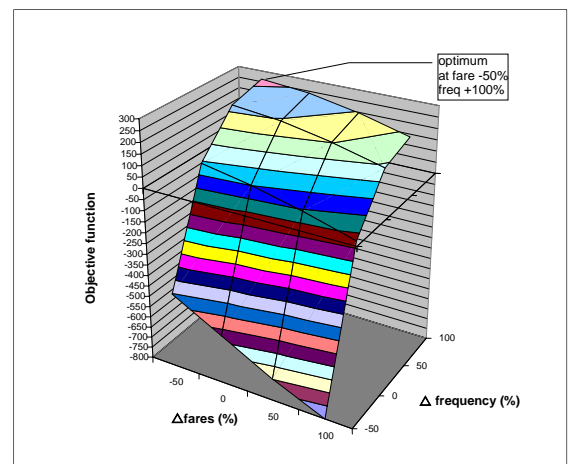
## When are optimisation methods appropriate?

When a city is assessing a relatively small number of policy instruments, or simply assessing one new proposal within a given strategy, formal optimisation is unlikely to be needed. However, where the number of options is substantial it will often be much quicker and less expensive to use a model in conjunction with an optimisation method than to use the model alone. Where there are several scenarios to consider, or constraints whose impact needs to be assessed, optimisation can prove even more valuable.

### Scenario testing and optimisation



### Optimising fares and frequencies



### Where can I find out more?

May *et al* (2005)  
Minken *et al* (2003)

References... Section 18

## 15. Implementation, Evaluation and Monitoring



### Types of barrier

- Legal and institutional
- Financial
- Political and cultural
- Practical and technological

### Overcoming barriers

- Identify possible barriers early
- Limit their impact at strategy design stage
- Distributional analysis to identify losers
- Involve stakeholders in trying to reduce impact
- Focus on those who might be adversely affected
- Provide compensation where needed

### Why is implementation important?

Implementation is rarely easy, even when a thorough study of the options has been conducted, and stakeholders' views have been taken into account throughout. In the extreme, the difficulties in deciding whether, and how, to implement may act as the final barrier to implementing a chosen strategy. There are a number of examples of good practice, often associated with the vision-led approach to planning (Section 4), but relatively few studies of how good practice has emerged. This Section is therefore based primarily on common sense and on observation of those cities which have been successful. It draws in part on a study of such cities by TRANSPLUS.

### What are the barriers to implementation?

The barriers to implementing a given strategy are likely to be identical to those outlined in Section 10 (and repeated here for completeness):

- Legal and institutional barriers, including lack of legislation to permit a given policy instrument, and lack of direct responsibility for it (Section 3)
- Financial barriers including lack of funds and restrictions on what funds can be spent on and when
- Political and cultural barriers, and in particular opposition from those adversely affected
- Practical and technological barriers, including site availability, engineering details and technical performance

As noted there, an inconsistent or incomplete process of strategy formulation may also serve as a barrier to implementation.

### How can these barriers be overcome?

The key to this is to identify these barriers at the outset when considering the possible policy instruments (Sections 9, 10). It should then be possible to design a strategy which limits their impact (Section 11). Stakeholder participation is also essential (Section 6). When those who might be adversely affected (or even fear that they might be) are fully involved in strategy formulation, it should be possible to identify their concerns, and either redesign the strategy to overcome them, or obtain agreement that, despite them, the strategy should be pursued. In practice those who might be adversely affected are often not identified at the outset, or do not see the need to participate until too late. A distributional analysis at the appraisal stage (Section 13) can help to identify such people. If all else fails, it may be necessary to compensate the losers, either financially or by offering them additional benefits which offset the problems for them.

## Does the sequence of implementation matter?

As noted in Section 11, the sequence in which a strategy involving several policy instruments is implemented is extremely important. Some instruments need to be in place before others can be effective; for example, measures which discourage car use may need improvements to public transport to be implemented first. This suggests that both need to be implemented together. Some instruments can be implemented gradually; for example prices can be raised, or traffic controls intensified, over time. This may well be a way of reducing fear of the unknown and of avoiding undue disruption. Some larger and more expensive elements of the strategy may well have to wait until finance can be raised, or until the benefits from investment have increased. The analysis of a strategy therefore has to consider carefully the costs and benefits of alternative sequences and timescales for implementation. At the same time, it will be important to ensure that the strategy as a whole is implemented; there is always a risk that if the more acceptable elements are introduced first, the less popular ones will never be used.

## Why is evaluation important?

Every new scheme provides an opportunity for learning from experience, and improving our understanding of the performance of the policy instruments used (Section 9). This can only be done if there is an effective before and after survey which identifies the effects of the strategy on the key performance indicators and against the principal objectives (Section 7). This will enable the strategy to be evaluated in the true sense of the word (Section 13). Evaluation should be carried out using the same appraisal framework (Section 13); however, it also provides an opportunity to reconsider the objectives, indicators and weights being used. We hope that, in due course, the results of such studies can be incorporated into our Policy Guidebook, KonSULT.

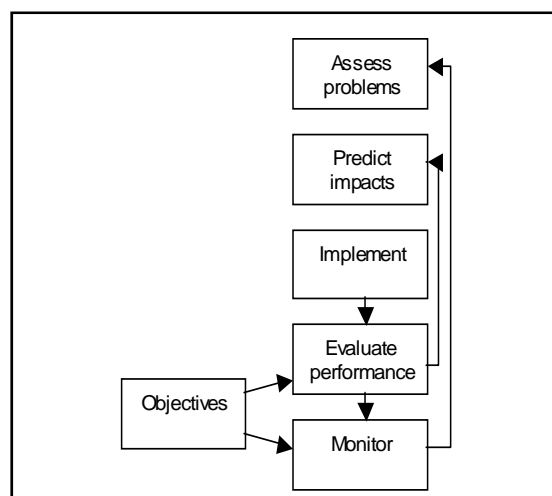
## Why is monitoring important?

