HiTrans Best practice guide

5

Public transport – Citizens' requirements

Development of principles and strategies for introducing **Hi**gh Quality Public **Trans**port in medium sized cities and regions

hi trans

Interreg North Sea Region

HiTrans Best practice guide 5

Public transport – Citizens' requirements

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An introduction to HiTrans

HiTrans is an abbreviation for "the development of principles and strategies for introducing high quality public transport in medium size cities and urban regions". Examples of high quality public transport may be light rail, guided busways or frequent, comfortable buses. But the defining criterion of "high quality public transport" is the ability to compete with the private car for everyday travel in circumstances where car ownership is widespread. Established by a partnership of cities and transport agencies in the United Kingdom and Scandinavia, HiTrans is specifically aimed at cities and urban regions in countries bordering the North Sea that have populations between 100,000 and 500,000 people.

The project is jointly funded by the European Commission's Interreg IIIB North Sea Programme and the following partners:

- Rogaland County Council, Norway, (lead partner)
- Aarhus County Council, Denmark
- Edinburgh City Council, Scotland
- Helsingborg City Council, Sweden
- Stavanger City Council and Sandnes City Council (in partnership), Norway
- Sunderland City Council, England
- Jernbaneverket, the Norwegian National Executive for building and maintaining railways
- NEXUS, which operates the metro in Tyne and Wear, England
- NSB BA, the Norwegian National Railway operator
- Oslo Sporveier, which plans and operates the bus, tram and metro network in Oslo, Norway
- Statens vegvesen, the Norwegian Public Roads Administration.

The North Sea region is characterised by urban networks with few large but many medium sized cities and urban regions. Urban land use is generally low density when compared to other parts of Europe. There are also similarities in terms of urban culture and climate in the North Sea region that can affect the use of different transport modes. Car ownership and usage in European cities is generally increasing, and providing public transport that can compete with the private car is a challenge throughout Europe. But there are some challenges that particularly apply to medium sized cities and urban regions. In contrast to that of large cities, public transport in medium size cities and urban regions tends to be based on relatively low quality bus services. Smaller populations and thus lower passenger demand mean that expensive infrastructure such as heavy rail or subways cannot normally be justified.

Medium size cities that are looking for alternatives to normal bus services rarely have the resources to adequately research the advantages and disadvantages of emerging technologies and concepts of high quality public transport, particularly as these would apply in their circumstances.

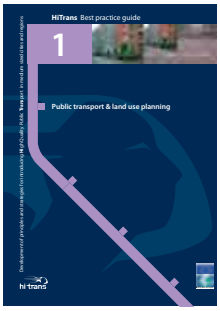
HiTrans is a cooperative research effort to obtain this knowledge; to find suitable and cost effective solutions for such cities, and to learn from the best examples of relevant cities throughout the world.

But the aim is not just for high quality public transport. The aim is for high quality cities.

Most new concepts of high quality public transport require new infrastructure. It is a challenge to make such infrastructure fit into – and better still, enhance – the qualities of the urban landscape.

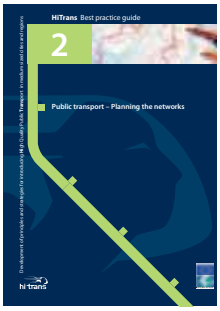
High quality public transport can also be used to restructure our cities to enhance the accessibility of the people who live in them without the choking traffic that diminishes our quality of life. At the same time it is expected that spatial planning oriented towards a city's high quality public transport network can be a critical factor in building patronage that in turn can justify more service

HiTrans' work has been organised through 5 work packages called *strands*. This work has resulted in 5 best practice guides.



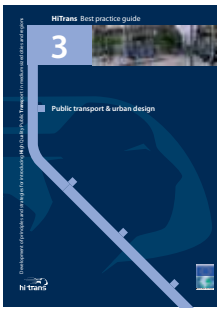
Best practice guide 1
Public transport & land use planning

How can we reshape our cities to facilitate the use of public transport? A series of case studies provides some inspirational illustrations of what can be done – as well as some salutary lessons of what to avoid. There are examples of cities regenerating run-down areas, curtailing urban sprawl, building successful public transport oriented communities, ridding themselves of traffic-chocked city streets, as well as examples of cities reinventing themselves as attractive places in which to invest and to live.
Main consultant: Lynn Devereux (WSP, Cambridge)



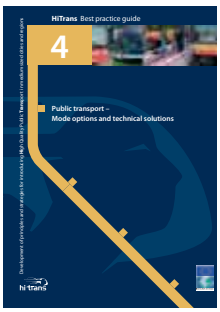
Best practice guide 2
Public transport – Planning the networks

Medium size cities face special challenges when introducing high quality public transport. How can the patronage be raised to generate the frequencies needed to make public transport a viable alternative to the car? This challenge is on top of well-known dilemmas that lie behind questions such as how far apart stops should be and whether resources should be spread between dense network of routes, or concentrated in a few, higher frequency routes. Illustrations and graphs demonstrate principles of network design, introducing concepts that simplify and clarify the planning public transport services. Also the report gives an overview of various legislative frameworks and their effects on the provision of public transport.
Main consultant: Gustav Nielsen (Civitas, Oslo)



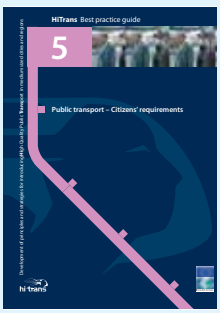
Best practice guide 3
Public transport & urban design

The introduction of high quality public transport can have profound implications for a city's urban design. It may be introduced with-out any thought about how it will look or its impact on people's ability to move about and enjoy the city's public spaces. On the other hand, it may be carefully designed to reinforce or en-hance these aspects – or to play a crucial part in the reinvention of the city's image. This guide uses case studies to examine the variety of urban design factors that should be considered when introducing high quality public transport: overhead wiring, rails, signs, stations, stops, guideways, safety barriers, as well as the vehicles themselves. It also provides advice on advertising and preventing vandalism.
Main consultant: Marie Burns (Burns+Nice, London)



Best practice guide 4
Public transport – Mode options and technical solutions

There is a wide range of options available for those planning the introduction of high quality public transport. Rail-based options range from ultra light rail to heavy rail, with various permutations and combinations such as tramtrains, light metros, metrotrains and so on. Cities opting for bus-based transport will have to choose between different forms and combinations of propulsion, as well as whether to use bus only streets, busways, and/or to adopt one of the evolving technologies to guide buses. The experiences of numerous cities are used to provide lessons of how to introduce cost effective solutions that suit the local circumstances, and avoid costly mistakes.
Main consultant: Trevor Griffin (Interfleet Technology, Derby)



Best practice guide 5
Public transport – Citizens' requirements

This report investigates what the citizens of medium sized cities require from the public transport system. The report is split into two parts. Part 1 is a desktop study analysing the findings of previous research into the requirements of both users and non-users of public transport. Part 2 presents case studies of medium sized cities and regions that are perceived as being successful in providing high quality public transport. The study identifies the qualities that have made a difference, as for example fare structure, speed, reliability and frequency.
Main consultant part 1: Alan Howes (Colin Buchanan and Partners, Edinburgh)
Main consultant part 2: Tom Rye (Napier University, Edinburgh)

About this Best Practice Guide

The objectives of this guide are to explore the qualities of public transport systems required by the citizens of medium sized cities, and to discern what types of services are needed to meet these requirements.

The guide is split in two stages.

Stage 1 is a literature review aimed at answering the question "What are the qualities required in a public transport system in order to attract non-users". It focuses on attitudinal research in Europe, North America and Australasia. Where possible, findings cover both users and non-users of public transport. 60 items of research were examined, of which 14 were classified as of direct relevance to the current research objectives.

Stage 2 is a series of case studies examining successful high quality public transport in terms of increasing patronage and/or reducing car use. There have been some spectacular cases of cities increasing public transport patronage and achieving a shift from car use to public transport. The gains have been made using both bus and rail-based services, in a variety of regulatory circumstances, and have sometimes been achieved without heavy expenditure. And sometimes the gains have been won in the most unlikely circumstances.

The report presents case studies of 10 such cities and 5 corridors, interviewing the officials concerned to find out how they have done it. The case studies pay careful attention to the local circumstances as well as the public transport service itself.

The report identifies the qualities that have made a difference – things like the fare structure, speed, reliability and frequency. More importantly, it has advice on how to achieve these for those directly involved in providing the service and for the policy-makers who shape the regulatory environment.

The purpose of the case studies is to understand the importance of different qualities of public transport in attracting previous non-users, and in getting existing users to use public transport more.

Contributors

Stage 1

The main author of the stage 1 part is Alan Howes of Colin Buchanan and Partners Ltd, Edinburgh. The report was written based on research collected by Buchanan and Partners Ltd.

Stage 2

The author of the stage 2 part is Tom Rye of Napier University, Edinburgh. The report was written based on research undertaken by the strand 5 members and the HiTrans experts.

Through regular meetings the strand 5 members have guided the process of producing the best practice guide. The members are:
Peter Lawson, NEXUS (strand manager)
Hildegunn Hausken, City of Stavanger
Tor Geir Espedal, Rogaland County Council
Clive Brown, City of Edinburgh

HiTrans experts have contributed to the research. These are:
Axel Kühn, Karlsruhe
Rob van der Bijl, Amsterdam
Tom Rye, Napier University Edinburgh

Tom Rye of Napier University has given expert advice throughout the work on this report and Ian Radbone of QED, Adelaide, has given editorial advice.

The HiTrans international steering group (ISG) is the main responsible body of the HiTrans reports. All HiTrans partners have a member in the ISG.

Contents

Stage 2

Stage 1

Colin Buchanan and Partners Ltd, Edinburgh

Executive summary

This report sets out the results of a study carried out by Colin Buchanan and Partners for the HiTrans Partnership. The study was in essence a literature review aimed at answering the question – "What are the qualities required in a public transport system in order to attract non-users".

Research Focus

The focus of the study is on attitudinal research – what people say they want, or "stated preference", rather than "revealed preference" in which the effects of change on travel behaviour is studied.

This ideally requires attitudinal research among users and non-users of public transport who need to be asked about their attitude to changing mode.

In fact, because relatively few research studies identified met all criteria, a rather broader approach was taken in selecting research. The study covered research literature from Europe, North America and Australasia. Around 60 research documents, mainly from Europe, were reviewed comprehensively. (These reviews can be found in an Appendix to the report; download at www.hitrans.org/guide5)

Findings – Public Transport Attributes

Qualities – or attributes – of public transport (PT) can be classified as "hard" and "soft". Hard attributes (which are generally "planned") include such items as route structure, timetable / frequency, location of stations/stops, and fares, while soft factors cover such things as reliability, provision of information, comfort and security, which have more to do with the way the system is operated.

The main results of the study, in broad terms, were that –

- **Reliability** is found consistently important, regardless of the country, and regardless of whether public transport experienced by the respondent is reliable or not. In nearly all surveys it came among the top three items – the only attribute to do so.
- **Frequency** was second most consistently important factor – particularly in the UK.
- **Fare Levels and Personal Security** were often found to be important, and in some research were the most important factors. However, this was not consistently so – the importance of these factors varied according to local and/or national circumstances.
- **The Extent of Routes** (or availability) was also generally found important in those research items that considered it – this is a "hard" factor and depends to a large extent on the characteristics of the area served – it is not normally so amenable to improvement as the above factors.
- **The importance of Information** was also variable. Generally it was found more important by non-PT users, but also by users of PT in the UK, where many recent changes in routes and timetables have made information an issue.
- **Of moderate or varying importance.** Other items found to be of only moderate, or varying, importance were the *location of stops and stations*, issues associated with *interchange* (transfer), *comfort and facilities* of vehicles, stations and stops, and *safety* (from accidents).
- **Not generally important.** Perhaps surprisingly, *travel time* was not generally found to be important, and neither were *staff and passenger behaviour*, or accessibility of *vehicles etc. for the less able* – though the latter is obviously important to a minority of passengers.

It should be noted that not all research covered all the above factors. Much research was carried out to meet local conditions, creating difficulty in making comparisons, while outside the UK very little research on increasing PT use covered non-PT users as well as users.

Other key findings

Other key findings were that;

- Differing lifestyles and/or psychological make-up have a large effect on an individual's ability, or willingness, to transfer from private to public transport.
- Other things being equal, users of different transport modes had similar views on the importance

of the various attributes. However, rail-based modes were often more expensive, and buses were often less reliable – this affected views on importance in some cases.
- Improving individual attributes of public transport is much less effective than a "package approach" where several items are dealt with at the one time – "the whole is greater than the sum of the parts".
- Many items of research came to the conclusion that in order to achieve modal transfer from the private car to public transport, "sticks" in the form of road user charging, or restrictions on car use, will be necessary in addition to the "carrot" of improved public transport.
- Non-users of public transport found it fairly difficult to distinguish the importance of various PT attributes – no doubt due to unfamiliarity with the product.

Case Studies

A number of Case Studies are reported on; key points from these case studies are;
- In *Freiburg*, Baden Wurttemburg, the car modal share was reduced from 60% to 46% between 1976 and 1992, owing to a sustained programme of improving public transport (including new tram routes), limiting provision for the car, more attractive PT fares, and land use planning policies.
- In the *Île de France*, PT users were 30% less satisfied with their transport mode than were car users and pedestrians – despite which PT had a slightly better image than the car.
- In *Greater Manchester*, security was most important for all groups except frequent bus users – who found reliability more important.
- The *EU MOTiF* study found significant local and regional differences between the importance placed on attributes.
- A Stated Preference study in three *New Zealand* cities found that, whatever policy scenario was represented in terms of public transport improvement and/or restrictions on car use, almost half of the respondents said they would continue to use their car.
- A *Norwegian* study pointed out that it is much easier to lose passengers by making PT worse, than it is to gain them by improving PT.
- A trial in *Scotland*, in which regular four car users transferred to PT for a trial week, found that three of them were unlikely to increase their PT use after the trial – and two of the four specifically mentioned bad weather while waiting for or walking to PT as a problem.

Further Research

An important aspect of the project was to recommend directions for further research. In this respect, the effect of two particular PT attributes seems to have been inadequately researched;
- The deterrent effect of bad weather and other factors when walking to/from or waiting for public transport – for instance, cold railway platforms or bus stops exposed to "road splash".
- The time span, or operating hours, of transport services.

There is a clear need for more research on attitudes to Public Transport among non-users – or infrequent users – of the various public transport modes, and further work in this area is recommended.

However, it seems that non-PT users are somewhat unaware of the characteristics of PT services, making research among such groups less reliable. Accordingly, the consultants recommend a study in which a significant number of regular car users are persuaded to use PT for a trial period of at least a week – preferably more – and their opinions of PT before and after scientifically evaluated.

1 Introduction

Brief Overview of this Research

In response to the brief, CBP identified, summarised and analysed a number of appropriate studies. Appendix 1 (download at www.hitrans.org/guide5) to this report lists around 60 such studies – a number of further studies were identified and examined but found to be of minimal relevance to the objectives of the current research. The principal means of locating studies was the Internet, supplemented by searches of university libraries and the consultant's own data sources. Leads to research were also identified via Internet Mailing Lists (including transit-prof, sustran-discuss and utsg), some international transport organisations (including APTA), and via the HiTrans panel of experts.

The research items found were summarised, analysed and categorised as to their relevance to this project. For ten of the items reviewed, a further analysis was made of the Quality of research – this can be found in Chapter 3 of this report. This analysis was carried out in accordance with the requirements of the brief, in order to identify for the future Best Practice in carrying out this type of research. The items chosen for review were limited by resource considerations, and by the amount of information given about survey methodology.

Appendix 1 breaks down the studies into three groups as follows:

- **Group A**, Major Items; Studies involving significant and original attitudinal research of direct relevance to the current research objectives (14 items)
- **Group B**, Items including attitudinal research, but less directly relevant to HiTrans objectives, or less complete information available (23 items)
- **Group C**, Items not including original attitudinal research, but of some potential or actual interest in relation to the current research (23 items).

A summary of each research item, with principal findings where appropriate, appears in Appendix 2 – Group A items and selected other items are summarised in more detail than others.

Thirteen of the research items, in German, were identified by the HiTrans expert Axel Kühn. These have all been listed in Appendices 1 and 2, although none appear to qualify for inclusion in Group A.

Each item is referred to by a reference number incorporating the appropriate group letter – some also have a "Short Title", noted in the list at Appendix 1.

Note that some items of research yielded more than one set of results – e.g. for bus and rail users, or for residents and visitors. Some of these sets of results were strictly on the theme of "what will encourage you to use another mode (e.g. public transport) rather than car", while others were more about levels of satisfaction with public transport services – which will depend more on the services actually offered in the locality where the research was conducted.

Some of the "Satisfaction" surveys, however, also established the relative importance placed by respondents on particular service attributes. This is of much more relevance to the study, although answers on importance, asked in the context of a satisfaction survey, do seem to be influenced by satisfaction (in an inverse manner).

Limitations of Research

Apart from the above, there were some other limitations to the research:

Differing approaches and methodologies often made it difficult to compare research on a common basis – for instance, the list of public transport attributes (and the terminology used) varied greatly from one survey to another. Note also the different types of research summarised at 0. This makes comparison and transferability of research difficult.

There was little if any quantification of attributes considered – for example, if reliability is important, *how* reliable must services be?

Few if any research items gave background information about the transport system(s) under consideration – such as how reliable they were, fare levels, frequencies etc.

None of the research looked at specific trip purposes – though some studies were restricted to commuters.

Public transport users in Karlsruhe. PHOTO: EVA BERGE

Structure of the stage 1 part

The remaining six chapters of the stage 1 part are as follows:

Chapter 2 describes the Characteristics of the Research in broad terms,

Chapter 3 analyses the Quality of Research in relation to 10 major research items, and incorporates a description of *Best Practice* in such research,

Chapter 4 summarises the various attributes (or qualities) investigated by the research,

Chapter 5 provides more details of some of the more significant items of research, including their principal findings,

Chapter 6 looks at some other general findings, summarises the totality of the research in terms of "attractive attributes", and

Chapter 7 summarises the conclusions of the current research exercise and highlights gaps in research for further attention by the HiTrans consortium.

2 Characteristics of research

Orientation of Research

The current work aimed at locating research which was focussed on the requirement to attract travellers out of their cars and on to public transport – i.e. to achieve modal shift or transfer. In fact, the research displayed four main approaches to this issue –

- Attempts to measure *satisfaction* with public transport services, sometimes along with the *importance* of various attributes of the product – usually limited to public transport users,
- Attempts to measure *dissatisfaction* with public transport services,
- Attempts to identify factors, or combinations of factors, that would *encourage travellers to use cars less*, and
- Attempts to identify specific factors to *encourage use of public transport*.

A number of further studies looked at peoples' *lifestyles*, and the effect of these on their propensity to switch to public transport – or to remain using their car. (See, for instance, the German study C61, Mobilitatsleitbilder und Verkehrsverhalten (Perception of mobility and traffic behaviour), which identifies three distinct groups of travellers based on their needs, and the European STIMULUS project (C75) which identifies travellers based on psychological, rather than demographic characteristics.)

A further approach was to look at the effects of specific improvements to public transport on patronage – "revealed preference" rather than "stated preference". This approach seemed in fact the most popular one, at least outside the UK. Although this type of study, including no attitudinal research, is somewhat outside the scope of the current study, some have nonetheless been included in Group C as good examples of an alternative approach. One of the best examples, in terms of achievement of modal shift, is "Freiburg: Public transport policy as a key element of traffic displacement" (C45). Another example of this approach is item C55, "Combined Evaluation of public transport packages of measures in urban areas – 1996/97", a study carried out by the Norwegian Transport Economics Institute in connection with the "Trial Scheme for Public Transport".

One of the principal reasons for the popularity of this approach outside the UK may be that in many other countries (at least, outside North America) the advantages of investment in public transport are taken more for granted than is the case in the UK. Accordingly perhaps, less need is felt to examine exactly what attributes of a public transport system meet the particular requirements of users or potential users.

In the UK, on the other hand, the emphasis which has developed over the last 20 years is to adopt a market-led approach to the provision of public services – in these circumstances, and in view of the limited funding available for capital projects, it is hardly surprising that there is a large amount of research aimed at establishing and justifying the best way of spending the limited funds available.

Such a market-led approach is increasingly being advocated in other parts of Europe, and is being followed in some cases. The VOYAGER study (C76) is an example of a European initiative advocating such an approach (see summary in Appendix 2).

It should also be noted that in much non-UK European research (apart from straightforward "satisfaction" or "barometer" surveys), while attitudinal interviews were conducted, they were conducted with elected representatives, planners and managers of transport systems, rather than with the users themselves. This may represent a different emphasis on who the principal stakeholders in the transport system are, arising from greater involvement of public authorities in public transport than is the case in the UK.

Of the four approaches listed above, the last is obviously most relevant to the current study – just three of the thirteen "Group A" studies (Items A02, A06 and A07) took this approach. Another four took the third approach (Items A05, A46, A50 and A51) – in this case reduction in car use could mean making less trips (number and/or distance), or reducing the distance travelled, or changing to public transport, or changing to walking or cycling, and the measures employed could be either "pull factors" (carrots – e.g.

In Nottingham a new a tram-system was introduced to increase public transport use. PHOTO: ARE KRISTIANSEN

better public transport) or "push factors" (sticks – e.g. increasing costs of car use).

Five more Group A studies (Items A01, A12, A26, A57 and A74) looked at *satisfaction* with public transport, and one (A03) at *dissatisfaction* – this rather negative approach was perhaps less productive. One study (A07, Perceptions of Bus Services, Edinburgh, 1995) asked questions about both dissatisfaction, and factors to encourage bus use – this yielded some useful results.

Of the studies in Groups B and C, few if any took "approach 4" as above – most adopted approaches 1 or 3, while many items in Group C carried out no attitudinal research at all.

"Barometer" Studies

The research carried out identified many examples of a fairly standardised "Barometer" survey of public transport user satisfaction. The basic aim of a Barometer survey is to measure the users' view of the quality of a public transport system in respect of various attributes (speed, comfort, security, price, reliability etc.). Surveys are normally done regularly (often annually) to enable trends over time to be identified.

This type of survey is commonplace in Europe – though not, in quite this form, in the UK. (The "tracking" surveys carried out by GMPTE (A74) and Nexus (A12) are however similar.) These "barometer" surveys are normally restricted to users of public

transport, and do not look specifically at measures to encourage modal change. – this makes them generally less relevant to the current study, and only one (by STIF, which was more comprehensive than the norm) has been included in Group A.

Nevertheless, some display some interesting results – good examples are B70, Die Zufriedenheit der Kunden mit dem Stadtbus Schwabische Hall (Customer satisfaction with Schwabische Hall city bus), and B60, "Viktig og dyktighet for de som prefererer kollektivt kontra de som prefererer bil" (Importance and satisfaction in respect of travel for public transport and car users), conducted for Oslo Sporveier.

Travel Blending

Travel Blending, or Personalised Travel Planning, is "a set of techniques or approaches that provide individualised analysis or advice to people based on their journey making characteristics". The technique has been much used in Australia, but has also been tried in various countries in Europe and elsewhere.

See *http://www.dft.gov.uk/stellent/groups/dft_localtrans/documents/page/dft_localtrans_504131-02.hcsp* for a report for the UK Department for Transport reviewing the effectiveness of such techniques.

Such approaches are outside the scope of the current study, but do give some pointers to requirements for further research. Reference should also be made to Item C77, "Scotland's Public Transport on Trial"; this describes an experiment by the BBC in which four car-users were asked to use public transport for a trial week, and then interviewed about their experiences and resulting change in attitudes.

Travel Modes covered

It will be apparent from the list in Appendix 1 that more studies looked at bus services than at rail – although many looked at all public transport modes, or were focussed on car users. This in part reflects a pre-occupation, with trying to obtain the sort of modal shift typically obtained by implementing a rail-based solution, but at the costs of a bus-based system. In other words – how do you get "rail" standards of service from a bus-based system.

This emphasis seems reasonable when it is remembered that buses are the major public transport mode (in terms of passenger trips) in the great majority of towns and cities – especially in the case of cities in the HiTrans size range. Also, it is easier and costs less to implement bus-based solutions, thus these are more deliverable in the short term than rail-based strategies.

Of the thirteen research items in Group A, three were more concerned with transfer from the car than to any particular mode; one looked specifically at rail (A12 Nexus Metro Tracking), and five concentrated solely on buses. Three studies looked at Public Transport as a whole, covering bus, rail, and to some extent tram.

Users and non-Users

Naturally enough, most surveys looking at satisfaction levels with public transport were carried out exclusively among users of that mode – although a small number distinguished between regular and irregular users. On the other hand, surveys looking at means of reducing car use concentrated on car users – who may or may not also have been users of public transport. Many surveys surveyed a cross-section of the total population, although a problem with such surveys in some areas is that they will pick up relatively few public transport users – or even potential users.

The GMPTE Multi-modal tracking survey (A74) was particularly useful in that it measured attitudes to both Importance and Satisfaction of both Users and non-Users in respect of Bus, Rail and Metrolink (LRT) services – furthermore it distinguished users between "frequent users" and others. Several other surveys grouped infrequent users together with non-users.

Of the thirteen items in Group A, two surveyed exclusively non-users of PT, four were confined mainly to PT users, and the remaining seven covered both users and non-users. Two of these (A74, GMPTE Multi-modal Tracking Survey and A07, Perceptions of Bus Services, Edinburgh, 1995) clearly differentiated their findings between users and non-users,

although one of the "user" surveys (A03, Scottish Bus Passenger Satisfaction survey) usefully distinguished between car owners and non-car owners.

One research item, "De keuzereiziger in onderzoek" (The choice user in research) looked specifically at the differences between "captive" and non-captive users of public transport – the latter stating that they had a car or other alternative transport available. It found little difference in attitudes between the two groups, though there were differences in demographics. It did *not* look at non-users.

It should be noted that there is evidence that perceptions of public transport vary significantly between users and non-users, partly at least because the latter are not familiar with the attributes of PT. For instance, many non-users will not know how reliable (or otherwise) their local bus service is – yet in the UK at least, recent media publicity may well convince them that their train service would be unreliable (which may well not be the case). Similarly, non-users may not appreciate the particular problems with through ticketing (or lack thereof) in some areas. Non-users are, however, probably more sensitive to problems with publicity for PT services, while users may not find this such a problem.

The GMPTE Multi-modal tracking survey (A74) addressed this issue clearly – see Appendix 2 for a summary of findings. Note that while this shows a difference between users and non-users in terms of importance attributed to different service attributes, it also shows that non-users differentiate much less than do users.

Locations of Research – the City level

CBP were aware of the fact that the HiTrans partner cities are all in the population range 100,000 to 500,000 or thereabouts, and ideally research should relate to this size of city. Certainly research relating to larger cities, or exclusively to rural areas was, by and large, excluded. The remaining research tended either to concentrate on one particular location, or to cover a complete country – or at least region. Where a single city was covered, there was in some cases a danger that the results of the research would be too much related to the particular circumstances and problems of that city - an obvious example being that in Edinburgh, where few people were concerned about bus frequency for the reason that most buses already run on fairly frequent headways.

Where research covered a complete nation or region, in most cases the results were not disaggregated according to size of settlement. In one case, though this was done: item A03, "Scottish Bus Passenger Satisfaction Survey". It should be noted that this survey was based on "satisfaction" rather than "factors to encourage modal shift" (see section 0 above), but nevertheless it should be noted that no significant differences were found between satisfaction ratings with particular attributes between settlements of differing sizes. This seems to indicate that some findings from generalised research, given careful interpretation, should be of significant relevance to the category 0

3 Quality of research

As required by the brief, an examination was carried out of the quality of research of a sample of 10 of the research items identified. This analysis was carried out in accordance with the requirements of the brief, in order to identify for the future Best Practice in carrying out this type of research.

Most pieces of attitudinal research depend on interviews of some kind with a number of individuals, whose answers collectively are taken to be representative of a larger population. Ideally, to review the quality of any research, the following key principles need to be examined:

- Design of Sample Frame and sampling methodology (error and bias)
- Survey mechanisms (distribution/type of survey)
- Questionnaire design (content/wording/ambiguity/format etc)
- Quality control (accurate inputting and coding)
- Analysis (accuracy/reliability/representativeness)
- Interviewer effects

More detail of this analysis can be found in Appendix 3.

Summary of this analysis

On the whole, in terms of the principles that could be addressed, the research that was reviewed has been conducted satisfactorily. However, this analysis is fairly limited and indeed subjective due to the lack of detailed available information particularly regarding the methodologies employed and the datasets on which results were based.

Although interesting in terms of relevance to this study, the research tends to focus on satisfaction levels rather than focusing on what qualities are required by citizens to deliver high quality public transport. Based on the questionnaires available, of the four where respondents were specifically asked what factors would encourage them to use public transport, two provided respondents with a predetermined list of choices rather than being asked spontaneously. Both the questionnaires used in the Public Attitudes to Transport in England (A02) and Perceptions of Bus Services (A07) surveys also encouraged respondents to give reasons/factors not on the lists.

Research No.	Sample frame	Sample bias	Survey Mechanism	Questionn-aire availability	Questionnaire design								Rating
					Content	Physical design	Q types	Q format	Q wording	Q ordering	Q instructions	Q design rating	
A01 New Route? Scot	Insufficient detail	-	Face-to-face (good)	Yes	3	N/a	4	3	4	3	N/a	Average	4
A02 CfIT Report England	Insufficient detail	-	Face-to-face (good)	Yes	5	N/a	4	4	4	4	4	Good	4
A03 SE Bus Satisfaction	Insufficient detail	-	Telephone (good)	No									4
B04 Edinburgh QBC	Insufficient detail	-	Self-completion (poor)	Yes	3	2	4	3	4	4	3	Average	3
A05 BSA 19	Reliable	Limited	CAPI (very good)	Yes	4	N/a	4	5	4	4	N/a	Good	5
A06 UKDfT Omnibus	Insufficient detail	-	Face-to-face (good)	No									4
A07 Edinburgh Bus 1995	Insufficient detail	-	Face-to-face (good)	Yes	4	N/a	4	4	4	3	3	Good	4
B11 Hetton-le-Hole	Reliable	Limited	Public consulta-tion (reasonable)	Not ap-plicable									4
A12 Nexus Metro Track	Insufficient detail	-	Self-completion (poor)	No									3
A46 Persuading People	Insufficient detail	-	Various	No									4

This table attempts to rate the 'quality' of a sample of ten pieces of research investigated. It is important to note that the ratings are very much subjective and are based solely on the relatively limited information available. As such it is entirely possible that the ratings would be different if more detailed information for each piece of research had been available.

4 Attributes of public transport and their importance

The research showed varying ideas as to what attributes of public transport were of concern to actual and potential users. Only one item, Fares, appeared in every study (at least, every study which looked at specific PT attributes). There was also general agreement that Journey Time, Reliability and Frequency were matters worth investigating and, to a slightly lesser extent, information provision. Beyond that there was little agreement between the items researched.

Some research, particularly that carried out in continental Europe, distinguished between "hard" or objective attributes, and "soft" or subjective ones – though there was no obvious agreement as to which attributes fell into which category. Generally, the items categorised as "soft" were those more difficult to measure, such as security, information and comfort.

One survey (B04 Quality Bus Corridor Monitoring, Edinburgh) asked respondents to indicate which of a list of 68 factors which discouraged them from using buses – some of these related to specific attributes of bus travel, while some were specific to the alternative mode (namely car). The full list can be found in Appendix 4.

In some respects this list is useful, as reference to the results should enable some infrequently researched items (e.g. "People using mobile phones") to be discounted. However, when many such attributes are included there is a likelihood that many of the items could duplicate each other to a greater or lesser extent (e.g. "The fares are too expensive", "The fares are not good value for money", "I can't afford the bus fares").

It should be noted at this point, that when considering the importance of particular factors in influencing modal shift, one most important point has to be borne in mind. This is, that perceptions of both users and non-users will be influenced by their experience. For example, some of the research seemed to show that in Edinburgh, bus users were little concerned by the frequency of services; this however is probably because most of them had the benefit of fairly frequent services, and could not therefore visualise this as a problem.

Some research attempted to allow for this by asking separately "How important do you consider [such and such]" and "How satisfied are you with [such and such]". This is a useful approach, but it is uncertain that all respondents are able clearly and reliably to make such distinctions in their replies. (This will depend to an extent on how carefully the research is conducted.) There is definite evidence that where respondents are less "satisfied" about a particular quality, they will give it higher "importance". There is also evidence that non-users find it relatively difficult to place different scores for "importance" on different quality attributes.

In the case of some factors, while the main topic addressed might be similar the detail of the question asked varied significantly from one survey to another. The remainder of this chapter looks at the main attributes researched and comments on relevant differences between surveys. Further detail may be found in Appendix 2.

"The Public Transport Offer"

This term, or a variant of it, was used in some studies to describe the basic attributes of the public transport service – mainly route structure, stop location, and timetable. There is a distinct difference between this attribute and other more general ones in that a "PT Offer" that suits one person may well not suit another who lives or works in a different location, or whose timing requirements are different. Some surveys ignored this item altogether, concentrating on more general attributes, while some others asked about the "convenience" of public transport, which will relate mainly to the details of the "Offer".

The suitability of the "offer" is basically a matter of good planning, and must be very specific to the individual location and market. It can be seen as a "sine qua non" – without a suitable "offer", no amount of other PT initiatives can be expected to succeed.

Fares

All the main items of research asked about fares. Sometimes the question was phrased simply – "Are you satisfied with fares?" or "Would cheaper fares encourage you to use Public Transport?", while in other cases the emphasis was on value for money.

The ranking of this item varied considerably. Some surveys showed it as the most important factor, while others did not – notably A12, Nexus Metro Tracking (9th out of 32 factors) and the visitor component of A07, Perceptions of Bus Services in Edinburgh (where it ranked 9th of 12 concerns).

There is some evidence that rail users put a higher importance on Fare Levels than do bus users – though there could be many reasons behind this. In the UK at least, many bus users receive discounted fares on account of age, whereas less rail users do so. In many countries, rail fares are higher than equivalent bus fares for the same distance, and the average distance travelled by rail (and therefore the fare) tends to be higher.

The one item of European research which made inter-country comparisons (A74, MOTiF) found more concern about Fare Levels in Germany and the Netherlands (where it was found of first importance) than in France, Portugal and Spain (where it did not score in the first three). (UK results also tend to show this factor scoring lower than third.)

Ideally, research into attitudes to fares should be linked with an assessment of average fares related to disposable income. None of the research reviewed made this link.