In addition, regular monitoring of conditions will help assess whether problems are being overcome, or whether new problems are emerging. It will thus provide the context for the next review of the strategy. Monitoring should be based on a comprehensive set of outcome, and intermediate outcome indicators (Section 7) which can be readily measured and easily interpreted. Many cities aim to carry out annual monitoring of performance, and five yearly reviews of their strategy. Some go further, and benchmark their performance against those of similar cities. Well conducted benchmarking schemes can help all participating cities to improve their performance.

### Implementation sequence

- Provide essential capacity first
- Then manage demand
- Introduce gradually where possible
- Implement those requiring substantial funding later
- But implement the whole strategy!

### Implementation, evaluation and monitoring



### Where can I find out more?

DETR (2000a)  
IHT (1996)  
TRANSPUS

References... Section 18



## 16. Case Studies



### Case study summary

- Decision-making context (Section 3)
- Approach to decision-making and participation (Sections 4, 5)
- Objectives, indicators, targets and problems (Sections 7, 8)
- Instruments, barriers and strategies (Sections 9, 10, 11)
- Prediction, appraisal and optimisation (Sections 12, 13, 14)
- Implementation and monitoring (Section 15)

### Overview

The assessment of cities' needs in PROSPECTS was based on detailed collaboration with six case study cities, with whom the project discussed decision-making needs, and for whom it conducted a series of model-based analyses to test the principles set out in Sections 7 to 14. These six, Edinburgh, Helsinki, Madrid, Oslo, Stockholm and Vienna, all represent good practice in policy formulation and implementation, though none follows in full the approaches which we recommend in this Guidebook. They are inevitably not representative of all types of European city. In practice they are all relatively large, with populations in the city region ranging from 0.7M to 5.3M. They are also all capital cities, and thus attract greater attention than provincial cities of the same size.

To help overcome this, PROSPECTS also conducted a questionnaire survey of decision-making contexts and needs in a further 54 cities from 17 countries, as highlighted in the map. Of the 54, 14 had populations of 30,000 to 100,000, 20 between 100,000 and 250,000, and 20 of over 250,000. They included 25 from northern and central Europe, 22 from southern Europe, and 7 from Newly Associated States in eastern Europe. The survey covered city characteristics, responsibilities, influences and participation; types of decision-making approach; objectives, indicators, targets and time horizons; past trends and future scenarios; policy instruments considered; and barriers to implementation. We have presented some of the results from this survey in Sections 3, 4 and 10; the full results, including comparisons between cities of different size and in different regions, are available in Deliverable 1 of PROSPECTS, listed in Section 18.

In this section we present four of these full case studies. As noted above, none of them represents fully the approach which we have advocated in this guidebook. As a result there are differences between them, both in the problems to be tackled and in the approaches which they have adopted. This is helpful in enabling both strengths and weaknesses in their approaches to be illustrated.

### Case study structure

In the following eight pages, we summarise each of the four case studies in terms of the principal themes of this guidebook, grouped as shown. In the latter two sections, we have only commented where the cities have adopted particularly interesting approaches. In the last two pages we have compared the four against each of these themes to identify examples of good practice and key messages for others using this Guidebook.

## The four case studies

Edinburgh, the capital of Scotland, has a population of 450,000, but serves as regional centre for some 700,000 people. It has developed around the historic Old Town and castle, which was an easily fortified volcanic plug just south of the Firth of Forth. The urban area is now developed up to the coast in the north, and to the next range of hills to the south. The Old Town and eighteenth century New Town are now a World Heritage Site, and Edinburgh has an active tourism and cultural industry, as well as being the legal and financial centre of Scotland.

Madrid is one of the 17 Autonomous Regions in Spain, with a slowly growing population (5.4 million inhabitants in 2001, and a yearly growth rate of only 0.5% since 1986) in an area of 8,028 km<sup>2</sup>. The population is distributed unevenly among Madrid City (2.9 millions and 4,727.7 inh/km<sup>2</sup>), the metropolitan ring (2.1 millions and 471 inh/km<sup>2</sup>) and the mainly rural rest of the region. Sprawl trends, with the central core losing population to metropolitan municipalities, have increased recently.

Oslo, the capital of Norway, has a population of 500 000, with 470 000 more in the surrounding Akershus county. Two thirds of the city's area is woodlands, and it has long been a policy not to expand into this green belt. Once an industrial centre, Oslo is now predominantly a service city. Oslo was quite successful up to the 1980s in relocating the inner city population to new residential areas, providing these with metro lines and other amenities from the start, and regenerating the inner city. However, long term trends towards relocating in Akershus outside the green belt are now generating urban sprawl. In transport, the most important experience has been the financing of new road construction by way of a toll ring.

Vienna is situated in eastern Austria, not far from the borders with Hungary, Slovakia and the Czech Republic. The capital of Austria, it has a population of 1.6 million (city area: 415 km<sup>2</sup>). It is by far the largest city of the country, with 20% of the population of Austria. The so-called "Urban Region Vienna" covers an area with a radius of 40 to 50 km around Vienna and has a total population of 2.2 million. The development of the population, settlement and employment structures in the Vienna region has led to urban sprawl and in particular to a sharp increase in car traffic.

**Edinburgh**



**Madrid**

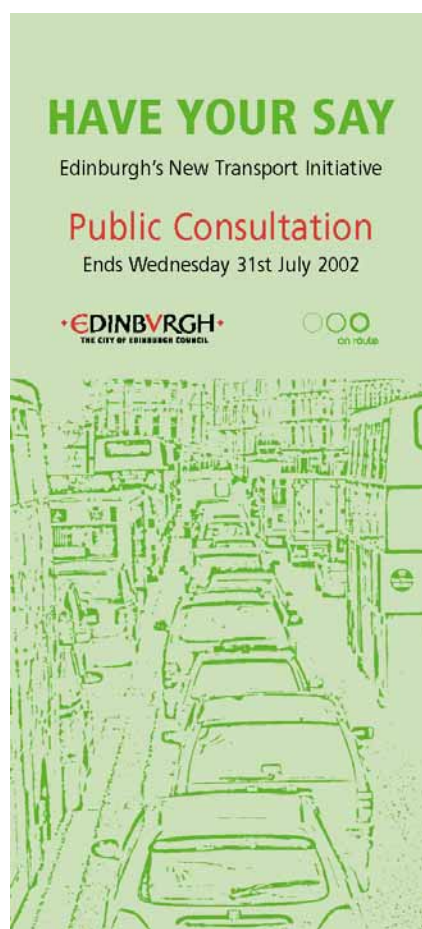
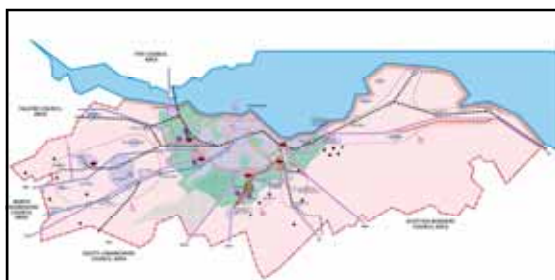


**Oslo**



**Vienna**





All trips by City of Edinburgh residents by mode (%)					
	Cycle	Walk	Public transport	Car (inc. passengers)	Other
1999	1.6	23.8	15.7	56.9	2.1
2000	0.8	23.5	16.7	56.0	3.0
2001	1.8	25.3	17.8	52.8	2.2
2010 (target)	6	26	23	45	-

## Case Study 1: Edinburgh

### Decision-making context

Edinburgh has experienced major changes in responsibilities for transport and land use. Regional and District Councils were abolished in Scotland in 1996 and replaced by unitary authorities. Power for many policies, including transport, was devolved from London to the Scottish Parliament in 1998. As a result, the City of Edinburgh Council is now responsible for transport policy within policies laid down by the Scottish Executive. The Executive follows national policies closely, but with subtle differences in implementation. In 1996 the Scottish Executive set up the Local Transport Strategy (LTS) policy documents for councils to produce for their area in the context of the strategic Structure Plan policies. The City of Edinburgh Council is responsible for all roads within the city, but not for the trunk roads and motorways which approach it. Bus services were deregulated in 1986 and many are still run by Lothian Buses plc, who are still owned by the Council and adjacent authorities. Rail services were privatised in 1992, and all local services are now run by Scotrail.

### Approach to decision-making and participation

Edinburgh reflects elements of all three approaches to decision-making. It has made extensive use of plan-based studies to develop its strategy. Having learnt from a period in the 1970s and 1980s in which sectional interests obstructed progress, it consults widely in order to achieve consensus in its strategy. It has had visionary leaders of its transport strategy, who have been keen for Edinburgh to provide leadership nationally.

The 1991 transport study, which laid the foundations for the strategy, involved workshops with representatives of all the main interest groups to agree on the problems and objectives and to identify possible solutions. The resulting strategy included the possibility of road pricing, which was always bound to be controversial, and the Council conducted three consultations. The first, in 1999, obtained views from residents and businesses on the choice between a low cost strategy without demand management, a medium cost one with charges for employee parking, and a high cost one financed by road pricing. The second, in 2002, sought residents' and firms' views on three transport options including two road pricing strategies. The third, in 2005, led to road pricing ("congestion charging") being rejected, following a city wide referendum. This has led to a major reappraisal of the overall strategy.

### Objectives, indicators, targets and problems

Edinburgh adopts an objective-led approach. It is expected to work towards the government's overall transport objectives which cover the environment, safety, economic efficiency and growth, and accessibility for all. These reflect most of the objectives listed in Section 7, with the possible exception of liveability and health and some aspects of equity. They do not, however, place much emphasis on longer term sustainability. Performance indicators are largely those specified by government, and include both intermediate outcome indicators of modal share and outcome indicators for the environment and safety. Targets are set for some of these, again largely reflecting government requirements.



### Policy instruments, barriers and strategy formulation

The key elements of the New Transport Initiative are enhancements to public transport infrastructure, improved management of the road network and reallocation of road space. The possibility of using road pricing to manage demand and generate revenue was considered, but has since been rejected. A land use strategy has been developed which complements these measures. The public transport improvements include new guided bus and light rail lines, reopening a disused rail line and introducing new rail services, together with park and ride and extensive bus priority schemes. Road network management measures include urban traffic control, on-street parking control, pedestrian friendly streets in the city centre, reallocation of other road space to buses and cyclists, and traffic calming in residential areas. Other innovative measures include experiments with car clubs and car free neighbourhoods, company travel plans and awareness campaigns.

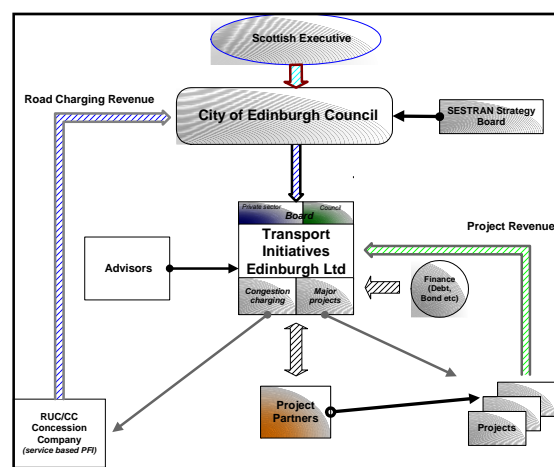
The main institutional barrier is the integration of services, ticketing and information by different service providers, following deregulation. Finance for transport is severely constrained, and road pricing has been developed as a major source of financial support for the overall strategy. In spite of extensive awareness raising and consultation road pricing remains the most contentious element of the strategy, and has now been rejected.