Reliability (or punctuality)

This may variously be seen as "whether the [PT vehicle] turns up – at all" (reliability) or "whether the [PT vehicle] is on time" (punctuality). However, few surveys attempted to distinguish the one from the other, and indeed it may be irrelevant to do so – if a bus is due every 10 minutes, and one is 10 minutes late, the effect is the same as it not running at all. Another aspect to this question is that of delays en route, affecting arrival times, as opposed to unpunctuality at the beginning of the trip – a few surveys looked at this aspect, which seemed to concern rail users rather than bus users.

Reliability / punctuality consistently ranked highly in terms of importance in securing modal transfer – the only exception being in respect of visitors to Edinburgh (Ref A07), whom it may be argued might not appreciate that it is an issue. The CfIT report on Attitudes to Public Transport in England (A02) showed it by far the most important factor in relation to rail services – though this may well be influenced by current problems of the UK rail network, both real and perceived.

Concern with reliability seems to be common to most countries – among the first three items in all cases. The MOTiF study (A57) found that "punctuality and reliability" were ranked among the three most important factors in all five countries summarised (Netherlands, France, Germany, Portugal and Spain) – and in the UK it ranks at number two. Polish studies, quoted in Item C76 (Voyager), also found punctuality, along with frequency, of premier importance.

Again, however, none of the reviewed research attempted to measure reliability or compare the extent of unreliability with the importance placed on it. The results from item B70 (Customer satisfaction with Schwabische Hall city bus) are however of interest in this respect – punctuality was accorded much the highest importance among all age groups (a score of 63, compared with the second highest of only 20), despite the fact that punctuality also attracted the highest score for satisfaction. This seems to suggest that the high importance of punctuality (reliability) is absolute, rather than being a product of dissatisfaction with the performance of particular systems – a conclusion not contradicted by other research.

Frequency

Frequency (and regularity) of service is generally seen by public transport professionals as a key factor in attracting patrons. The research reviewed showed it to be of about the same importance as Reliability, at least in the UK, though perhaps less of an issue in other countries. This possibly reflects differences in

Real time information provides predictability. PHOTO: HANS MAGNAR LIEN

service levels between the UK and other countries, although it could also be due to differing values placed on time by public transport users in different countries.

Frequency can be seen as a "hard" factor, and as part of the "PT Offer". In most cases, it will be related to the level of demand, and the economics of provision mean that unless there is an appropriate level of demand it may not be possible to increase frequencies. One point should however be borne in mind. When designing a (bus or tram) route network, the planner often has a choice of two approaches –

- **A "sparse" network** of routes, with more spacing between routes, and hence longer walking distances to stops for some passengers, - but higher frequencies, or
- **A "dense" network** of routes, with shorter walking distances, but accordingly lower frequencies.

The decision taken will of course depend to a great extent on geographic and other considerations – but other things being equal, the "sparse" network with higher frequencies will generally attract more passengers than the alternative. (This has been shown convincingly by commercial network planning exercises in the UK.) There may, of course, be resultant social issues regarding a minority of disadvantaged passengers who are less well served by the "sparse" route structure.

Service Information

The way in which questions about information were asked varied significantly from one survey to another, as did the resulting answers. Nearly all the "Group A" research covered this aspect in some way – either in general terms, or specifically in relation to information at the point of boarding, or (unfortunately in only one case) in relation to Real Time Passenger Information (RTPI). The 1995 survey of Perceptions of Bus Services in Edinburgh (A07) found, among both residents and visitors, that the factor most likely to encourage them to use the bus was better information at bus stops, and the second most important factor was RTPI. However, all other items of Group A research gave these factors a lower level of importance (though there was some significant dissatisfaction with current provision in much of the UK research).

The MOTiF study (A57) divided this topic into "pre-trip" and "on trip" information. In none of the five European countries studied did either of these items make the top three in terms of importance, and in several cases they were among the three least important.

It seems, therefore, that among PT users outside the UK information is not generally seen as an important issue. There was insufficient non-UK non-user research to come to any firm conclusions about this group – there was though a little evidence (e.g. the MOTiF study, A57) to show higher (but not high) importance placed on information by non-users outside the UK.

In the UK, on the other hand, information is a matter of significant concern among both users and non-users – no doubt as a result of the much greater

frequency of service changes following deregulation (of buses) and privatisation (of both buses and the rail network).

Geographical Extent of Routes
This is very much a "hard" factor – part of the "PT Offer". Questions about this were asked, in some form or other, in about half the "Group A" research. It was generally given quite high importance, though there is no doubt that people who have the benefit of nearby provision of a rail station and/or bus stop are much less likely to consider this an issue than those who do not. The effect of access distance (walking time) on take-up of public transport is generally well understood in transportation planning, and this factor is probably less relevant to this current study.

Operating Times of Service
The effect of this factor (Evening and Night services, Sunday services etc.) on PT patronage and indeed car ownership is perhaps less obvious. However, only a few of the studies reviewed considered this; the CfIT Report (A02) asked a question about "extent of service", but it is unclear whether this referred to geographical or time extent – probably the former.

Interestingly, the 1995 Edinburgh Bus Attitude study (A07) found this factor the second most important "disadvantage of using the bus" among residents – after infrequent buses. Unfortunately, when asking questions about factors to encourage bus use, this survey seems to have ignored this particular factor.

This factor is one that merits further investigation by means of new research. It is not just the operating hours that have an effect, but also changes in operating patterns at different times of day. For instance, people who regularly finish work late in the evening may be discouraged from using public transport because of reduced frequencies at that time, even if their travel to work is satisfactory.

Journey Times
Almost all the "Group A" research considered this factor – although it was sometimes asked in terms of "journey speed". Questionnaires seldom, if ever, made clear if waiting time or transfer was included in this figure, although these were sometimes the subject of separate questions. Its ranking was quite variable – although there was a definite tendency for non-users to rate it as more important then did users.

The MOTiF study (European, confined to users) found that while in France this factor was considered important, it was not so in Germany, the Netherlands, Spain or Portugal (and neither is it in the UK). The study findings include the quote "The importance of travel speed, according to popular opinion decisive for modal choice, seems to be exaggerated. Availability, connections, punctuality and frequency are just as or even more important."

The STIF "Barometer" survey (which covered both users and non-users) found that "speed" counted as number 3 in terms of importance in 1996 – but in more recent surveys its importance has declined.

Vehicle Comfort
This was another topic where the emphasis and wording of the question varied greatly. Although about half the research covered this topic, it did not rank highly in any surveys. There is, however, some anecdotal indication that the external appearance of vehicles (particularly buses) affects the way in which non-users perceive the image of the public transport service – and accordingly their likelihood of using it.

Vehicle Accessibility
Surprisingly, many surveys omitted this factor – it may well be more important to existing (or frustrated) users than to non-users. In any event, it ranked highly in importance in two Group A surveys, but low in a further three (although one of them was in respect of rail, and another visitors to Edinburgh). There can be no doubt however that it is of great importance to a minority of public transport users.

Seat availability
Only a small number of surveys considered this factor, and none found it particularly important.

Connections between services and through ticketing
It was not in general possible to separate these two issues in the research. It was covered in terms of importance in six out of 10 of the Group A surveys, but not found of over-riding importance. It was, however, more important to rail users.

Cleanliness of vehicles and/or other facilities
Although this factor does seem to have been a cause of some dissatisfaction, it does not seem, in general, to be important to many users or non-users.

Personal Safety and Security issues
Relatively few of the "Group A" surveys considered this issue, and in general it did not seem to be a matter of great concern. It is, however, of more concern to women than to men, and of particular concern after dark. It seems that this is a matter of particular concern on the Nexus (UK) Metro system.

In some surveys the issues of Safety (from accidents) and Personal Security (from attempted crime etc.) were difficult to separate – in Spanish and Portuguese surveys (quoted in MOTiF), "safety" was ranked number 1 in terms of importance – it appears that this may be traffic safety rather then personal security.

A US survey (Transit non-user survey in Florida – C59) included the following interesting comments (note that the surveys referred to were carried out in the Greater Miami area, which is seen in Europe as offering distinct personal Security problems);

It was determined that those who are the most exposed to public transportation perceive transit to be safer. Hence, riders are less worried about safety than potential riders and potential riders are less worried about safety than non-riders. Comparatively, public transportation in Miami-Dade is perceived to be safer than driving a busy interstate (I-95), getting money from an ATM, or going to the grocery store at night.

From the above, it seems that this issue may be more one of perception than reality. It certainly seems likely that this is an issue that will vary very much in importance from one place to another, and no generalisations can be made.

Payment of Exact Fares
Only a small number of surveys covered this, and it was not generally found to be of great importance. However, it was a significant cause of dissatisfaction among visitors to Edinburgh (A07) – it should be noted that practice on bus services in this respect varies significantly within the UK, and Edinburgh requires exact fare payment.

Access to Stops and Stations
To a certain extent this is covered by "Geographical Extent of Routes" – however, there may also be an issue with the quality of access (facilities for pedestrians). This includes, for instance, lighting and weather protection on the pedestrian network adjacent to stops and stations – if carriageway drainage is not correct, water-splash onto the footway from passing vehicles can be a particular problem.

This issue does not seem to have been covered extensively to date, although one ongoing research item (C43, The Convenience of Rail Travel) may throw some light on it in due course. This may be another item for further research.

Helpfulness of Staff
Covered in only a few surveys, this does not seem to be a major concern.

Travelling comfortably on the tram-train of Karlsruhe. PHOTO: EVA BERGE

5 Some key Findings and Case Studies

This chapter provides a brief overview of the research items which most closely matched the requirements of the brief, and also mentions some other items of particular interest. More detail for all these items, along with other items reviewed, may be found in the summaries in Appendix 2.

Pedestrians and trams dominate the central streets of Freiburg. PHOTO: HANS MAGNAR LIEN

C45, The Freiburg Case Study

Item C45, "Freiburg: Public transport policy as a key element of traffic displacement" (see Appendix 2) describes experience in Freiburg over the last 30 years. It includes no attitudinal research, and is therefore strictly outside the scope of this study, but is nevertheless very worthy of note. Freiburg (SW Germany) has a population of around 0.25m – very much in the "HiTrans" range – and by deliberately following a process of planning for public transport use, has achieved enviable results. For instance –

- Between 1976 and 1992, car modal share decreased from 60% to 46%;
- Over the same period, and despite the growing number of inhabitants, the absolute number of cars entering the city centre each day decreased from 236,000 to 232,000.

These are results unique in Germany – or so the Freiburg authorities claim. Freiburg has a well-planned tram system of 26.2 route kms (actually relatively short) together with a bus route network of 168 kms. The keys to success in Freiburg have been –

- Integration of land-use and transport planning,

- Segregated tracks and signal priority for public transport vehicles to achieve high average running speeds,
- Reliable, comfortable services operating throughout the city,
- Low fares using a regional travelcard,
- Provision of high-quality transport infrastructure on the major traffic axes, and
- Limiting provision for the private car in the CBD.

Freiburg's experience illustrates excellently the benefits of an integrated approach to transport provision, including land-use planning, improvements to public transport and some restraint of the private car. The benefits gained, in terms of modal transfer, are doubtless much greater than those that could have been gained from any of these approaches alone.

A78, Barometre 2003, Syndicat des Transports d'Ile-de-France

This "Barometer" (Customer satisfaction) survey is unusual in that it surveys car users and pedestrians as well as public transport users. The principal findings of relevance to the current study are;

- The overall satisfaction of PT users with their mode of transport is about 30% lower than that of car users and pedestrians.
- Despite this, the overall image of public transport as a travel mode (among all persons) is slightly better than that of the private car.
- For the Metro and RER, the image is considerably better than that of the car, mainly owing to better travel times and less likelihood of delay.

The image of PT is good because it is seen as reliable, frequent and cheap - despite the Metro, in particular, being smelly, dirty, noisy - and creating security worries at night.

The "image" survey included the question – "The quality of public transport depends on different elements. Among the following elements, which in your opinion is the most important?". The elements listed were Security, Punctuality, Speed, Information availability, Cleanliness, and Availability of seating/ standing room.

- 64% of respondents cited Security as the most important issue, followed by 23% for Punctuality – no other issue scored more than 5%.
- However, when the same question was asked in 1996, the three top scores went to Punctuality (43%), Security (33%) and Speed (11%).

The study concluded that the increased importance of security could be due to the amount of coverage of the issue in news media.

A74, Multi-Modal Tracking Survey, Greater Manchester Public Transport Executive

This found that -

- Non-users obviously found it difficult to distinguish between importance of different PT attributes.
- Security was consistently important - except for frequent bus users
- But for frequent PT users, reliability was even more important than Security

The first finding above, which echoes a finding in many other items of research, casts a certain amount of doubt on the usefulness of non-user surveys; it appears that non-public transport users are to an extent ignorant of the attributes of public transport – strengths as well as weaknesses. This means they have difficulty in answering questions about what discourages them from using PT, as they are not sufficiently familiar with the product. Often, it appears, information is mentioned as the first barrier – because it is the first "hurdle" the non-user has to jump before they can use PT.

It may well be, however that having used PT, former non-users may find other barriers that they were previously unaware of – such as unreliability, or lack of late night services.

A01, A New Route?, Scottish Consumer Council
A survey of a sample of the whole Scottish population carried out in 2002. 41% of the interviewees used buses more than once per week. 78% of bus users said they would prefer to travel by car. It asked the question "What would encourage you to use local bus service more?". The most popular answers, in order, were –

- Lower fares,
- Higher frequencies.
- Better accessibility (for the disabled etc.), and
- Reliability.

A02, Public Attitudes to Transport in England, Commission for Integrated Transport
A survey of a sample of the whole English population carried out annually (most recently in 2002). Covers bus and rail, asking the question "How could bus/rail services be made better?". (Question only posed to those who said they might change mode if services were improved). In respect of bus services, the most important factor was frequency, followed by reliability. For rail services, the priorities were reliability followed by fares.

A57, MOTiF – Market Oriented Transport in Focus (EU Study)
This was primarily a multi-national literature review, incorporating reports of results of a number of (user only) surveys. The principal findings of this study were –

- In all of five countries from which studies were reported, (Netherlands, Germany, France, Spain, Portugal) punctuality was among the top three items in terms of importance
- In nine specific studies of PT users examined, reliability (punctuality) was found the most important item in five – in one it was second, in two it was third (both in Roissy, France) and in one (Norway Trial Scheme) reliability was not apparently covered.
- Frequency was also of high importance
- Travel speed was of (surprisingly) little importance to users
- Differentiation between importance factors was not great
- There were significant local and regional differences

This study found results to be strongly affected by, for example, the size and structure of the urban region, the type of transport system and also differences between the countries and regions – results from one place were not necessarily transferable to other locations. It was also found that differences between methodologies made it difficult to compare results from different studies.

A03, Scottish Bus Passenger Satisfaction Survey, Scottish Executive
A survey of bus users only in selected parts of Scotland. Asked the question "What sometimes discourages you from using buses more?" as well as asking about satisfaction with services. found information at stops caused greatest dissatisfaction; however, when asked what discouraged them from using the bus more –

- 51% said nothing discouraged them
- 15% preferred using their car
- 7% each quoted cost and infrequency as discouragement factors, and
- 4% quoted unreliability.

A50, Constraints affecting mode choices by morning car commuters – New Zealand
This research was carried out in three cities in New Zealand – Auckland, Wellington and Christchurch. (All of these are in the HiTrans size range, unless Auckland's satellite towns are included in its population.) It was a straightforward "Stated preference" survey in which respondents (who were all car users) were presented with a variety of scenarios combining changes to the relative attractiveness of public transport and car travel. The following principal findings emerged;

- Almost a half of the respondents always chose to continue to drive their car, whatever the policy scenarios presented. (These respondents tended to be male, self-employed, drive a company car or business vehicle and use their car during working hours for business related trips.)
- Car drivers have constraints influencing their mode choice for the morning peak period trip (e.g. needing to transport children, needing a car for work during the day)
- There was significant opposition to "sticks" – particularly those involving higher costs to car users,
- Implementing measures to promote the use of alternative modes to the car, without complementary measures to deter car use, might not have the desired affect on traffic growth and congestion.
- The most popular "attraction factors" for public transport were found to be –

1) Provision of a bus lane to reduce trip times by 35%
2) Increasing frequency of services in the peak period
3) Improving the routing of services.

A06, Attitudes to Local Bus Services, UK DfT
This survey interviewed a structured sample of the UK population as part of an "Omnibus Survey". It asked the question "What single improvement could be made to encourage you to use buses (more often)?" of infrequent and non-users of public transport, and the question "How could the bus services that you use be improved?" of regular users.

For infrequent users and non-users, fares were found to be main issue, followed by extent of routes and daytime frequencies. However, for regular users the main issues were (in order) frequency, reliability and fares ("value for money") – with frequency and reliability ranking very close together. 21% of infrequent and non-users said that nothing would encourage them to use buses more, while 53% said it was the convenience of the car, rather than any attribute of buses, that stopped them using buses more.

A07, Perceptions of Bus Services, Lothian and Edinburgh Enterprise Ltd & Lothian Regional Council
Interesting in that it covered (separately) both residents and visitors, and asked about both satisfaction and "encouragement factors". Covered users and non-users. It asked the questions "What would encourage you to use buses more?" and "What are the main disadvantages of using buses?". It found information at stops (including RTPI) the main encouragement factor for both residents and non-residents (followed by fares, for residents only). Lack of frequency, followed by infrequent off-peak services, were the main disadvantage for residents (users and non-users alike), and the requirement to pay an exact fare the main disadvantage for visitors.