### Prediction, appraisal and optimisation

Lothian Region commissioned a novel strategic transport model, START, for the 1991 study. This was used to test some 70 possible policy combinations, and enabled the key elements in the strategy to be identified as the appropriate levels of infrastructure provision, road space reduction, public transport fares, and road pricing. The final strategy was based on these. Subsequently a land use model, DELTA, was added, and the two have now been upgraded to a new version, TRAM/DELTA, which enables the effects of a transport and land use strategy to be tested over a twenty year period. Appraisal methods are specified by government, in Scottish Transport Appraisal Guidance (STAG), and include a cost-benefit analysis, which covers travel and accident costs, and a multi-criteria framework to highlight impacts on the environment, accessibility and equity. Edinburgh provided the test-bed for the optimisation methods described in Section 14. To date, however, the optimisation procedure has been used primarily for research purposes.

### Implementation

A key issue is how to manage the implementation of such a complex strategy. A new body has been established: TIE (Transport Initiative Edinburgh) Ltd, owned by the City Council but managed by the private sector. The company is responsible for developing, procuring and managing major projects; ensuring public acceptability; procuring, implementing and operating the road pricing scheme; and raising funds in other ways.







## Case Study 2: Madrid

### Decision-making context

The Madrid Regional Government has responsibility for regional roads, while the main roads remain in the hands of the national government and local roads with the municipalities. The Regional Government is responsible for the approval of local urban development plans (*Planes Generales de Ordenación Urbana*) and for coordinating public transport services in the region. It has promoted the *Consortio de Transportes de Madrid*, a public authority integrating most of the public transport responsibilities previously in the hands of the Regional and Local Governments. Almost all municipalities have voluntarily joined the *Consortio* and transferred to it their responsibilities for public transport. The *Consortio* also runs the Metro system on behalf of the Region.

### Approach to decision-making and participation

Although elements of all the three approaches to decision-making are in operation, there has been a clear move from the “plan-led” to the “vision-led” approach. Consensus among institutions has been another key and continuing aspect, but attempts to open up the process to other stakeholders have lacked ambition and have yielded modest results. Regional and local land use plans are required, by law, to hold public hearings, prior to final approval. This is not the case for many urban development and transport projects, and in particular for the metro extensions built recently or in progress. More participatory processes have been attempted, with mixed results. While information provision is extensive, and formal and informal consultations are made at various stages, there is no direct influence of most groups in actual decision-making, or signs of moving in that direction.

### Objectives, indicators, targets and problems

The rapid movement of population to the suburbs in search of better housing is leading to significant changes in transport demand and land use patterns in the Madrid metropolitan area. This has tended to dominate the Regional Government's objectives, which are to cope with this problem, while supporting economic growth and seeking equity between the areas within the region. Considerations of efficiency, environment and safety are subsidiary to these, but still important in tackling the problems of out-migration. There is not much emphasis on long term sustainability and, indeed, the current trends are producing more and longer journeys. The main indicators and targets used, as discussed further below, relate to process indicators of modal shares.

### Policy instruments, barriers and strategy formulation

Transport policies have combined four key principles for many years. An integrated public transport system has been developed, covering fares, services and the administrative framework. One of the key issues was the introduction of the PT Travelcard, valid in the whole region. There has been an impressive investment in transport infrastructure, including commuter rail services, expansion of the metro system (with 120 km of new lines in the last ten years), innovative infrastructure such as the first HOV lane in Europe, and the development of park and ride interchanges. Recently new tram projects have been passed to connect suburbs with metro and commuter rail stations. The quality of public

transport has been enhanced, encouraging and assisting undertakings to renew their fleets and introducing more comfortable, less polluting vehicles. Information systems are offered in the web, but information centres have not been sufficiently developed.

Madrid City for its part is developing a strategy that reduces car use in the centre: pedestrianisation, parking pricing, car restrictions and segregated bus lanes.

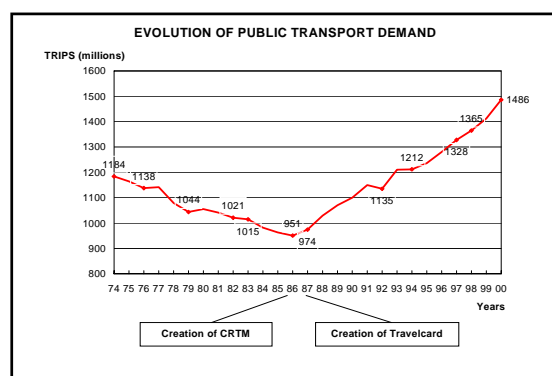
Economic prosperity in the late 1990s has favoured a more *market-oriented* approach to spatial planning: the regional vision has been gradually replaced by *ad hoc* planning, negotiated on a case-by-case basis between the Regional Government (or the City of Madrid) and big developers. Transport has emerged as one of the key elements in these negotiations, with the public sector providing public transport infrastructure to these newly developed areas, in some cases before urban development actually occurs. The Regional Government's attempts to limit new urban development plans in the suburbs have failed in the last few years, new urban development proposals are generally approved by public authorities, with little concern about their future impacts on the transport system.

#### Prediction, appraisal and optimisation

Both the *Consortio* and Madrid Region use modelling techniques based on EMME/2 to evaluate new infrastructure for roads and public transport. The predictions are based on a household mobility survey conducted every eight years in the Region. All the plans and projects are appraised using a cost-benefit analysis complemented by the appraisal of some environmental and social effects. However, these techniques are applied only to improve the design of strategies and projects already decided by consensus among public bodies.

#### Implementation and monitoring

Monitoring is mainly focused on the effective implementation of new facilities, and their co-ordination with the construction of the new planned urban areas. Monitoring is also conducted by the respective operators (parking lots, rail, metro, buses), but there is not much interest in elaborating indicators to make this information more useful for decision-makers and the public. Modal split has received much attention as an indicator of the effectiveness of transport policies in Madrid. This is not surprising, as public transport patronage has steadily increased since the *Consortio* was created in 1986. Today, Madrid is a leader in public transport share: public transport covers 54% of all motorised trips (1997) in the Region, and is dominant in the central city (66%) and in radial trips (52%).





### Case Study 3: Oslo

#### Decision-making context

The decision-making context in the Oslo region is very complex. National authorities and their regional offices are in charge of the trunk road system and the railway infrastructure and get their funding from parliamentary budget decisions. The national railway operator is in charge of local and intercity railway traffic, and receives subsidies partly at the national level and partly from Akershus county. There are two counties in the region, Oslo and Akershus. The counties' main responsibilities are secondary health care, education, transport (county roads and public transport) and strategic planning. There are two major public transport providers, one for each county. One of them procures all transport service production from private firms, while the other (Oslo) produces tram and metro services itself and provides bus services through its subsidiary and another major firm. Land use regulation at the detailed level is the responsibility of the third—municipal—level, which in the case of Oslo is identical to the country level. The municipalities are in charge of minor roads and streets.

#### Approach to decision-making and participation

The decision-making approach at the national level is plan-led. Ten year national transport plans are rolled forward every four years. Increasingly, they are also concerned with city transport problems, and even try to include urban land use policies. At the same time, the counties have their own strategic plans. To the extent that elements of the local plans require national funding, they will have to be adopted in the national plan. The structure means that a system of consultation is required to develop the plans. Planning based on local initiatives and partial local financing through user charges has now become the standard in Norwegian urban transport planning. A clear statement of objectives and analysis of problems lead on to consideration of the policy instruments needed to achieve the objectives. However, since there are so many parties involved, each with a need to get the plan through their elected bodies, it is also vital to seek consensus. In the past, it proved possible to reach a sufficient degree of consensus on strategic road and public transport infrastructure packages: the Oslo Package 1 of road infrastructure investment started in the late 1980s and still underway, and the Oslo Package 2 of public transport infrastructure initiated in 2000. Currently, a more comprehensive package, Oslo package 3, is being devised along the same lines. Issues of main road building, user charges and equity have led to local political conflict on the package, but consensus is expected to be reached soon. Participation is sought through a system of hearings, meetings, information leaflets and through media debate. Participation was especially prominent in the regeneration of inner city residential areas.





### Objectives, indicators and targets

At the highest level, the objective has been stated as follows: the land use and transport system of Oslo and Akershus is to be developed to promote socially efficient use of resources, environmentally sound solutions, security in local communities and neighbourhoods, traffic safety and a high level of accessibility. Of the objectives of Section 7, growth is given less priority in Oslo, while equity issues are important even if not mentioned explicitly here. For the national transport plan, a set of indicators has been devised, although they do not seem to meet the decision-makers' need for information and lack a clear link to objectives. In the county plans many of the lower level objectives are framed as targets.

### Policy instruments, barriers and strategy formulation

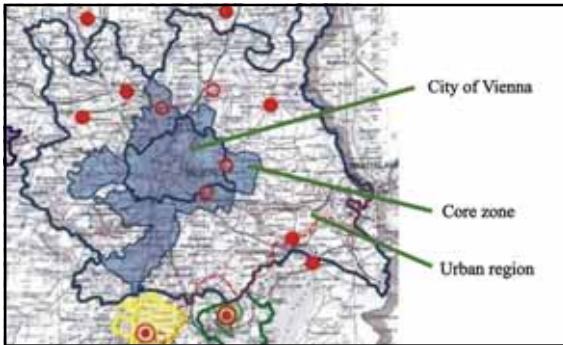
Current plans are very much biased towards infrastructure provision. As noted earlier, the most important Oslo experience is the financing of a package of new road construction by way of a toll ring. The toll ring was intended to raise money without affecting traffic, and was rather successful in this respect. However, legislation to allow road pricing and road tolling for other purposes than financing infrastructure building has since been enacted. At the municipal level, a charge on studded tyres is levied and the toll ring extended to 2012 to finance urban regeneration in the harbour area. Seeing that in spite of infrastructure provision, congestion and air pollution are becoming severe problems, the coming Oslo package 3 will have a broader scope. The strategy might consist of concentrating development to public transport nodes; improving public transport quality and implementing an area-wide common policy on financing of public transport operations and on fares; policies to promote walking and cycling and mitigate environmental damage; and a car use policy that combines infrastructure with traffic calming measures in a balanced package that takes all effects into account. The implementation of a comprehensive strategy will require a permanent coordinating group; agreement on this constitutes a political barrier. The other main barrier is finance. National policy has been unfavourable to Oslo and the tax base has been eroded. To circumvent these barriers, financing by user contributions has been developed.

### Prediction, appraisal and optimisation

Transport models are used for large projects, and were used to assess problems for the recent comprehensive plan. But strategic plans have often consisted of a set of projects that have been evaluated separately. LUTI modelling has only been applied for research purposes. CBA (including accidents, air pollution and noise) with an accompanying EIA have long been the standard methods in appraisal. A common national framework for this exists. Optimisation has only been used for research purposes.







## Case Study 4: Vienna

### Decision-making context

Urban development and transport policy is the responsibility of the Viennese city government and administration. Regional development is coordinated by PGO (Planning Group for East-Region), but this organisation has no legal power. Municipalities can make their own decisions on land use within their respective borders. Public transport responsibilities are divided between the city of Vienna, which is responsible for inner-city PT services (metro, tram, bus), and the national government, which takes responsibility for railway and regional bus services. The Transport-Association East-Region (*Verkehrsverbund Ost-Region: VOR*) was established in 1984 in order to establish an interconnecting network of transport services with a unified fare structure. In July 2002, most federal roads were turned over to local state government while major motorways remain under the authority of national government.

### Approach to decision-making and participation

The decision making of Vienna is more or less based on a mix of approaches (Section 4). However, the city mostly follows a plan based approach. The fundamental objectives, policies and measures of urban and transport planning were formulated in the Urban Development Plan and the Traffic Concept (both published in 1994) and updated recently in the Urban Development Plan 2005 (STEPS05). These plans are to be updated every 10 years. Moreover, current trends of urban development are analysed in Urban Development Reports, the latest published in 2000. Visions for Vienna were published in the Strategy Plan 2000 and the Masterplan Transport 2003. In recent years, a consensus-based approach has gained more and more importance, e.g. in the development of the Masterplan Transport all citizens were able to participate. This approach is very similar to that recommended in this guidebook. The starting point was a participation process in which the relevant stakeholders defined the overall objective. Indicators to monitor the achievement of the defined objective were defined.