Note that in the part of the survey which produced the results quoted above, "reliability" was not covered as a specific attribute – the answers could well have been different if it had been.

A12, Tyne & Wear Metro Customer Satisfaction Tracking, Nexus
A regular Metro user survey, asking users to rate the importance and satisfaction level of 32 attributes. Found reliability to be most important, followed by frequency and personal security, and least satisfaction with the provision of toilets. However, combined ranking of importance and satisfaction ("satisfaction gap") made "Behaviour of Other Passengers" top priority for improvement, followed by the related issue of personal security, then reliability.

A46, Persuading People out of their Cars, Transport Research Institute, Napier University
A survey by a psychologist of sticks and carrots required to effect modal transfer, based on a variety of surveys and focus groups among non-users of PT. Only a few specific attributes of public transport were considered. Main findings included –

- The most important barrier for car users against using PT was the 'affective' effort required (i.e. emotional energy expended on a journey in dealing with uncertainty about safe and comfortable travel and timely arrival).
- About one third of car drivers in England and Scotland would like to reduce the use of car while only about 6-7% are likely to.
- English motorists think that coercive ('push') measures to reduce car use would be less effective than facilitative ('pull') measures in cutting their car use. (A finding contradicted by some other research.)
- The most effective "pull" measures were found to be: more reliable PT services (82% believe very or fairly effective) and cheaper transport (71%)
- "Push" measures would have most success in displacing old, poor and urban dwellers.

A51, Policies to attract drivers out of their cars for short trips, UK Department of Environment, Transport & the Regions
A survey of a cross-section of population in five English locations, including London, using household surveys and in-depth interviews. Found lower PT fares to be of little effect, and emphasises importance of "sticks" as well as "carrots". Most effective "carrot" shown to be "improved bus routes" – although this is a rather imprecise statement. 22% of car drivers said they had no alternative to using the car.

"Group B" Research
A number of research items which looked otherwise promising were "relegated" to Group B and not covered in the overall evaluation. Further reference can be made to these in Appendix 2.

Some items were discounted because they concentrated too heavily on a single issue – this applied to B04 (Edinburgh QBC Monitoring, concentrating on RTPI), B24 (Nexus Best Value Review on Personal Safety and Security), and B33 (Travelling by Car, concentrating on the UK government's "Transport Direct" information initiative). The latter does, however, come to the important conclusion that *"increased use of public transport in the future would be more dependent on the quality and reliability of the services themselves, than on the quality of information provided"*.

Other items (e.g. B04 "Barriers to Modal Shift" and B11 "Hetton-le-Hole") were discounted because the research involved was too localised and not of general application, while others gave no indication of the ranking of the attributes considered. (B04 also suffered from a low response rate, giving rise to doubts about the representativeness of the results.)

C55, Combined Evaluation of public transport packages of measures in urban areas – 1996/97 (TØI, Norway)

This report evaluates the success of packages of PT measures carried out in four separate city areas of Norway. Principal findings were –

- In just one (Rogaland), there was an increase in PT modal share by improving Frequency, Accessibility, Bus Stops, Information and Marketing
- Synergy effects can be obtained by combining measures into packages
- It is easier to lose passengers by making PT worse than it is to gain passengers by improving PT

C77 - "Scotland's Public Transport on Trial", an experiment carried out by BBC Scotland

This was very much an anecdotal survey - but nevertheless revealing and may point a direction for further research. Four regular car users in different parts of Scotland were persuaded to use public transport for a week.

- All four had their perception of PT altered by the experience (mostly for the worse)
- Two of the four specifically mentioned waiting for PT in bad weather as an adverse factor
- Only one of the four expressed the intention to use PT more following the trial - despite some positive comments from the other three

C31, Understanding Customer Needs, for UK Department for Transport by the Bus Partnership Forum (a group including both bus operators and local authorities)

This document addresses a very similar brief to the current CBP research for HiTrans. It includes no original research, but gathers together a variety of evidence from the UK and other countries, notably Germany. For instance, it describes experience in Köln where, between 1985 and 1999, the number of annual PT trips per capita rose by 39%.

The keys to success in growing PT trips, according to this paper, are frequency, reliability and simplicity of network – it cites the "Overground" concept developed by First Bus in the UK whereby a simplified network of high-frequency bus routes is marketed in the same way as a Metro network. It is also apparent, however, from much of the research quoted that significant success in growing PT ridership depends on sustained effort and investment over a period, covering many aspects of the PT product.

The paper is well worth reading in its entirety. (Available on the Internet – see details in Appendix 2, which quotes from the paper extensively.)

Rogaland has introduced electronic ticketing to make boarding easy. PHOTO: KOLUMBUS

6 Summary of findings

This chapter presents in summary form an overall view of the results of this study. Before doing so, however, some salient points deserve mention;

- The need to implement a broad-based rather than piecemeal approach to PT development,
- The necessity for "sticks" rather than relying solely on "carrots", and
- The extent to which the research showed up differences in attitudes to various modes, or differing attitudes based on lifestyles

The whole is greater than the sum of the parts

There is considerable evidence to show that the above is true when it comes to implementing improvements in public transport – campaigns need to be multi-faceted, addressing at the least the issues of frequency, reliability and journey time – and probably fares too. Further comment on this matter can be found in Appendix 2 in the summaries for the following items:

- B37, Users' Expectations (Les attentes des usagers); Union de Transports Publique (France)
- C20, Review of Best Practice Marketing, Ticketing and Passenger Information ("TIGER"); Gwent Economic Region
- C31, Understanding customer needs; UK DfT
- C45, Freiburg: Public transport policy as a key element of traffic displacement; European Commission and EAUE, Berlin
- C55, Combined Evaluation of public transport packages of measures in urban area – 1996/97; TØI (Norway)

(The last-mentioned, interestingly, quotes a scheme in Rogaland county which, uniquely among the four studied, increased the modal share of PT by a combination of increasing frequency to every 5 minutes, upgraded bus stops, accessibility measures and emphasis on information and marketing.)

Sticks and Carrots

All the research which has studied such matters agrees that neither "carrots" nor "sticks" are on their own enough to achieve modal transfer. The following items in particular address this matter:

- A50, Constraints affecting mode choices by morning car commuters; New Zealand Modal Choice, University of Sydney et.al.
- A51, Policies to attract drivers out of their cars for short trips, UK Department of Environment, Transport & the Regions
- C20, Review of Best Practice Marketing, Ticketing and Passenger Information ("TIGER"); Gwent Economic Region
- C31, Understanding customer needs; UK DfT

Differing Lifestyles (and other characteristics) and their affect on willingness to use Public Transport

Several surveys categorised respondents in some way, and attempted to relate these categories to their attitudes to travel. These surveys typically found that different groups of travellers had differing propensity to switch to PT, depending on demographics, lifestyle or psychology. Of these three categorisations, demographics was generally found to have least impact on travel choices.

The one survey that looked at specifically at psychological categorisation (C75, STIMULUS), used purpose-built software to segment the interviewed samples according to psychological make-up rather than pre-determined demographic, behavioural or attitudinal variables. This method of segmentation involving the generation of natural groupings of people revealed more differences between the segments than conventional segmentation. These naturally occurring groups within the population have different psychological structures from each other, hence their outlook on the world is different thus requiring different methods of communication.

This finding has obvious implications for product design and segmented marketing in the PT field, but it has to be noted that STIMULUS found large differences between sites in the typology and size of these groups – thus making generalisation of results impossible.

As far as lifestyles are concerned, study C61 (Mobilitatsleitbilder und Verkehrsverhalten) distinguished between three groups –

- First group's lives are hardly depending on traffic and movement. Social mobility is separated from spatial mobility.

- Second group's social mobility is strongly depending on car mobility and will strongly oppose measures seeking to reduce car mobility.
- Third group is willing to abandon the car. This will only happen with group specific measure which have not yet been researched and activated enough.

Research items B8, B47, B48, B52 and C77 all refer further to the "lifestyle" issue. What is apparent is that changes in lifestyle, common throughout Europe, pose particular problems in making public transport attractive to non-users. These include, for example:

- Parents who need to take their children to nursery on the way to work
- Increasing numbers of people who are self-employed, and/or working at a variety of locations
- More part time work, starting and finishing at "difficult" times – especially in the retail sector, and
- People with more than one job

Reference has already been made to a study in New Zealand (three major cities) which found that the group of car users most resistant to modal transfer tended to be – "male, self-employed, driving a company car or business vehicle and using their car during working hours for business related trips".

It should be noted that no research item was found that clearly disaggregated travellers by trip purpose when considering "importance factors" – or even satisfaction. Some items however (such as the New Zealand survey just referred to) were restricted to consideration of commuters, so effectively looked at work trips only.

Different Modes – Different Attitudes?

Very few studies compared the importance of different factors for users of different PT modes, and where this comparison was made, it seems that the same factors are generally judged most important, regardless of mode. There were however major differences between satisfaction with the various modes – typically buses were found to be less reliable and/or slower than rail-based modes, obviously resulting from the effects of traffic congestion in the absence of bus priority measures. This dis-satisfaction sometimes seemed to affect the importance scores, where these were disaggregated by mode (e.g. A74, GMPTE Tracking).

It is in fact very difficult to interpret attitudinal surveys, either about importance or satisfaction, to draw general conclusions about specific modes. All such surveys are carried out in a particular environment and in relation to specific PT operations, and the attributes of these systems will vary independent of transport mode. For instance, in a specific location there may be problems in relation to –

- Personal security at a particular bus or train station, or
- Adverse media publicity about a particular transport mode, or
- Staff shortages on a particular mode, or
- a whole host of other matters.

These issues are in all probability not intrinsic to the particular mode – but they may well be peculiar to the mode in question in the place in question. Staff shortages, and the resultant unreliability, are an excellent example of problems that can "give a mode a bad name" in a particular location.

Summary of findings in relation to PT attributes

The table on the following page summarises the main results of a selection of studies – the selection is necessarily dependent on the extent to which research items can be "fitted" to a common format. Differences between methodologies, and the fact that different questions were asked in the different surveys, mean that it is not possible to "average" results from the various surveys. The top three factors in each survey are, however, highlighted to aid in comparison.

Note that the actual wording of questions did not always reflect directly the table headings. Certain factors covered in very few surveys (e.g. Real Time Passenger Information, necessity to pay Exact Fare) have been omitted. Where no ranking is given for a particular attribute/survey combination, it may be assumed that the question was not asked.

This is purely intended to be a summary comparison – much more detail on results is given in the preceding chapters, and conclusions are summarised in the following chapter.

Summary of ranking of attributes

		Survey Type	Mode(s)	User/Non-user
	Leading surveys covering non-users and/or considering "Encouragement factors"			
A01	New Route Scotland	4	B	U
A02	CfIT report England (Bus)	4	B	B
A02	CfIT Report England (rail)	4	R	B
A06	UKDfT Omnibus	4	B	B
A07	Edinburgh Bus 1995 (residents)	4	B	B
A07	Edinburgh Bus 1995 (visitors)	4	B	B
A78	STIF Barometre 2003 (Importance)	1	A	B
B60	Oslo Sporveier (Importance)	1	A	B
A74	GMPTE Tracking (Bus) (Importance)	1	B	N
A74	GMPTE Tracking (Rail) (Importance)	1	T	N
A46	Persuading People	3	A	N
A50	New Zealand Modal Choice	3	A	N
A51	Short Trips	3	A	B
	[Dis-] Satisfaction surveys and other user-only surveys			
A12	Nexus Metro Track (Importance)	1	T	U
B70	K-barometer Schwabisch Hall (Imp.)	1	B	U
A03	SE Bus Satisfaction (Discouragement to use)	1	B	U
A26	UK DfT Bus Quality	1	B	U
A05	BSA 19 (Least satisfaction)	1	A	B
A07	Edinburgh Bus 1995 (resident non-users, disadvantages)	2	B	N
A07	Edinburgh Bus 1995 (visitor non-users, disadvantages)	2	B	N
	Surveys reported in the MOTiF study (A57) – all scored on Importance			
	Rotterdam – Bus	1	B	U
	Rotterdam – Tram	1	T	U
	Rotterdam – Metro	1	B	U
	Madrid	1	A?	U
	Norwegian Trial Scheme	1	A?	U?
	Roissy – Bus	1	B	U
	Roissy – RER	1	R	U

B=Bus, R=Rail, T=Tram, A=All U=User, N=Non-user, B=Both

Ranking Attributes Covered

Reliability	Frequency	Fares	Journey Time	Connectivity issues	Vehicle Comfort & C	Vehicle Access`y	Seat availability	Cleanliness	Information (general)	Information at stops	Facilities at stops/stations	Stop access	Personal safety/security	Staff issues	Extent of routes	Times of service
4	2	1	7	6	10	3	-	5	9	-	-	-	11	8	-	-
2	1	3	7=	6	-	14	11=	9	5	-	14	14	7=	15	4	4
1	3	2	12	4	-	14	10	5=	7	-	14	14	11	15	5=	5=
3=	3=	1	3=	-	-	-		-	-	9	-	6	-	-	2	-
-	-	3	6	8	7	5	10	-	-	1	-	-	-	-	-	-
6	-	8	3	9	10	11	-	-	-	1	-	-	-	5	-	-
2	-	-	5	-	-	-	6	4	3	-	-	-	1	-	-	-
1=	1=	4	-	9=	-	5=	1=	-	7=	7=	5=	-	11	-	9=	-
7	8	2	13	-	3=	-	9	5=	11	-	5=	-	1	12	3=	-
3=	3=	14	12	-	-	5	8=	8=	7	13	-	-	2	15	10=	-
1	-	2	3	4	-	-	-	-	6	-	-	-	-	-	-	-
-	1=	4	3	-	-	-	-	-	-	-	-	-	-	-	1=	-
-	2	3	-	-	-	-	-	-	5	-	-	-	-	-	1	6
1	4	9	-	-	15	-	-	5	7	-	8	-	2	16	-	-
1	4	5=	-	7	11	13	5=	3	10	-	9	-	12	2	8	-
3	2	1	6	-	8	13	10	9	-	-	-	7	14	-	4	-
2	10	4	20	-	8	19	17	3	6	1	7	-	11	18	-	-
1	5	4	3	-	-	-		6	-	-	-	8	2	-	7	-
3	1	5	4	-	8	13	10	12	-	-	-	-	-	-	-	2
4	5	9	3	-	8	12	6	11	2	-	-	-	-	-	7	-
1	-	-	9	-	5-8	-	-	-	-	-	-	-	5-8	4	-	-
1	-	-	10	-	4	-	-	-	-	-	-	-	2-3	7	-	-
1	-	-	?	-	7	-	-	-	-	-	-	-	3	2	-	-
2	1	-	6	5	8	-	-	-	11	-	-	-	3	10	-	-
-	2	1	6	3	5	-	-	8	-	-	4	-	-	-	-	-
3	2	5	6	1	8	-	-	-	11	13	-	-	4	8	-	-
3	4	2	5	6	7	-	-	-	9	13	-	-	1	11	-	-

7 Summary of conclusions

The Strategic Dimension

Two points emerge quite clearly from the research analysed;

- In order successfully to achieve modal transfer, "carrots" or "pull" measures are not on their own sufficient; "sticks" or "push" measures are also necessary. Of the various "push" measures available, fiscal measures seem to be the most unpopular, but also the most likely to be effective – restrictions on parking are also likely to be effective.
- Packages of measures are more effective than the sum of the effects of individual measures. An integrated approach to improvements in public transport is called for. (See section 0, and various references in Chapter 5.)

It is also the case that different groups of travellers will react in different ways to a given scenario (in terms of public transport improvements and/or measures affecting private car use). These groups may primarily be defined mainly by their lifestyles, or perhaps by their psychological make-up, rather than by demographic factors. The existence of these groups will have an effect on the extent to which any package of measures will be successful, and also means that use must be made of market segmentation – designing different public transport groups for different groups of travelers. See section 0 above for more detail.

The Light Rail of Strasbourg is well received among its citizens. PHOTOS: EVA BERGE

Factors affecting propensity to use Public Transport

From the research reviewed, the most important factors required by citizens for high-quality public transport are –

- **Reliable services**; this is probably the most important single factor in retaining existing users – and keeping any new users who are attracted.
- **Adequate service frequencies** – although little of the research quantified this, it is likely that services at least as good as every 10 minutes are needed in the daytime.
- **Good information** on services – not necessarily RTPI, but there must be good information at stops and stations (simplification of the network may assist in communication). This attribute is more important in places where services are subject to frequent change (e.g. the UK), and for attracting new users – existing users place less value on it.
- **Affordable fares** – although the appropriate level of these can only be determined by local study, and in many, if not most, locations studied fares were not a major source of dis-satisfaction.
- **Stops and stations close to** the homes of prospective users, and services that go where people want to go.
- **Users should feel Safe and Secure** both at stations/stops and when travelling.

Note though that in relation to *Safety and Security*, survey results are very mixed. Feelings on this matter seem to depend to a large extent on general (real or perceived) crime levels in the areas concerned. It is also very much the case that women are more

concerned about this than men (although men are in fact more likely to be victims of attack or theft while on public transport), and there is understandably more concern about these issues for evening trips. In the UK at least, bus users seem less concerned on this issue than other PT users.