Participation tools are used informally. The city administration provides a lot of information for citizens and stakeholders by means of publications, the Internet, exhibitions and a citizens' service office. Other elements of more active participation are discussions and on-line chats about concepts and projects of urban development. At the project level the municipality uses a tool of citizens' participation (*Bürgerbeteiligungsverfahren*) as a formal part of the planning process. The main objectives are the transparency of the planning process and to include as much as possible public acceptance.



### Objectives, indicators, targets and problems

The Traffic Concept includes objectives such as the reduction of traffic impacts on the environment and health, an increase of traffic safety and a reallocation of urban space for pedestrians and cyclists. To achieve these objectives, a reduction in urban sprawl, a reduction in traffic volume and an increase in the mode shares for public transport, walking and cycling are needed. Several indicators have been defined to monitor the achievement of the objectives, such as modal split, traffic safety (number of accidents, injuries and fatalities), noise level, air pollutants and CO<sub>2</sub>. A target formulated in the Traffic Concept 1994 is to reduce the modal share of private car to 25% by 2010.

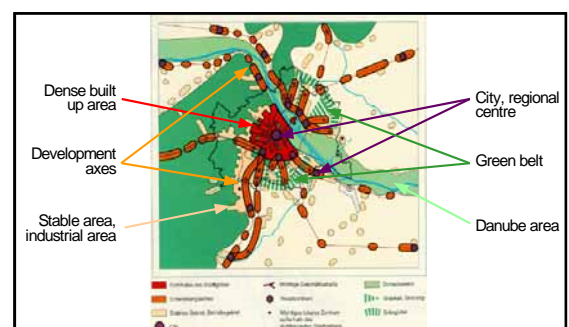
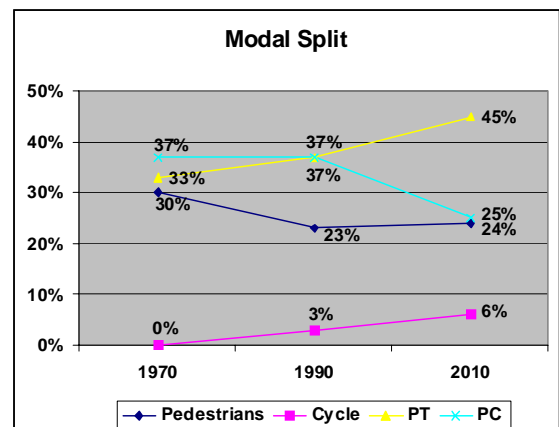
### Policy instruments, barriers and strategy formulation

Vienna pursues a strategy of polycentric development to achieve a reduction of urban sprawl and traffic volume. This strategy includes elements of increasing the density of central districts, urban expansion around sub-centres in the other districts and axial development along regional railway lines. The Traffic Concept provides a list of specific packages. Public transport services are to be enhanced through an extension of the underground, prioritisation of buses and trams and an improvement of marketing and information. Walking and cycling are to be promoted through an extension of pedestrian areas and bicycle ways. Car restraint measures focus on parking space management within the inner districts and traffic calming.

Barriers exist with respect to the axial development. Firstly, there is a lack of co-ordination of the municipalities' activities regarding land use within the Vienna region. Each municipality pursues its own policies, and their aim is in general to collect as much tax as possible. The main problem is that no binding instruments are in place to support axial development. The planning group PGO can only give recommendations. Secondly, landowners and investors use their financial power to overcome land use and transport policies, so that certain projects are realised, which are not in accordance with the planned and desired developments.

### Prediction, appraisal and optimisation

The Viennese administration uses the multi-modal model VISUM/ VISEM as a formal transport modelling tool. VISUM is an information and planning system for network analysis and forecasting. VISEM is applied for the trip generation matrices based on a travel demand model, which basically considers activities and connects these with a mobility program. The urban planning department has been using VISUM/VISEM for more than seven years. During this time the model has been improved and the transport network refined. It is used to model the whole urban transport system as well as impacts of special projects. Currently the model is being used to analyse impacts of urban extensions in the north east of Vienna. There is no formal requirement for appraisal.



	Integration			
	Edin- burgh	Madrid	Oslo	Vienna
Roads	(✓)	x	x	✓
Traffic management	✓	(✓)	(✓)	✓
Public transport	x	✓	x	✓
Demand management	✓	(✓)	(✓)	✓
Land use	✓	x	x	x

	Decision making			
	Edin- burgh	Madrid	Oslo	Vienna
Vision	(✓)	✓		
Plan	✓	(✓)	✓	(✓)
Consensus	(✓)	✓	✓	✓

	Objectives			
	Edin- burgh	Madrid	Oslo	Vienna
Efficiency	✓	(✓)	✓	
Environment	✓	(✓)	✓	✓
Liveable streets	✓	(✓)	✓	✓
Safety	✓	(✓)	✓	✓
Equity	✓	✓	✓	
Economy	✓	✓	(✓)	
Future generations			✓	✓

## Case study comparison

### Decision-making context

None of the four cities has a simple structure for decision-making. Edinburgh is notable for the number of changes in responsibility which it has experienced in the last decade. It is also alone in having little direct control over public transport fares and services. However, it has the advantage, uniquely among the four, of having direct responsibility for both transport and land use. Madrid has an enviable degree of coordinated control over public transport, which has been central to its strategy. Management of the road network is dispersed, but does not appear to pose a serious problem. Its main weakness is its inability to control the pattern of new development. Oslo's structure is the most complex, with a mix of responsibilities at three tiers of government, and two separate counties responsible for the conurbation. Vienna has the most integrated management of its transport system but, once again, has its land use development managed separately.

### Approaches to decision-making

All four cities adopt a mix of vision-led, plan-led and consensus-led approaches. Edinburgh combines all three, but places particular emphasis on planning, followed by extensive consultation. Madrid's approach has changed over time, with a move away from planning towards a vision-led emphasis. It seeks consensus among the agencies responsible, but has not placed great emphasis on wider consultation. Oslo's approach is more strongly plan-led, with decisions based on ten year plans rolled forward regularly. Increased emphasis is being placed on consensus-building among the responsible agencies, and wider consultation is a key element in its approach. Vienna has a mixed approach, with less emphasis on analytical planning and the strongest reliance on consensus-building and widespread participation.

### Objectives, indicators, targets and problems

This aspect of the case studies reflects the greatest difference in cultural approaches to strategy development. Edinburgh's approach is clearly objective-led, with objectives, indicators and targets largely selected to reflect the expectations of government. It includes most of the objectives proposed in this guidebook, with the exception of inter-generational equity. Its targets are a mix of outcome (safety, pollution) and intermediate outcome (modal shares). Madrid does not have a clearly stated set of objectives, but is principally concerned with economic growth and equity, and the problems caused by traffic growth. Once again intergenerational equity is not a concern. Its indicators relate principally to modal shares. Oslo adopts virtually the full set of objectives proposed in this Guidebook, with greater emphasis than the others on longer term sustainability; conversely it is less concerned with economic growth. It uses a range of indicators, but they are not well linked to the objectives. Vienna has had an aim of reducing car use for several years, but has only recently specified its objectives. Its principal concerns are environment, health and safety, with some consideration of longer term sustainability.

## Policy instruments, barriers and strategy formulation

The balance of strategies differs between cities. All stress public transport investment, and all have pursued innovative solutions. Edinburgh emphasises management of road space and control of land use. Madrid has introduced information systems and some road space management, but places little emphasis on demand management or land use controls. Oslo has invested in road building, but is now focusing on public transport, walking and cycling, land use controls and the potential wider use of road pricing. Vienna has a similar emphasis, but uses parking controls and traffic calming as its main tools for controlling car use. Finance is a barrier in all cities; so is the mix of institutional responsibilities, which particularly limit the ability to manage land use. Public acceptability is a critical issue in Edinburgh and to a lesser extent in Oslo.

## Prediction, appraisal and optimisation

All four cities use conventional four stage models to predict the effects of alternative strategies, although Madrid only does so to improve the design of already accepted proposals. Only Edinburgh uses a land use-interaction model, and none as yet uses sketch planning models or optimisation other than for research. Approaches to appraisal differ markedly. Edinburgh and Oslo adopt a combination of cost-benefit analysis and multi-criteria appraisal, as specified by their governments. Madrid adopts a similar approach but only for enhancement of chosen strategies. Vienna has no formal appraisal methods.

## Key messages

All four cities have been very successful and innovative in developing their strategies. However, the above review has highlighted some key messages for the future.

1. Decision-making contexts are complex and difficult to change; decision-making processes need to be designed to work within this context
2. However, failure to plan transport and land use together poses serious threats for longer term sustainability, and needs to be addressed by city governments
3. Visions, plans and consensus are all important elements of decision-making; in addition, the public are increasingly seeking active participation
4. Some cities are less specific as to their objectives, focusing instead on strategies to reduce car use. There is a danger that this will lead to some key impacts of transport being overlooked
5. Few cities are currently addressing long term sustainability. While this is understandable, there is a need for an assessment of longer term impacts
6. Indicators and targets tend to reflect modal shares rather than the impacts of transport on society, which could lead to the latter being overlooked
7. Public transport improvements are a dominant element of strategy, but they alone will not control overall demand for travel or the growth in car use. Greater emphasis is needed on land use and demand management
8. A greater emphasis on appraisal could help to ensure that the chosen strategy is the most effective means of meeting the city's current and long term needs.

	Instruments			
	Edin-burgh	Madrid	Oslo	Vienna
Roads			✓	
Traffic management	✓	✓	✓	✓
Public transport	✓	✓	✓	✓
Demand management	✓		✓	✓
Land use	✓		✓	

	Prediction and appraisal			
	Edin-burgh	Madrid	Oslo	Vienna
Transport model	✓	✓	✓	✓
Land use model	✓			
Appraisal	✓	(✓)	✓	

## Key messages

- Need to reflect complex decision-making
- Integration of land use planning is crucial
- Visions, plans, consensus, participation all key elements
- Objectives need to be clearly stated
- Long term sustainability must not be overlooked
- Outcome targets are more useful than modal shares
- Land use and demand management need greater emphasis
- Thorough appraisal is needed to ensure effectiveness



## 17. Glossary

Many of the terms in this glossary can be defined in several ways. The definitions provided are the ones which have been used in the PROSPECTS project. Definitions of individual policy instruments are not included but can be found in KonSULT.

The meanings of words in italics can be found elsewhere in this glossary.

**Accessibility** The accessibility of an activity to an individual is the ease with which the individual can get to the places where that activity can be performed

**Appraisal** Assessing the relative merits of *strategies* before they are implemented

**Barrier** An obstacle which prevents a given *policy instrument* or *strategy* being implemented, or limits its implementation in some way. A **constraint** is similar

**Complementarity** A condition where the component instruments of a strategy have a greater beneficial effect than any instrument on its own

**Cost-benefit analysis** *Appraisal* of the *economic efficiency* of a strategy, by weighing the costs of a *strategy* against the benefits it might bring, over a number of years into the future

**Efficiency (or economic efficiency)** Maximising the benefits which users can gain from the transport system, after taking account of the costs of provision and operation of the system

**Environment** Environmental impacts include noise, air pollution, vibration, visual intrusion, severance, intimidation, and the loss of flora, fauna and historic buildings

**Equity** Equality, especially between different groups in society, in opportunities to travel, costs of travel and environmental and safety impacts of travel