It should also be noted that while Safety and Security are generally agreed to be of importance, this may not necessarily be a cause of dis-satisfaction. The results of research by Metro-Dade Transit, Florida (C69) are particularly worth quoting in this respect – this is the Miami area, considered by most Europeans as fairly unsafe, and yet –

"A section of MDT's (Metro Dade Transit) survey specifically addressed the safety issues its passengers and potential passengers encounter. It was determined that those who are the most exposed to public transportation perceive transit to be safer. Hence, riders are less worried about safety than potential riders and potential riders are less worried about safety than non-riders. Comparatively, public transportation in Miami-Dade is perceived to be safer than driving a busy interstate (I-95), getting money from an ATM, or going to the grocery store at night."

Items of only moderate importance were –

- Need for and Quality of Interchanges
- Comfort and facilities (in vehicles, at stations and stops)
- Safety (from Accidents)

Items of relatively minor importance included –

- Staff and Passenger Behaviour
- Accessibility of stops, stations and vehicles (although obviously of great importance to a relatively small minority of users)
- Journey times – although obviously this will depend on the extent of differences between public and private transport overall times (including walking and waiting where appropriate).

Inter-country comparison of Most Important Factors

	Dutch	French	German	Portugal	Spain	UK
Most important	Price	Travelling speed	Price	Safety	Safety	Information
Second most important	Security	Regularity	Connections	Punctual, reliable	Security	Reliable
Third most important	Punctual, reliable	Punctual, reliable	Punctual, reliable	Frequency	Punctual, reliable	Frequency

The table shows that Punctuality/Reliability is one of the first three concerns in all six countries, but no other issue appears in the top three for more than two countries (unless Regularity is considered the same as Frequency, in which case it appears for three countries). "Safety" in Portugal and Spain refers to traffic safety, not personal safety.

Inter-country comparison of Least Important Factors

	Dutch	French	German	Portugal	Spain
Third least important	Customer orientation	Possibilities to obtain tickets	On-trip information	Accessibility (stops, vehicles)	Pre-trip information
Second least important	Pre-trip information	On-trip information	Comfort (vehicles, stops)	Possibilities to obtain tickets	Comfort (vehicles, stops)
Least important	Possibilities to obtain tickets	Pre-trip information	Accessibility (stops, vehicles)	Pre-trip information	Accessibility (stops, vehicles)

This table comparing least important factors is somewhat less useful as most of these "lesser factors" appear only in some surveys – and there are a large number of other factors that appear in just one or two surveys in one country or another. The low importance of information is accounted for in part by the fact that the research included in this study related to users of public transport only.
There is no clear evidence in respect of ease of access to stops and stations, and the effect of the time-extent (operating hours) of services. More research is probably needed.

There appear to be significant differences between attitudes in different countries. The table is based on that presented in the MOTiF research (A57), with a column for the UK added based on CBP's assessment of the various UK studies. (Note that in the case of the first five countries, the research covers PT Users only – for the UK the findings represent a mixture of user and non-user research, but with users predominating. Note also that this table represents, for each country, a synthesis of results from a variety of surveys – it is NOT a definitive statement of the situation in each country as a whole, but more an indication of likely trends.)

Which groups are most likely to switch to using public transport?

Much of the research reviewed made the point that there were differences between the propensities of different groups to use public transport. These differences seem to relate more to differences in lifestyle than to straightforward demography, and may point to the necessity to design different public transport "products" for different groups. However, the typology and structure of these groups will vary greatly from location to location. Section 0 gives more detail on this subject.

Requirements for Further Research

Two particular public transport attributes seem to have been insufficiently researched in terms of their effects on modal transfer – these are;

The ease (and quality) of access to stops and stations (see section 0), and the effect of the time-extent (operating hours) of services (see section 0).

There also seems to have been little research aimed specifically at young people, who often use public transport to travel to school but give it up in favour of the car as soon as possible afterwards. The German study B62 (see appendix 2) is one of the few studies to address this subject, and further research may be justified – it may be easier to keep these public transport users than to gain new ones.

A further proposal is based on the experiment carried out by BBC Scotland (C77). The reason for this is that it is apparent that most non-users of public transport have only a poor idea of what public transport has (and has not) to offer – and in many cities, there are large numbers of travellers who have not used urban public transport for a considerable time.

The BBC Scotland experiment (in which four car users tried public transport for a week) was however very limited. To develop this concept further it would be necessary to carry out such experiments in a number of locations, with more volunteers (at least 20 per location, chosen to represent various "lifestyle" groups), and with more scientific research on the opinions of the volunteers after the experiment (this might be by means of focus groups).

This proposal obviously requires further development, but the consultant believes it could yield valuable insights into the possibility – or otherwise – of attracting different groups of travellers to public transport, and the measures necessary to achieve this.

Apart from this, there is an obvious need for future research in this area to be standardised, as far as possible, in approach and format. It may be appropriate to seek this via INTERREG. The comprehensive "multi-mode Barometer" approach taken by STIF (see section 0) has much to commend it, as it facilitates quality measurement, ranking of "Importance" and inter-modal comparisons.

Stage 2

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8 Introduction

The objective of this study is to explore the qualities required by the citizens of medium sized cities of their public transport systems, and what type of solutions are required to meet these demands.

Initial discussions within Strand 5 led to the conclusion that there was a need to carry out a short desk-top review – of both literature and survey reports – related to the qualities required by citizens from their public transport networks. This would identify these key qualities, for both users and non-users. The second stage of Strand 5 would then review actual case studies to find out how different cities, regions and corridors have addressed these needs.

The first stage of Strand 5 found a number of commonly-recurring qualities required by citizens of their public transport systems. Much of this information referred to the needs of existing users, and not necessarily to the qualities required to attract current non- or infrequent users of public transport. HiTrans partners therefore decided that the second stage of Strand 5 should focus on those cities and regions that have achieved mode shift from car to public transport, or increased public transport ridership, to understand in more detail the importance of different qualities of public transport in attracting previous non-users, and in securing greater use by those people who were already using public transport some of the time.

Overall, therefore, the aims and objectives of this second Strand 5 report are to examine case studies of successful high quality public transport services, and to discuss these in the light of the qualities required by citizens, as identified in Strand 5 Stage 1.

The rest of this report goes on to do this by:

Detailing the methodology for the study, which is based on a number of case studies.

Giving brief descriptions of the case studies and their social, economic, political, organisational and demographic context.

Presenting the results of the case studies, summarised under a number of easily compared category headings.

Explaining the key reasons why the case studies have succeeded in attracting former non-users to public transport – and how this relates to any market research that the case study cities had carried out on users' or non-users' requirements for public transport.

Comparing these results with the review of literature that was carried out for Strand 5 Stage 1 of HiTrans, as well as with other relevant studies.

Drawing a number of conclusions about the factors that appear to be key in delivering public transport systems that provide the level of quality required if citizens are to be attracted from their cars to public transport.

9 Methodology

In order to achieve the aims of this second stage of Strand 5, the HiTrans partners and their three supporting experts prepared a list of medium-sized cities that are known to have achieved high quality public transport, either across their network as a whole, or on certain corridors within their local area.

A questionnaire, a copy of which is shown in Appendix 5, was prepared and then sent to each case study town or city. This was to provide a structure for an interview and visit that was then carried out in most case study locations. The questionnaire collected information on general social, economic and political aspects of the case study location; about the organisation of public transport; about the extent and use of public transport operations in the locality; and, importantly, about any research that has been undertaken in that locality regarding qualities demanded by citizens of their public transport system.

Questionnaires were completed by the case study interviewee, by the HiTrans research team, or by a combination of the two; and they were filled in with varying levels of completeness. However, in many cases, additional supporting information was supplied by the interviewees and/or the case study expert. Also, in many cases, questionnaires were filled in by experts based on internet and literature research, and the interviews themselves concentrated specifically on those factors that were important in providing the qualities in public transport that were required by citizens in each area, and how these qualities had been delivered. It had also been intended to carry out a case study in Flanders, Belgium, but ultimately it did not prove possible to secure a local contact for a case study visit. However, it was possible to carry out a site visit to the public transport operator there who suggested that the case study should in fact be of the Flemish city of Gent. Consequently, the report presents some general data about Flanders and more detail on Gent. In addition, the two French case studies were carried out without site visits but with the assistance of local contacts who were interviewed by telephone. Some results have also been included that are based on desktop research.

A caveat that has to be placed on this report is that questionnaires and interview case study reports were completed to different levels of detail by interviewees and Strand 5 members. This is entirely understandable as in some locations it is simply impossible to find all the information that was requested in the questionnaire, as such information may not be collected locally. Where there is a lack of information, this has been highlighted in the report. It is the view of the authors that, where information is lacking, this does not detract from the overall conclusions that are drawn.

Case study locations and mode

All the case studies chosen are in north western Europe. They were selected because the experts and members of Strand 5 were aware of these as examples of good practice, from personal knowledge, or from previous research. In particular, they were selected because they were believed to have worked on improving those aspects of their public transport services that the Stage 1 work had shown to be important to citizens.

Case studies were carried out in the following locations; as can be seen, these were categorised as either network or corridor. Corridor cases, as their title suggests, consider improvements along individual lines that are normally part of a wider network. Network cases look at the results of improvements to public transport over a wider area in a city or a region and/or over a longer period of time.

Networks

- Achterhoek Region (NL) – buses*, and regional heavy rail
- Angers (F) – buses*,
- Basel (CH) – buses, trams and regional heavy rail
- City of Brighton (UK) – buses
- City of Nottingham (UK) – buses and light rail
- City of York (UK) – buses
- Flanders (BE) – buses and light rail (trams)
- Freiburg (D) – buses, light rail (trams) and regional heavy rail, network
- Grenoble (F) – buses and light rail (trams), network
- Jönköping (SE) – buses, network

(* non-guided)

Corridors

- Amsterdam Region (NL) (Zuidtangent) – bus rapid transit, unguided bus, but focusing on a busway
- Chemnitz (D) (City-Bahn) – light rail and rural heavy rail
- Düsseldorf (D) (Regiobahn) – regional heavy rail
- Saarbrücken (D) – shared track, tram-train
- Stuttgart Region (D) (Schönbuchbahn) – rural heavy rail

The partners believe that these chosen locations give a very good mix of “best practice” cities and modes relevant to the objectives and scope of HiTrans.

10 Case Studies – Networks

The following section provides a summary of each case study city or region for the network cases. In chapter 12 there are summary tables that permits easy comparison of each case study location.

In general, information is presented regarding the following issues:

- the region's population (and growth);
- the population within 30 minutes drive time of the main city centre;
- the main local industries and the state of the economy;
- levels of income;
- local geography insofar as it affects the nature of the network;
- local and regional government structure;
- the regulatory situation with regard to public transport;
- main sources of finance for public transport initiatives;
- the state of local public transport and its development;
- car ownership levels;
- modal split for trips within the area; and
- local and regional transport objectives.

The reason for selecting each case study for inclusion in this report is also provided. Chapter 11, on corridors, also follows the same broad structure. Summary tables and comparative analyses are provided in Chapter 12.

Achterhoek Region (NL)

Achterhoek is an area of some 350,000 population in the east of the Netherlands, bordering on Germany. It is a predominantly rural area with some small and medium sized towns – principally Winterswijk, Zutphen and Doetinchem (see map below) and, apart from rivers, there are few topographical constraints on transport networks or on other development. The main towns of Arnhem and Nijmegen lie to the west of the region, which has been enjoying slight population growth in the past 10 years. Whilst there is a high proportion of the workforce employed in agriculture (around 5%), the most important economic sector is still manufacturing, with 18% of the total workforce. Unemployment is around the Netherland's national average. In common with many parts of Europe, out-commuting is becoming more important, in this case, to the towns to the west.

The region is not heavily congested and so from its geographical centre it is possible to travel to most of the rest of the region by car within 30 minutes. Car ownership for the Gelderland province as a whole (within which Achterhoek is located) was 433 per 1000 persons in 2003. Average GDP per capita was €21,000 in 2002 (all data sourced from Statistics Netherlands).

The Region of Achterhoek is a co-ordinatory body composed of 17 (shortly to be 20) local authorities in eastern Gelderland (in the east of the Netherlands) that was set up in 1975. The member authorities have devolved a number of responsibilities to the Region, including in traffic and transport, and economic development.

Although the provision of road-based public transport is still a Provincial responsibility in Achterhoek (that is, it is planned and funded by the Province of Gelderland, a higher and statutory level of government), the regional authority plays a key role in strengthening the provision and importance of public transport in the region. The region reacts to and takes part in public transport planning activities in the region, working together with Provincial officials and operators. In the field of infrastructure plan-

ning, the regional authority also has a key input to the regional traffic and transport planning process.

The Provincial Traffic and Transport Plan (2002) is centred around four key themes: prevention, better use, building, and pricing. Prevention means land-use planning to reduce the need to travel (although it should be noted that land-use planning implementation is a local not a Provincial responsibility). Better use means the more efficient utilisation of the existing road, cycleway and public transport network, and the improvement of cycleways, public transport interchanges and corridors, and limited road building where necessary. Building is obviously related to this and is targeted on reducing congestion at key "hotspots" on the road network. Pricing is seen as a measure that might be implemented in the long term, in order to address accessibility problems as they become more serious.

The HiTrans case study in Achterhoek is of the public transport system as a whole and, in particular, how it has been re-planned to simplify and reduce route duplication; integrate fares and ticketing; and provide bus-rail integration at rail stations. In addition, there has been investment in high quality interchanges, high quality rail vehicles and buses and in the doubling of service frequencies on the rural rail lines in the region, from their former one train per hour to two, rising to four in the peak. Rail infrastructure investment also permitted higher line speeds and therefore reduced journey times on some parts of the local network. The total investment in infrastructure and capital items was €67.4 million, of which €17 million was for rail infrastructure (to enhance capacity to permit a more frequent service); €46 million was for new rail vehicles; and €4.4 million was for new buses.

The bus network has been simplified and now feeds into the rail network. The operator of local rail services and buses is the same, and drivers are often qualified to work on both networks. This assists service integration. All these measures have together led to a virtual doubling of bus and rail patronage in the region over the past 5 years, to a projected annual total in 2004 of 13.2 million passengers. The car accounts for about 50% of trips in the Achterhoek region; it is not thought that this proportion has reduced, but compared with many parts of Europe this is a very low mode share for private car in what is a mainly rural and small-town area.

Achterhoek was chosen as a case study for Hi-Trans Strand 5 because of the success it has enjoyed in increasing the use of its public transport system at relatively modest cost, and because it is a semi-rural area, unlike many of the other case studies that are normally found in the literature.

Angers

The city of Angers is the main urban centre in the department of Maine-et-Loire, France. It lies to the west-south west of Paris, on the main road and railway line to Nantes. The area consists of:

- A highly urbanised central zone, with 151,000 people at a density of 35 per hectare, and a 1998 car ownership level of 0.98 per household.
- An inner ring of development, comprised of ten communes, which can be seen as an extension of the central zone (71,300 people).
- A third low density and primarily agricultural zone made up of a further 19 communes (57,700 people).

Local public transport is co-ordinated within an area called the "Local Transport Perimeter (LTP)", which encompasses Greater Angers and 29 further communes (local municipalities) with a population of 222,300 (1999), about a third of the department as a whole. Public transport within the LTP is the responsibility of the Angers Transport Syndicate (SYNTRA), which was formed in 2001 and some 52 members: 23 represent Angers and the other communes have one member each.

Per capita incomes vary from €12,258 in the city itself to €16,113 in the inner ring. The population of the whole LTP area grew by 8% between 1990 and 1999. Whilst growth was concentrated primarily in the second, suburban ring, Greater Angers itself (the inner area) still accounts for 58% of the population and 57% of the jobs. Employment is dominated by public and private services, including several major employers with several thousand staff each.

The regional government (in this case, Pays de Loire) is responsible for bus services running between two or more departments. It is also responsible for specifying and funding regional rail services, which are then run on its behalf by SNCF, the national rail operator.

The departmental government is responsible for interurban bus services within the department, whilst the commune, or group of communes, is responsible for local surface public transport. Hence in the case of Angers, municipalities have ceded powers over local public transport within the LTP to SYNTRA. Very importantly, SYNTRA is given the power to level a payroll tax – the versement transport – on every company with more than 9 local employees within its area. This is then used to finance investment in and subsidise the operation of local public transport which, in the Angers LTP area, consists only of buses and a lightly used rail network (although there are aspirations for a light rail system as well). SYNTRA organises and operates (or secures franchises for the operation of) public transport services within the LTP area, according to a quinquennial plan (the Local Transport Plan, the PDU (Plan Deplacement Urbain)) that it draws up and agrees with its constituent municipalities and the department. The current objectives of the 2002 PDU are to:

- Re-allocate road space to promote the use of environmentally-friendly modes of transport.
- Improve safety for all road users but especially pedestrians, cyclists and motorcyclists by, for example, providing more cycle lanes.
- Improve modal share for public transport by improving journey times through bus priority, enhancing information and ease of interchange.

There is also a local land-use plan, the key objectives of which are to:

- Promote multi-polar development and to ensure that infrastructure is set up to serve this pattern of development.
- Control development in built-up areas.
- Encourage development in corridors that will be served in the future by tram.

There are 24,500 public parking spaces in the Greater Angers area, of which just over a third are charged spaces. Where there is a charge, this varies in the range of €0.5–€1 per hour.

In spite of some parking restraint and the land use policies listed above, the mode share for car continued to increase during the 1990s, from 56% of all trips in 1989 to 60% in 1998, although in the context of a greater number of trips made overall. Public transport mode share fell from 12% to 9% over the same period, and walk trips from 26% to 24%. This

is partly due to reducing land-use densities as the population moved out of the dense inner core.