**Evaluation** The process of finding out, after implementation, what the real impacts of a *strategy* have been and how they compare to what was expected beforehand

**Indicator** Ways of quantifying *objectives*: for example, road accident numbers are one indicator of safety

**Instrument** Also known as measures, instruments are the specific components (e.g. lower bus fares, road pricing) of a *strategy*

**Intergenerational equity** Meeting the needs of the present without compromising the ability of future generations to meet their own needs. (See also the full definition of sustainability in Section 7 of this Guidebook)

**Integration** Integration involves combining *instruments* so that they reinforce one another and create *synergy* in meeting *objectives*

**Land use** The function of a given area of land. Examples of types of land use include: residential, industrial, commercial, agricultural and recreational

**Liveable streets** Pleasant street and outdoor conditions. It includes the positive external effects on social, cultural and recreational activity in neighbourhoods

**Management** How the transport system is managed and operated, usually to reduce congestion and accidents and to protect the *environment*. **Demand management** encompasses measures to affect how people travel. **Traffic management** is the allocation of road space to different users

**Mobility** Ease of moving about. Often specifically meaning access to a private vehicle for travel

**Model** A (mathematical) representation of the relationships within the land use / transport system; widely used to predict the outcomes of transport *strategies*

**Monitoring** A continuous programme of measuring changes in the transport system

**Multi-criteria appraisal** *Appraisal* against more than one objective

**Objective** A broad statement of the improvements which a city is seeking. Objectives specify the directions for improvement, but not the means of achieving it

**Objective function** One or more *objectives* incorporated into a mathematical expression, often used in modelling as part of an *optimisation* process

**Optimal** An optimal *strategy* is one which performs best against its *objectives*

**Optimisation** A (mathematical) process to determine the *optimal* transport *strategy*

**Policy** A broad approach towards transport and *land use* planning, including the specification of *objectives* and the choice

of a *strategy* and its component *instruments*

**Pricing** The way in which users are charged for using the transport system. **Road pricing** is a pricing system where motorists pay directly for using the roads

**Reliability** For the road system, reliability means little daily variation in travel time. For the public transport system, it means that vehicles depart on time and arrive at stops on schedule

**Revenue** Income from transport *pricing*

**Robust** Likely to be successful in a wide range of future *scenarios*

**Scenario** A possible future set of demographic and economic conditions

**Sensitivity analysis** is a programme of tests of a *strategy* to find out how its performance changes with changes in the assumptions made

**Stakeholder** All people and organisations which have an interest in the transport system

**Strategy** A combination of *instruments* to meet a given set of *objectives*

**Synergy** A condition where the component *instruments* of a *strategy* have a greater beneficial effect than the sum of their parts

**Target** An aimed-for value of an *indicator*

**Threshold** The value of an *indicator* which should not be exceeded

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## PROSPECTS Reports

PROSPECTS (Procedures for Recommending Sustainable Planning of European City Transport Systems) was funded under the European Commission's Environment and Sustainable Development Programme, with the purpose of providing cities with guidance in generating optimal land use and transport strategies to meet the challenge of sustainability in their particular circumstances.

Deliverable 1 reviewed cities' decision-making requirements. The initial results from six Core Cities were used to produce a questionnaire survey which was circulated to around 60 cities, drawn from across Europe. The report is structured around five tasks: the broad approaches to decision-making; objectives and indicators; trends and scenarios; policy instruments; and barriers to implementation.

Deliverable 2 built on the planning framework reported in Deliverable 1 and applied it to evaluation, presentation and optimisation. It established a set of high-level objectives, a hierarchy of indicators of achievement and alternative methods for appraisal against these. It identified the presentation methods for all relevant information that could best help decision makers and promote public participation.

Deliverable 3 analysed the ability of existing forecasting tools to meet the requirements arising from a city's decision-making needs. In particular, it considered, firstly, the representation and prediction of the supply effects which result from the implementation of transport instruments and, secondly, the representation of behavioural responses by the various actors in the transport / land use system to the implementation of transport instruments.

Deliverable 4 presented an interim summary of the performance of the 60 policy instruments identified in Deliverable 1, under the headings of land use measures, attitudinal and behavioural measures, infrastructure provision, management of infrastructure, information provision and pricing. This has been developed into the Policy Guidebook which is a companion volume to the Methodological Guidebook and to this Decision Makers' Guidebook.

The PROSPECTS deliverables can be found at <http://www-ivv.tuwien.ac.at/projects/prospects.html>

## Land Use and Transport Research (LUTR): Policies for the City of Tomorrow

The LUTR cluster links several different projects in the area of sustainable urban mobility, including land use, transportation, and the environment. The common objective is to develop strategic approaches and methodologies in urban planning that all contribute to the promotion of sustainable urban development. This includes issues of transportation demands and related land use planning, the design and provision of efficient and innovative transportation services including alternative means of transportation, and the minimisation of negative environmental and socio-economic impacts.

We have been able to draw on most of these projects in this updated Guidebook. Their websites are as follows:

Artists: <http://www.tft.lth.se/artists/>  
ASI: <http://www.factum.at/asi/>  
City Freight: <http://www.cityfreight.org/>  
Ecocity: <http://www.ecocityprojects.net/>  
Ishtar: <http://www.ishtar-fp5-eu.com/>  
LUTR: <http://www.lutr.net>  
Prompt: <http://prompt.vtt.fi/>  
Propolis: <http://www.wspgroup.fi/lt/propolis/>  
Prospects: <http://www-ivv.tuwien.ac.at/projects/prospects.html>  
Scatter: <http://www.casa.ucl.ac.uk/scatter/>  
Sutra: <http://www.ess.co.at/SUTRA/>  
Transplus: <http://www.transplus.net/>  
Veloinfo: <http://www.velo.info/>

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The revised version reflects the work conducted in the other eleven Land Use and Transport Research (LUTR) projects and the overarching reviews conducted in PLUME. We are grateful for the contribution of all participants in those projects.

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