The HiTrans case study in Angers is of the public transport system as a whole. It was selected because it has enjoyed considerable increases in usage over the past few years and also because it is entirely bus based; it was the view of the expert who selected Angers that it represents the limits of what can be achieved in high quality public transport using buses alone (compared to the more well-known tram cities in France). In addition, it has achieved one of the lowest levels of public transport subsidy of any comparable urban area in France (although this level has been rising in recent years). In 2002, this subsidy level was €62.17 per inhabitant, which covered 65% of operating and capital costs, which themselves totalled €25.012 million.

Between 1998 and 2002, local public transport use within the Angers LTP rose from 22 million trips to 25.21 million trips, an increase of around 13%. In common with Basel (see below), there were no radical changes or additions to the network during this period. The main elements that appear to have led to an increase in patronage were as follows:

- Creation of an integrated ticket for SNCF rail, local bus and interurban bus within the LTP area; and integration of the latter two services.
- Simplification of existing bus routes and increases in frequency on core corridors, some of which carry up to 20,000 passengers per day.
- Although routes were simplified, there was also an increase in the number of routes from 21 to 31 between 1997 and 2002, and a 7% increase in route km over the same period. This led to a more comprehensive but at the same time more comprehensible system.

Basel

The Swiss city of Basel (*Basle* in French), with an approximate population of 290,000, is located at the point at which Germany, France and Switzerland meet. Situated in northern Switzerland, it is the capital of the half-canton Basel-Stadt (City of Basel) on the Rhine River.

Local public transport around Basel straddles the borders and is co-ordinated by the Three Nation Agglomeration (TNA), a co-operative agreement between Lörrach county in Germany, Department Haut Rhin in France, and the Northwest Swiss Tariff Union (NSTU/VVBNS). In the Swiss parts of TNA, car ownership is around 540 cars per thousand residents, up from 436 in 1996 and an estimated 330 in 1986. There is a clear inverse relationship between public transport network density and car ownership; and between land use density and car ownership. Conversely, land use density and public transport pass ownership are positively related– the areas with the highest pass ownership are also amongst the most dense. There is a population of about 200,000 within a 30 minute drive of the city centre.

The City of Basel is surrounded by a rich agricultural region and it is also a major centre for the chemical industry, pharmacy, banks, and transport logistics.

TNA serves a total population of some 600,000 people in the three countries – a total that has been in decline, with a loss of around 35,000 people since 1990 due to changes in the industrial base. Land-use, although not perfectly co-ordinated with transport planning, is conducive to serving movement by public transport as development has been concentrated (deliberately) mainly in the valleys, leading to natural corridors along public transport routes leading into Basel. There is a trans-border plan for the agglomeration that seeks to maintain the co-ordination of land-use with transport such that public transport remains convenient for as great a proportion of trips as possible.

There are effectively only two levels of government in the Basel area of Switzerland. These are the canton (effectively a county, of which the most

Basel tram interchange. PHOTO: AXEL KÜHN

populous is the Canton of the City of Basel), which has responsibility for local and regional public transport; and the national (federal) government, which has some responsibility for funding regional public transport but no responsibility for local public transport. More than 20 Swiss cantons are covered by the area of the Verkehrs Verbund Nordwest Schweiz, which has a co-ordinating role, in particular to establish common fares and integrated ticketing.

In France, there are four levels of government – commune, department, region and Federal Government – of which the commune (sometimes acting in groups), department and region are the main actors in the provision of public transport. In the German section of the TNA, the County is the primary provider of public transport. In Germany and France local public transport will eventually be required to be tendered (put out as a concession) due to European law; this is not the case in Switzerland, where tendering can be entered into but is not obligatory.

Whilst it was not possible to obtain a copy of the local transport plan or equivalent for Basel, a review of the Canton-Basel website established that the local and regional transport objectives are expressed in a wide range of activities that can be seen, broadly, to be improving infrastructure and travel choices, but with particular emphasis on parking management, road safety through traffic calming, cycling, and improving public transport. In particular, the objective for public transport is to provide a high quality and attractive service that will contribute to the quality of life of the Canton and that will maximise the proportion of trips that is made by environmentally-friendly means.

The Basel area has often been cited as a good example of high quality public transport in a medium-sized city, due to its high (and, during the 1970s and 1980s, increasing) mode share for public transport, and for the co-ordination of land-use and transport. Canton Basel still has one of the lowest levels of car use of any European city of its size: in 2002, just 27% of trips were made by car, and 32% by public transport (the balance being on foot or by bike).

For many years, Basel has been seen as an excellent example of integrated public transport, achieving improvements in the farebox ratio as well as increasing ridership and modal split, thanks to a combination of pull measures along with supportive parking and land use policies. For example, public transport ridership within the Basel canton itself rose

53% between 1983 and 1995, and public transport's share of motorised trips in the metropolitan area rose from 39% to 46% over the same period. This situation has deteriorated somewhat due to population loss and changes in employment structure, but Basel remains an excellent example of high quality public transport in a medium-sized city; it is for this reason that it has been included as a case study in HiTrans Strand 5.

There have been no specific investments or "break point" changes (e.g. introduction of a totally re-structured bus network, construction of a tram line) in the Basel case in the way that there have been in other cases under consideration in HiTrans Strand 5. Instead, Basel has benefited from steady investment in and subsidy of bus, trolleybus, S-Bahn (suburban rail) and tram; and, in addition, an integrated tariff and ticketing network that stretches across 3 countries. The integration of the City and regional tram operators into effectively one operation during the past decade was also an important improvement that is likely to have contributed to Basel's success.

This tariff and ticketing network includes the initially heavily subsidised and transferable "EcoAbo" (environmental season ticket), similar to that introduced in Freiburg, but introduced in Basel in 1984. For adults, this costs around £27/€40 for a three zone unlimited monthly ticket, covering an area of over 100 sq km. Senior citizens pay two thirds of this price and children a half.

Brighton and Hove (UK)

Brighton and Hove has a population of 247,817 people (2001 Census) and is located on the south coast of England, due south of London. It is a regional centre for shopping and employment; a popular costal resort and conference centre; accommodates two universities,; major leisure facilities and a sub-regional centre for health services. In addition to the residential population, there are an estimated 8 million visitors and seasonal workers per annum to the town; it is a very popular day trip destination for people from London as well as a key centre for teaching English as a foreign language to adolescents from all over continental Europe and further afield. The local economy is relatively buoyant but the structure is changing somewhat, with a small but increasing proportion of the economically active population living in Brighton but working in London.

The city developed from historic core settlements with a series of local authority provided housing estates built after 1918. These have since evolved into areas of multiple deprivation and low-income households. Consequently car ownership and use is low in these areas, and they provide good bus operating territory. GDP per head in 1998 was around £10,500 (€15,700) and, overall (in 2001), 37% of households had no car, well above the English average of 26%. Some 52% of journeys to work by residents in 1991 were by car, either as driver or passenger; by 2001, this had fallen to 48%.

The geographical arrangement of bus routes is constrained by the north – south alignment of the main railway line to London. The 19th century bridges provided are not suitable for modern buses. As a result it is difficult to provide east-west bus routes, giving Brighton a butterfly wing shaped set of bus services, with east – west North Street as the nodal point for the network, with 2,800 buses per day.

Brighton and Hove City Council became a unitary authority on 1 April 1997, responsible for all local authority functions, such as Education, Highways, Social Services, Transport and Planning. Thus there are only two levels of government in the City; national and local.

In common with all the UK case studies in this report, Brighton's local public transport is operated in a de-regulated environment: any bus operator who is able to obtain an operator's licence (essentially demonstrating that they can operate safely) can then go ahead and operate bus services when and where they wish, at whatever fare they wish. Any co-ordination between operators, including tariff and service integration, must be voluntary and must be very carefully arranged if it is not to fall foul of the UK's strict competition (anti-collusion) legislation. The local authority can provide on-road infrastructure such as bus lanes and stops but has no direct influence over commercially provided bus services – it can only subsidise services that are not provided commercially by the private sector. It will be noted from the UK case studies that in this type of environment successful delivery of high quality public transport has depended on close but largely voluntary collaboration between the local authority and the major bus operators in the area.

All Local Authorities in England and Wales are required by law to produce a five year Local Transport Plan. Brighton's transport objectives, taken from its 2001–2006 Local Transport Plan (LTP), can be summarised as:

- Encourage partnership and innovation in promoting and delivering choice in the provision of sustainable transport.
- Reduce danger for all road users
- Improve accessibility for all people
- Seek compatibility between transport and planning policies and decisions
- Reduce road traffic, pollution and congestion within and around the city

The HiTrans case study in Brighton is concerned with its bus system. While the modes available are train, local bus and express bus, for local transport purposes the bus is the predominant mode. There is a multimodal ticket available but sales are low, indicating the importance of the bus for local public transport trips. The bus network has experienced very rapid growth in patronage in recent years and has been cited as an example of successful high quality public transport in a deregulated environment. As noted above, mode shift to public transport for the journey to work has also been achieved, and there has been a 12% fall in peak hour car traffic since 2000.

This success had been achieved because the bus operator and the Council have both implemented improvements that together have delivered a 45% increase in bus patronage in around 10 years (1993–2002), high levels of customer satisfaction, and a total of 35.27 million bus trips in 2003. This has brought Brighton from below average levels of ridership per head for a UK city to well above average. At the same time, the bus company continues to run without subsidy (other than a rebate on its fuel tax). Only 2% of the bus mileage receives local authority subsidy: these are "socially necessary" routes and are competitively tendered to the bidder best meeting a combination of specified quality and price.

Factors that have been key in delivering success in Brighton are as follows:

- Route simplification by the operator, with the creation of a series of core "Metro" routes running at 5–8 minute frequency (daytime), and a simple fare structure (£1, €1.5 flat fare).
- Investment in new low floor buses such that the average age of the fleet is less than 5 years.
- High quality paper-based information produced by the operator, together with real time information, jointly funded by operator and local authority.
- Improved stops, shelters and bus priority, funded by the local authority.
- Publicity targeted at specific user and non-user groups e.g. house to house leafleting along certain routes.

This experience of Brighton is similar to that of the other British case studies and some of those in France. It should be noted that efficiency savings in operations (reductions in wages, reductions in fixed costs and cuts in staff numbers) in bus companies in Britain have generally preceded increases in public transport patronage such as that seen in Brighton.

Nottingham

In total, Greater Nottingham's population is 625,400, whilst Nottingham City's population is 270,000 (2001 Census). Nottingham has a large student population; largely because of this, the population is comparatively young. There is a population of around 500,000 within a 30 minute drive.

Nottingham is the regional capital of the East Midlands, and is home to several large established companies, and the Inland Revenue's national headquarters are also located in the city. There has been a shift in employment from mining and manufacturing (engineering and textiles) to financial and other services, which now employ 50,000 people; it is also the 4th largest shopping centre in the UK. Only about 25% of jobs are located in the city centre, and the trend to decentralisation and to out-commuting is continuing. The number of people of working age is projected to rise by 2% between 1996 and 2011, which could lead to a small increase in journeys to work. The economic buoyancy of Nottingham is reflected in its GDP per head which, at £17,500 (€26,250) in 2002, was 40% over the UK average.

Greater Nottingham is made up of the City – a unitary authority, responsible for all local services – and three Districts (Gedling, Broxtowe and Rushcliffe), which have a second tier of local government, the county council, which maintains all transport services with the exception of parking and concessionary bus fares. The districts and the City are geographically contiguous, so the urban area is covered by both City and District councils (i.e. some parts of the urban area have two levels of local government and others only one).

In 1991, 63% of households living in the Greater Nottingham area had a car, compared with 57% in 1981. This percentage is lower than the figure for England, which was 68%. By 2001, the proportion of households with no car had fallen to 30%, compared to 25% in England as a whole.

Nottingham's transport objectives are similar to those in York, as shown below. However, the integrated planning of land use and transport is more difficult in Nottingham than in York because, in the former case, the local authorities outside the immediate centre of the city (the districts) are planning authorities, but the county is the transport authority (for roads other than national roads). Land use policy is supportive of transport objectives, but individual land-use decisions (by districts) may not be. There is no regional government.

All Local Authorities in England and Wales are required by law to produce a five year Local Transport Plan (LTP). Nottinghams' transport objectives, taken from its 2001–2006 LTP, which is produced jointly for the Greater Nottingham area by the City and County Councils, can be summarised as:

- To increase sustainable access to the city centre
- To reduce traffic growth and to encourage modal change away from the private car
- To improve integration and interchange between modes
- To integrate land use and transport planning
- To maintain and enhance Greater Nottingham's accessibility to regional, national and international markets, particularity by modes other than car
- To improve accessibility to transport for all
- To improve safety for all
- To improve air quality and to alleviate other transport impacts on health

Nottingham's main form of local public transport has been the bus since the 1950s. The rail system is such that it is of relatively little use to the majority of travellers to and in Nottingham (although an old freight line running north from the city was re-opened to passenger traffic in stages from 1993 onwards). The regulatory and funding context for public transport is similar in Nottingham to that in Brighton and Hove. The Nottingham case shows that even in this context, growth in patronage across a city's public transport network is possible.

For some 15 years there has been an aspiration to reintroduce trams (LRT) in the city and in 2004 this aspiration was finally realised, with the opening of Nottingham Express Transit (NET) Line 1, northwestwards from the city centre to the nearby town of Hucknall, also serving some seven park and ride sites. Integrated ticketing and services between bus and

tram are facilitated as the tram operator acquired a 50% stake in the main inner-urban local bus operator, and vice versa (after some negotiations with the competition authorities).

Nottingham is an important market for public transport and it is key to the City's local transport plan (LTP) objectives. There are now 3 main operators: the tram operator, Nottingham Express Transit (NET); the Council-owned bus company Nottingham City Transport (NCT); and a privately-owned bus operator, Trent Barton, which operates services to more suburban destinations and has won several awards for its high quality customer service and innovative marketing. (Regardless of their ownership, the bus and tram companies cannot receive direct subsidy and operate in the same deregulated environment as those in Brighton and York; the vast majority of routes must, therefore, operate without subsidy).

In 2003/04, 73 million passenger trips were made on Nottingham City Transport bus services, an increase of 1.7% since 2000/01. In addition, an estimated 11 million trips were made on the tram in 2003/04. The number of trips made by Trent Barton on its routes that serve Nottingham is not available, due to concerns about commercial confidentiality.

The reasons for this increase in public patronage are several. Nottingham City Council became a much larger organisation in 1999, due to changes in local government structures. At this point, the Board of NCT decided to make major changes in the senior management of the bus company in order to make the culture rather more "customer-orientated" and relatively less engineering-focused than it had been previously. In collaboration with the City Council, NCT then went about a radical restructuring of its fares and route network to make them simpler.

In a similar manner to Brighton and York, it decided to focus its resources on core routes and to supply a clear product on these routes: a bus every 10 minutes between 0700 and 1900 Monday to Saturday, and a last bus home from the city centre at midnight. Routes that previously crossed the city centre from one side to the other have now been split and terminate in the city centre; this caused some controversy locally but it is the Council's view that the increases in patronage demonstrate that the decision was correct. In addition, the Council is investing heavily in order to facilitate interchange, as it recognises that many key destinations lie outside the city centre and serving them by direct routes from all parts of the city is simply not practicable.

Core bus routes have benefited from investment in new buses, bus shelters and stops (almost every stop is provided with high kerbs to enable level boarding). They have also benefited, where road width permits, from bus lanes, although the Council recognises that local politics can mean that certain bus lanes, though they might be desirable from an operational point of view, are nonetheless not implemented. New buses were funded by the bus operator, and other infrastructure by the Council.

The tram is a PFI (private finance initiative) scheme. No public funds were invested up-front but, rather, the DBFO (Design, Build, Finance and Operate) consortium (Carillion, NCT, Transdev and Balfour Beatty) spent £200m to build the tram and then keep the revenue plus an "availability or performance payment" from central government, routed via the Council, for the next 30 years. The main route is 12km long, linking Hucknall with Nottingham City Centre and the main railway station, with a 2km spur to a Park and Ride site near junction 26 of the M1 motorway. Since the tram opened in May 2004, it appears to have led to an increase of 20% in total public transport patronage (bus and tram) in the corridor in which it operates.

Nottingham was chosen as HiTrans case study as an example of how it is possible to improve public transport use and quality within a deregulated situation but that good voluntary partnership and shared ownership assists the process.

York

The City of York administrative area has a population of just over 181,000 people (2001 Census) and covers a total of 27,200 hectares. The majority of the population (approx. 133,000) live within the main York urban area (6,500 ha) contained within the York Outer Ring Road, within a 30 minute drive of the city centre.

This area is also the main location for business, industry, shopping and services. Other significant settlements are primarily commuter villages/towns with local services and are located beyond the Outer Ring Road. The remainder of the District is predominantly rural in character. Whilst over 66% of households in York had access to a car at the time of the 1991 Census, this still means that over a third did not; this had fallen to 27.3% by 2001.

There are only two levels of government in York: the city council, which holds all local functions, and national government. All roads within the York urban area are controlled by the council (there are no national roads) but, in common with Brighton, it has relatively little control over its bus network as this is operated in a deregulated environment. National rail is regulated but privatised and the local council has even less control over that. Whilst there is in theory supposed to be competition in bus provision, in fact, in common with almost all of Britain outside London, local monopolies have developed and in the case of York almost all bus services are provided by FirstGroup. Because York is an historic city, it has a very good market for bus based park and ride (tourists) and so the Council developed this from the early 1990s onwards. This has proved important in the Council's later ability to influence the local bus operator.

The current modal split for journeys to work (2001 census) indicates a very high proportion of walking and cycling activity in York relative to other parts of the UK, accounting for over a quarter of trips. This is due to its compact size, flat terrain, ancient street pattern, lack of parking, a culture of cycling developed when York was a rail and chocolate manufacturing town, and due to the Council's efforts to calm traffic and provide cycle facilities. Bus use is lower than the national average but has grown over the past 10 years. Car use is rising but this appears mainly to be at the expense of motorcycling and cycling; rail use has increased, probably due to York's increasing function as a place to live for people who work in nearby Leeds.

All Local Authorities in England and Wales are required by law to produce a five year Local Transport Plan. The City of York's transport objectives, taken from its Local Transport Plan 2001–2006 (LTP), can be summarised as:

- To promote a transport system that leads to a healthier society by reducing the amount of car traffic in the city and encouraging more sustainable forms of travel
- To enhance safety for all road users.
- Using transport as a means to facilitate local economic development and vitality.
- Making sure that people are able to access services regardless of their car ownership status, income or any mobility impairments.
- To promote integration within and between different modes of transport.

In York's case, these objectives are intended to be achieved through a mode shift from drive alone car use to other more environmentally-friendly modes.

Because York is a unitary authority (thus there are only two levels of government in the City; national and local) it is able to plan land-use and transport together within its area. However, this does not always mean that land-use decisions are made in a way that is supportive of transport policy objectives; other factors (economic development, local politics) may be more important.

York has been selected as a case study for HiTrans because of its success in influencing mode share towards bus use and walking; and also because, over the past very few years, bus use has grown by around 40% in absolute terms.

The case of York is similar to that in Nottingham and Brighton: there was an historic bus network, with a multiplicity of rather infrequent and indirect routes that was, consequently, relatively lightly-

used. The City Council and the bus operator worked together to re-structure the route and fares network in a similar manner to that in Nottingham (and also suffered from some similar criticism for severing cross-city routes). The operator also invested heavily in new buses and the Council in bus priority (where politically possible) and improved stops and shelters. In York, the results have been spectacular growth in bus use, albeit from a low base; and also some growth in public transport's mode share. Bus patronage rose 17% 2000/1–2002/3, and 14% during 2003, from an annual total of 8 million to over 10.5 million passengers.

Single fares are relatively expensive – it can cost up to £2 (€3) to travel the 10 km across the city – but unlimited travel daytickets cost only slightly more than €3 (and weekly passes €15), encouraging increased trip-making.

The costs of such improvements have not been enormous. From 2002/03 to 2003/04, for example, the Council spent about £1.4 (€2.1) million on park and ride and a further £1.6 (€2.4) million on other bus infrastructure improvements. Since 2001, the bus operator has spent about £5 (€7.5) million on new buses. (£1 = €1.5.)

Several factors have been particularly important in York's success. As in Nottingham and Brighton, the City Council became the transport authority after local government reorganisation in the late 1990s, taking over from an authority that previously covered a much larger area with a consequently much wider set of political priorities. This allowed the new transport authority to focus its efforts on the City of York area alone. Shortly thereafter, a new Operations Director was brought in to manage the main bus company locally, First York. He had considerable experience of, and a positive attitude to, working with local authorities and it was clear from the HiTrans Strand 5 meeting in York that Council officers and this particular individual have a very good working relationship: both appreciate what the other is, and is not, able to deliver. It appears that this relationship has been key to the changes in public transport that have been implemented in York; the major bus operator and Council were willing to support one another when dealing with the public consultation aspects of the changes that they made, for example. Finally, the existence since the early 1990s of four very successful park and ride sites in York (which were implemented by the previous transport authority) was key in convincing the bus operator that York had a strong market for bus travel. First York operate the park and ride services and car parks under contract to the City Council (which owns the car parks); the bus operator pays the City Council to be able to do this.

Flanders and Gent

This case study concerns the example of the public transport network in Flanders, Belgium, but with specific reference to the case of the city of Gent, one of Flanders' main centres.

Flanders is one of the three semi-independent governments of federal Belgium (the other two being Wallonia and Brussels), with a population of around 8 million. De LIJN is the public transport (PT) operator of Flanders, covering rural areas mainly, as well as some smaller and medium-sized cities, like Antwerp, Gent, Mechelen, Oostende, Bruges and Hasselt. Car ownership is 0.53 per household and GDP per head is €25,500 (2003). Flanders has been successful in developing a modern industrial base and in attracting high-technology investment. In terms of numbers of workers employed in high-tech and research-intensive industries, Flanders is the third most advanced region in the EU.

Industry, including construction, has seen its share of GDP decline from 32.2% in 1985 to 26.8% in 2002. By contrast, over the same period the share of the services sector as a proportion of GDP has risen from around 64.9% to 71.6%, driven mainly by increased business services including financial, real estate and rental services.

The transport objectives of Flanders are summarised in its Mobility Plan, which was laid before Parliament in 2002, as follows:

- To guarantee the accessibility of towns and villages.
- To give everyone equal access to mobility.
- To improve traffic safety.
- To realise a transport system that is also beneficial to quality of life.
- To reduce pollution from transport.

This places the Flemish model of public transport provision in a firm policy context: the Flemish government is seeking to improve public transport for all, and cost-effectiveness is a secondary consideration. This is why the Flemish case study is of interest in HiTrans.

Gent's public transport system consists of suburban rail, 35 km of tram lines, one trolleybus line and feeder bus routes. The trams account for about 8% of the total vehicle km, the trolley bus about 2% and the balance is made up by bus services. Precise usage figures for Gent are not known but in Flanders overall ridership has risen from 216 million trips in 1998 to 368 million in 2003 (70%), and it is understood that the level of increase in Gent has been similar. A number of factors contributing to this increase are listed below. Fares are worthy of a particular mention: single tickets (valid for interchange between buses and trams for an hour) are €1 if bought on board or €0.75 if bought in carnet format; a month's unlimited travel on any local public transport (i.e. excluding rail) anywhere in Flanders costs only €25.

A major contributory factor to the success of public transport in Flanders is the government's responsibility for public transport – it is seen primarily as a public service. Particularly since 1998, due to changes in Flemish politics, this role for public transport has been re-emphasised and a number of initiatives have been pursued, including:

- reduction in fares
- simplification of the fare structure
- special tickets (like season tickets Buzzy, Pazz & Omnipas)
- special fare offers for private companies (and their employees)
- free and reduced fares for target groups
- free public transport in the city of Hasselt

A certain level of public transport is guaranteed for all inhabitants of Flanders. This is called basismobiliteit. Social equity is mirrored in social accessibility to public transport: no-one in Flanders should live more than 650m from a bus stop in a rural area, or 500m in an urban area. Road safety and environmental quality are considered to be major secondary objectives of public transport. As a result public transport in Flanders is available to all, and reliable.

Public transport in Flanders does however come at a cost. Operating subsidies from the Flemish Government totalled almost € 503 million in 2003 (€1.50 per trip, approximately), an increase of almost € 66 million compared with the previous year. Capital

subsidies were of the order of € 454 million (De Lijn Annual Report 2003). The percentage of operating costs recovered from fares has fallen from 29% in 1998 to 22% in 2004.

In order to realise transport objectives, there is a 22 year plan (from 2003–2025) for public transport in Flanders, called the Pegasus plan. Its objectives for the Gent region are to cut car kilometres by 7% and raise public transport patronage by 15 million passengers per year. This will be achieved by investing some €230 million in 6 new/extended tram lines (more than doubling network length) and an extended network of feeder bus services. Investment in tram lines is emphasised because market research on a recently-completed tramline extension showed how much more its users preferred the tram to the previous bus service. Fully 40% of the tram users had never used the service when it was provided by buses, and of the remainder, 60% of them used the tram more frequently than they had the bus. This was because they found the tram easier to use, faster and more reliable.

Freiburg

The city of Freiburg in Breisgau is located in the south-west of Germany near the French and Swiss borders and is a municipality in the federal state of Baden-Württemberg. It has a population of about 200,000 including a large number of students. Including the two counties around the city, the Freiburg area has a population of around 615,000 people; 250,000 of these live within 30 minutes of the city centre. Car ownership in Freiburg has grown from 410 cars per thousand people in 1980 to 500 today, with 700 per thousand in the surrounding more rural counties. However, this increase in motorisation has been accompanied by a counter trend in modal split.

Freiburg is called the German ecological capital because of its integrated planning strategies and its excellent public transport system. The city is not an industrial area as such: administration, education and services dominate. Although the number of jobs in the city has decreased from 110,000 to about 97,000 in the last 15 years, the unemployment rate has remained at around 7–8%. Freiburg is still very much a growing city with regard to population. Nonetheless, the city's population is insufficient to meet the demand for workers and so around 51,500 people commute into the City each day, with only around 15,000 leaving.

There are four levels of Government in Freiburg as in most other parts of Germany: Federal Government – State Government – "Regierungsbezirk/County – Municipality. The State Government has in this case devolved powers on local rail services to the level of a "special purpose community", the ZRF, that has been created by its constituent members, the City of Freiburg and the two surrounding counties, who have ceded competencies to it. Though it lacks legislative political power, the ZRF is however responsible for the Breisgau S-Bahn (local rail) network and the Local Transport Plan, which means that it decides on the objectives and programme for public transport in the region. The council of ZRF is a political one and makes decisions on, for example, spending on public transport projects.

Railway station in Freiburg.
PHOTO: AXEL KÜHN

There is another public transport body in the area (other than the operators). The Freiburg passenger transport authority RVF (a "Verkehrsverbund", or "transport union") is a community of the operators (17 in the Freiburg region), subject to some political control from city and county councils, based on a contract between ZRF and RVF. The RVF is responsible for setting fares and the ticketing, although the structure of the fares system (especially the RegioKarte and Umwelt Abo) is "safeguarded" by subsidies of ZRF. Routes and timetables are largely in the control of the ZRF via the Local Transport Plan (part of the contract between ZRF and RVF). It should be noted that the main public transport operator in the region, the tram company VAG, though set up as a limited company, is still 100% owned by the municipality.

In order to improve the environment, reduce congestion, improve road safety and to enhance the economic vitality of its city centre by improving its environment, Freiburg has for many years pursued the following policies:

- Increasing non-motorised mobility.
- Increased use of public transport.
- Reduced mobility for private cars.
- Reduced car parking.
- Integrated land-use and transport planning.

Because of its well developed public transport system and the attention paid in the past to pedestrian and cycling traffic, Freiburg has an unusually high share of walking, cycling and public transport trips and a corresponding low percentage of car trips. During the period 1976 to 2002 the mode share for walking cycling and public transport increased from 40% to 60%. This was entirely at the expense of the share of car trips, which decreased from 60% to 40% in the same period. It is because of this remarkable performance that Freiburg has been included in Strand 5 Stage 2 of HiTrans.

The case of Freiburg is similar to that of Basel: there has been no single measure, or change in services or infrastructure, that has led to an increase in public transport ridership and a modal shift from car. Rather, there has been a deliberate policy since the 1960s to improve public transport services and ticketing, and to restrain car use through expensive on-street parking and city wide 30 kph zones

Public transport in Freiburg consists of an S-Bahn (local rail) network, longer distance rail, inter-regional buses, and local trams and buses. These have been

continually improved since the 1960s but the 1980s were particularly important in improving the situation. During this time, key bus routes were replaced by tram lines and, as a result, journey times reduced drastically, sometimes by as much as 40%. New parts of the city were deliberately planned around new tram lines that were introduced prior to the occupation of new houses.

Also, in 1984, the "Environmental Season Ticket" (Umwelt Abo) was introduced, initially for the City only. This was much cheaper than the existing all network season ticket and encouraged off-peak trip making, as it could be used by one person in the peak, but was also valid for trips by a family of four in the off-peak.

These improvements are believed to have been the key reasons why public transport patronage rose from 27.7 million trips in 1983 to 65.9 million in 1995, an average of 7.5% per year. This increase is believed to have continued since then, not least because public transport has been improved at a regional scale, with new S-Bahn links and the availability of the Umwelt Abo across the ZRF area.

The regional public transport body RVF, in common with its counterparts throughout Germany, regularly surveys public transport user satisfaction; in 2002 it gained first place in overall satisfaction ratings across the country.

Grenoble

The city of Grenoble is the main urban centre in the department of Isere. Local public transport is co-ordinated within an area called the "Local Transport Perimeter (LTP)", which encompasses 27 municipalities, including the City of Grenoble, with a total population of 400,000 (1999), about a 40% of that of the department as a whole. There is a population of approximately 250,000 within a 30 minute drive time of the city centre. Whilst there has been a traditional industrial base of extractive industries, agriculture and metalworking, this has diversified in recent years and Grenoble is now a centre in France for information technology. Recent inward investments by Philips and Motorola in the area are amongst the largest of their kind in France in the past 10 years. GDP per head in 2001 was around €24,000.

Public transport within the LTP is the responsibility of an organisation called SMTC, which itself is controlled and jointly funded by the Department and the Greater Grenoble Council ("La Metro"). The population of the area has been growing consistently over the past 15 years but this has tended to occur in suburban areas (within La Metro) rather than in the City of Grenoble itself. The departmental unemployment rate is 8.2%. The regional government (in this case, Isere) is responsible for bus services running between two or more departments. It is also responsible for specifying and funding regional rail services, which are then run on its behalf by SNCF, the national rail operator.

The departmental government is responsible for interurban bus services within the department, whilst the commune, or group of communes, is responsible for local surface public transport. Hence in the case of Grenoble, municipalities have ceded powers over local public transport within the LTP to SMTC. Very importantly, SMTC is given the power to level a payroll tax – the *versement transport* – on every company with more than 9 local employees within its area. This is then used to finance investment in and subsidise the operation of local public transport which, in the Grenoble LTP area, consists of buses, trams and a rail network that is little used for

Tram terminus at the university. PHOTO: AXEL KÜHN

Trams in Grenoble city centre. PHOTO: AXEL KÜHN

local trips. SMTC organises and operates (or secures franchises for the operation of) public transport services within the LTP area, according to an quinquennial plan (the PDU (see Angers for definition)) that it draws up and agrees with its constituent municipalities and the department. In the case of local trams and buses, the operator is a company owned by the private company Transdev. The current objectives of the 2002 PDU are to bring about mode shift from car by:

- Re-allocating road space to more environmentally-friendly modes of transport.
- Promoting car sharing.
- Increasing modal share for public transport by renewing existing networks and enhancing their capacity.

Between 1992 and 2002, investment in public transport and some limited parking restraint (9,000 of the 15,000 public parking spaces available in the Metro area are charged) has brought about a small modal shift and certainly consolidated the position of public transport vis a vis car transport – the latter now accounts for 53% of trips, down from 54% in 1992. This is in spite of a 24% increase in the total number of motorised trips (by all modes) over the same period. In areas of La Metro that are particularly dense, central and highly accessible by public transport, its share of all trips rises to 17%.

Grenoble was selected as a HiTrans case study because of its success in maintaining public transport mode share and increasing public transport patronage by 20% in 10 years due mainly to the implementation of two tram lines and the re-structuring of its bus network to feed into these tram lines. It was also selected because it is one of France' oldest "new" tram schemes.

The first tramline, route A, opened in 1987 and was then 8.8 km long. Route B followed in 1995, sharing track with route A in the city centre but branching off east to serve a major university and hospital complex. As well as providing a new mode of public transport, the tram in Grenoble is also seen as a vital tool in urban regeneration efforts. Further extensions in 1996 and 1998 brought the total network length to over 20 km and, when Route C opens, this will add a further 13.5 km, much of it intended to re-

lieve traffic on the city's congested southern bypass. The tram is now so well thought-of that residents campaign to have it extended into their areas. Capital cost per km for Routes A and B was around €20 million (total network cost around €400m); this high figure reflects the fact that much running is on street, and also that the high frequencies operated requires a large tram fleets (53 sets at the present time).

In addition to the tram, there are 40 interurban bus routes, 24 urban bus routes, Taxibuses, bus services for the mobility impaired, and four night bus routes. The urban bus routes were re-structured around the tram lines when they were opened. It is not clear from the information supplied whether this re-structuring was the result of any market research. Trams operate every 4 minutes at peak times and buses every 6 to 15 minutes. A single fare within the urban area costs €1.20 and a monthly ticket €38, slightly higher than in other French case studies for HiTrans Strand 5. The tram route investment was covered jointly from the *versement transport* and from national government funding. The former source covers operating deficits which now amount to €111 per inhabitant per year.

Total local public transport patronage in Grenoble was 46.6 million in 1992, rising to 60.7 million in 2002, of which 30 million were made by tram. Between 1997 and 2002 the number of public transport trips per inhabitant rose from 121 to 160. The coverage of operating costs from fares has however reduced from 45.2% in 1997 to 34.3% in 2002.

Jönköping

Jönköpings Kommun (municipality) and Jönköpings Län (County) are situated in south central Sweden, between Gothenburg and Stockholm. Jönköpings Kommun has a population of 118,000; there are an additional 140,000 people within 30 minutes drive of the town centre, and car ownership is 0.5 per person. The Jönköping city region looks, in plan, like a "T": it stretches 25 km N–S and 10–15 km E–W, and urban development is largely in a linear (corridor) pattern. This has assisted Jönköping in providing a good example of high quality public transport in what is a town at the low end of the HiTrans' size range.

The main industries are manufacturing: for example, Electrolux employs around 2,000 at its site at Huskvärna, and other major firms active in the area include ABB and StoraEnso. Services such as higher education and health are also important. Given its central location in Sweden, Jönköping has also become a centre for the logistics industry. Over the last 25 years small and medium sized enterprises have grown in importance in the Jönköping area, and no one employer dominates the labour market. The average income per head is around €30,000, rather lower than the Swedish national average.

Jönköping is part of a wider region of several counties, covered by a regional public transport body that covers an area of 110,000 square kilometres. The counties (the Läns) have responsibility for procuring bus services and for most roads within their areas. However, a voluntary regional public transport body runs the fares system for each region, procures regional rail services, and procures regional bus services and also internal bus services for counties who wish this to be done on their behalf, on an agency basis. Transport services are purchased on the market in a tendering process. Contracts are let for up to five years by a special purpose authority, Jönköpings Länstrafik AB, which is 50% owned by the kommun and 50% by the län.

Fares cover about 60% of operating costs on regional services, with the remainder coming from national government (for rail services) and the counties (for buses). The existence of such a regional

Bus at Huskvärna. PHOTO: CLIVE BROWN

public transport body has ensured the integration of services and of fares.

Jönköping's transport objectives include reducing car use; increasing public transport use, walking and cycling; reducing journey times for all modes; increasing the accessibility of the public transport system; and increasing economic development. Some progress has been made towards increased public transport use, and the accessibility objective.

The case study from Jönköping concerns the restructuring of the local bus network in the city and surrounding areas, around a concept called KomFort. Prior to its introduction, in 1996, public transport patronage in the town had been in decline. To address this, three years of discussion and studies of other European public transport systems took place before the Län (county council and public transport authority) and the Kommun (town council and roads authority) hit on the idea of a few core bus services, with local and rural feeder routes. This represented a relatively radical change as, previously, most areas of the town had had low frequency but direct services to the town centre. These were in some cases replaced by a feeder route and an interchange.

The bus network is now such that it is arranged around three key high frequency (6 buses per hour), high capacity routes using modern low floor vehicles, with traffic signal priority and easy access to the town centre. Some £5 million was also spent on bus priority measures on-street. This had the effect of reversing the long-term decline in bus patronage in the town, and also helped to revitalise its town centre, which had been suffering competition from a major out of town centre.

Co-operation between Län and Kommun was considered key to the success of KomFort. Working in isolation, neither of these bodies could have achieved what was delivered in co-operation. From the interview, it seemed that the co-operative spirit was very strong at a Director level, which would have assisted the project. In addition the need for co-operation between bus operators and their staff was considered to be of value, encouraged by a 0.5–4% quality bonus, some of which is paid to staff.

The Kommun spent around SEK 60 million (£5 million, €7.2 million) on a series of measures to benefit buses, including:

- new stops, with concrete surfaces, and level access,
- bus only priority measures through residential areas,
- bus only motorway underpass,
- new bus only roads,
- bus priority at traffic signals.

In planning routes the need to generate acceptance of longer walking distances and avoidance of areas with lower population densities was recognised; hence the slogan "Think Tram – Use Buses!".

The Länstrafik initially let three contracts (later reduced to two, when Arriva Sweden acquired one of the other contractors) for new bus services in the Jönköping area. These are typified by:

- shorter, more direct routes
- shorter journey times and higher frequency services (every 20–30 minutes)
- simpler numbering system
- new accessible, articulated, five door accessible buses on main routes,
- plain clothes revenue enforcement staff
- feeder services in suburban areas and
- a real time information system.

The main, core Citybus network has seen an increase in demand. The number of passengers has increased by 15% and the modal share of public transport for trips to central Jönköping increased from 19 to 22% between 1996 and 2002. The real time information system serves to give a positive impression of high punctuality. Cost coverage has increased over the same period from an average of 50% to 70% from fares (with over 100% on one route), and service quality has also been improved by paying ridership bonuses to the bus operators, some of which goes to drivers themselves. Total ridership on the local (Län) public transport system is now 11.5 million (2003).

A key factor in the success of the network was also the decision to locate the new university area in the city-centre. The partners were also very aware of the importance of developing the city-centre to a higher degree than the rural areas.

The Citybus services were designed to be more attractive and of higher status than other local bus services. This is reflected in current use by a good cross section of society whereas in the past buses tended to be used only by those who had no other choice. Rural bus services were felt to be the lowest status services. However, the feeder services have been less successful in attracting passengers and were the subject of initial criticism by residents who lost their direct services to urban centres.

The Län feels that pull factors appear to have been more important than push factors in the success of the system: new low floor accessible vehicles, a simpler route network, real time information at bus stops, and beacon based priority at traffic signals.

Conclusion to networks chapter

It can be seen that there are some commonalities and some important differences between the Hi-Trans case studies of networks. These are compared and analysed in much more detail in Chapter 12, but include:

- Different regulatory situations in the British case studies compared with elsewhere.
- The French, German, and Dutch case studies are all situated in areas with multiple levels of government and in many cases feature the addition of non-statutory special purpose public transport co-ordination bodies, in contrast to their British and (to a lesser extent) Swedish counterparts.
- Some of the cities selected have light rail and/or heavy rail local transport networks, whilst others have achieved change with only bus-based systems.
- Almost all the case studies have achieved impressive increases in public transport ridership, but mode shift to public transport has been rather harder to achieve in the face of increasing car ownership and motorised trip making; however, many of the networks considered have nonetheless seen some modal shift away from car.
- Levels of "supporting policy" for public transport – parking measures and integrated land-use planning – vary considerably across the case studies.

If mode share is used as the definition of success, then it is rather different in different countries (France compared with Germany for example). With what appear to be comparable levels of public transport investment in French cities, mode share for car is still rather higher than in Germany.

11 Case studies – Corridors

This chapter presents case study information from the corridor cases that were selected for this research. In general they were chosen because, in the HiTrans experts' view, they represent good practice in moving towards high quality public transport in particular corridor(s) in a city or region. This does not mean that they have all achieved spectacular growth in patronage or modal shift, although there are some notable examples of such success. In some cases, examples have been included because they demonstrate an innovative approach to securing improvements to public transport; in others, because they show how relatively low cost improvements can be brought about in otherwise declining markets.

Once again, information is presented on: the corridor's population (and growth); the population of the region as a whole; the type of local industry and economy; levels of income; local geography insofar as it affects the nature of the network; local and regional government structure; the regulatory situation with regard to public transport; and the main sources of finance for public transport initiatives. Information is also presented on: the state of local public transport and its development; on car ownership levels; on modal split for trips within the area; and about local and regional transport objectives, where these are available. The reason for selecting each case study for inclusion in this report is also provided.

Amsterdam Region (NL) (Zuidtangent) – bus rapid transit, unguided bus

This case study concerns a bus rapid transit corridor, and specifically a busway (unguided), in the Amsterdam region of the Netherlands.

More than 2 million people live in the Amsterdam region. In comparison, the Rotterdam region has around 1.4 million. More than half of the population of the Amsterdam region lives close to Amsterdam itself and, of those, the majority lives in Amsterdam (735,000 inhabitants). Population growth since 1996, at 6%, has exceeded the Netherlands average by a half. Population density is, as might be expected, very high in general in the region, at 1473 inhabitants per square km, but up to 4454 per square km in the City of Amsterdam itself. The population along the corridor in this case study is about 500,000, although this population is concentrated at the eastern and western ends, in Haarlem (west) and in Amstelveen and Amsterdam Zuidoost (east).

The region of Amsterdam is one of the economic "power-houses" of the Netherlands. The area has very high quality infrastructure including, among other things, Schiphol airport, various ports, a very modern digital communications network and very good connections with the Netherlands' hinterland. All important industrial sectors are represented in the regional economy but there are particular concentrations in logistics, manufacturing industry and business services. Amsterdam is a world-renowned financial centre, and it is important at the continental level for ICT and multi-media. GDP per head in the Amsterdam region excluding the City of Amsterdam itself was €38,000 in 2002.

There is a regional body in the Amsterdam area, the "Amsterdam Regional Organ" (ROA), to which the Province of Noord Holland has devolved powers over local public transport (bus, tram, trolleybus and metro). Until January 2002, two organisations had the exclusive right by the Province to operate public transport: GVB in Amsterdam, and Connexxion in the rest of the region. However, the new Public Transport Law (2000) is intended to make public transport more market-orientated, with the aim of realising

more efficient and customer-focused public transport. In order to achieve this, from January 2002, regional public transport was set-up on the basis of competitively awarded concessions. Each concession covers one sub-area of the region – Amsterdam, Amstelland-Meerlanden, Waterland en Zaanstreek – and is periodically re-tendered by ROA. Public transport powers are delegated by the Province of North Holland to the City of Amsterdam and ROA within their respective areas, but North Holland keeps control outside the ROA area; revenue support for public transport comes direct from central government.

Key aims for regional public transport are to reduce congestion, pollution and road safety problems through:

- Improved cycle infrastructure to make the bicycle the mode of transport of choice for short journeys.
- Improved public transport so that it can better serve dense flows of travellers to and from main travel nodes.
- Facilitation of faster car travel for trips where there is no alternative to the car.
- Making better use of existing transport infrastructure in general.

The Amsterdam region has an extensive public transport system consisting of heavy rail, tram, metro and bus, although, the case study for HiTrans concerns one particular element of the system, a new (non-guided) busway called Zuidtangent that runs from Haarlemmermeer, in the southeast of Amsterdam, via Amsterdam Schiphol airport, a major office development area in Hoofddoorp, and the Spaarne Ziekenhuis (hospital), to Haarlem in the west. Zuidtangent was selected as a case study because it is an unusual example of heavy infrastructure investment but in a bus-based mode of transport. The Zuidtangent serves a corridor that was not previously well-connected by public transport (it was served by a variety of conventional bus services) but was nonetheless identified to have sufficient demand to warrant investment in fixed-route infrastructure.

The busway provides segregated running for the vast majority of its length to the west of Schiphol, with intersections either grade separated or with absolute signal priority over other traffic. Stops are designed to look like stations, with medium-height platforms and Kassel kerbs to provide level boarding onto the high quality articulated buses. The average speed of buses over the 25 km length of the route is 42 kph including 19 stops, providing a considerable journey time advantage over the car at peak times, when the general road network is heavily congested. Basic frequency is 6 buses per hour each way but in the peak this is increased to 8 over the section from Schiphol to Hoofddoorp.

The busway was funded by the Dutch national government and also by Schiphol airport: reconstruction work on one runway provided the opportunity to build a cut and cover tunnel that would have been prohibitively expensive, had it been constructed by deep bore methods. The total cost was €275 million and construction lasted from 1994 to 2002, with opening in early 2003. Maintenance of the busway is the responsibility of municipalities along the route.

The Zuidtangent operation is run by the local state-owned bus operator Connexxion and to date has not been subject to competitive tender. It covers about 50% of its operating costs from fares, which are set on a zonal basis. A 10 km trip costs around €3. Patronage has exceeded expectations and has grown by 10–20% in the past two years alone; unfortunately precise patronage data is considered commercially confidential and neither operator nor Province will release it.

Chemnitz

Chemnitz, in east central Germany, lies at the foot of the Erzgebirge Range, on the Chemnitz River. The city is located near Dresden, in Saxony (Sachsen). Chemnitz is located in a leading textile manufacturing region, and locomotives, textile and mining machinery, and chemicals have been produced here. Industrial growth in the 19th century and early years of the 20th century was rapid. The city was known as Karl-Marx-Stadt from 1953 to 1990 when it was in the GDR (East Germany). A regional transport authority (Verkehrsverbund of Middle-Saxony, VMS) was created in 1998 to co-ordinate public transport in the Chemnitz (and Mittweida, Freiberg, Erzgbirge, Zwickau and West Sachsen) region, an area of 4,679 square km with a population of 1.4 million. Car ownership is now 509 per thousand people, up from 302 in 1992. Average income per head is €19563 (2003).

During the period 1990–1995 the population of Chemnitz declined from 310,000 to 250,000 and job opportunities by 50,000. New jobs also tend to be created in new service industries in new locations rather than traditional industries supported by good public transport links. Commercial, retail and employment growth has not been directed towards public transport corridors. There is no restriction on city centre parking, new city centre car parks have been established, and Chemnitz is seen generally as a car-friendly city.

The modal-split for public transport (within total urban traffic) is 15%, which is low even in comparison with other former East German cities; concomitantly, the share of car-traffic is high (45%) and still growing. Since 1989 there has been a total reversal in the fortunes of public transport, since the effective cap on car ownership that existed in Communist times was lifted and car ownership rose close to West German levels in a few years. The main form of urban public transport in Chemnitz is still a bus and tram network, which has seen significant retrenchment since reunification in 1989, including frequency reductions and major efficiency savings, through redundancies.

However, the HiTrans case study in Chemnitz concerns two rural and semi-rural rail and lightrail lines that have been modernised and/or re-opened in recent years. This case is included because the investment in rural and semi-rural schemes contrasts with the situation of retrenchment inside the city urban area.

The overall environment for public transport in Chemnitz is not particularly positive. The Chemnitz tramway company Chemnitzer Verkehrs AG (CVAG) saw a reduction in staff numbers from 1,500 to 500 between 1990 and 2004. German unification has had a number of impacts in public transport in east Germany (beyond general and local specific economic impacts). Generally, public transport fares have risen whilst, at the same time, there has been a significant reduction in staff levels and staff wages (wages at City-Bahn (see below) are 25% less than at the mother tram company). There has been little improvement to public transport within the city itself with low morale amongst traditional tramway staff who can foresee no planned improvements to their services and equipment. To remain within cost budget, in December 2003 the frequency of urban tram services was reduced to every 15 mins after the morning peak. Thanks to increases in efficiency resulting from staff reduction, service reduction and fare increases, CVAG today covers 60–70% of its operating costs from fares.

Chemnitz has been selected for HiTrans Strand 5 Stage 2 because it has pioneered a number of innovative rail projects in the city hinterland. These are detailed below.

City-Bahn Chemnitz Gmbh. City-Bahn is a separate but daughter company of CVAG. Some 60% of the shares are held by CVAG and 40% owned by private regional bus operators. It is small in comparison to its partners and has been established in order to manage regional rail services in the Chemnitz region. City-Bahn proposals for light rail development and re-opened rail links were implemented following their inclusion in the Saxony Regional Transport Plan (1995).

Saxony regional council finances 90% of infrastructure costs and also pays for 50% of vehicle investment costs. The passenger transport author-

Pilot tram and Regio Shuttle, Chemnitz. PHOTO: AXEL KÜHN

City centre interchange, Chemnitz. PHOTO: AXEL KÜHN

ity, VMS, agrees with City-Bahn the level of service to be provided, the cost, and the required revenue support. (This is determined by comparisons not competitive tender). But once these costs and level of support are agreed City-Bahn must achieve them. Integrated ticketing arrangements and reimbursement, plus service and timetable development, are also co-ordinated and agreed with VMS.

City-Bahn has developed two types of operation: rural rail services operated with DMUs; and conversion of heavy rail infrastructure to light rail. The example visited for the first type is Glauchau–St. Ägidien–Stollberg. There are plans to expand Citybahn services to cover more of the subregion, including a new link to Zwickau.

However transport and land use planning has not really supported development of City-Bahn projects, nor has changes in the economy of the region or the public transport policy in Chemnitz itself. So, for example, City-Bahn was discouraged from serving a new out of town retail centre as it was believed that this would damage city centre shops, although no restriction was placed on travel by car to the out of town site.

Glauchau–Stollberg Regional Rail Service – Regio Shuttle. The 'CityBahn' operated 'Regio-Shuttle' rural rail service runs on a non-electrified rural line, operating over the DB main line in part, with substantial modernisation over the previous rural freight line, from Glauchau via St. Ägidien to Stollberg. The line re-opened for passengers in late 2002, is 19.45 km long, and serves six new stations and two that were re-located. Use of the line is increasing; from carrying less than 200 a day in DB times, to between 400 and 450 now. This is recognised as still being low, but new services take time to 'bed down'. Policy here as in many parts of Eastern Germany is to keep the rail network alive with a basic service.

Chemnitz Model – The Pilot Tram Route. The second case study in Chemnitz is that of a tram service (the Pilot Route), which operates from Stollberg into Chemnitz City Centre. The Stollberg–Chemnitz line uses a former DB/DR passenger route, which remains open to heavy rail (although there are no regular

services). Within Chemnitz the service uses an existing tram line. The Pilot Tram route opened for passengers in February 2003, is thus relatively new, and little research has been undertaken on passenger needs or reactions to service. City-Bahn has a 30 year lease to operate and maintain the infrastructure and a similar contract to run the passenger services.

The ownership and operational structure is quite complicated, with a mix of involvement for different parts of the network. There is Deutsche Bahn AG who lease some infrastructure to City-Bahn, a new Regio Infrastructure Services (RIS) company which owns new and leased track, signalling and new stations, and an access agreement with the mother tram company CVAG to use their tramway within Chemnitz. The creation of RIS at the same time as City-Bahn follows EU-requirements to separate infrastructure and operation: RIS is the infrastructure company, while City-Bahn is the operator. RIS is a joint venture of City-Bahn and privately-owned RP Eisenbahn (both 50% of shares). The tram-train operation needs specialist adaptation to run on the joint operation railway track, including profile of wheelsets, adapted braking systems and other equipment. The capital costs of the improvement totalled around €40 million.

Ridership has increased significantly; in its last days as a DB route it carried 900 people a weekday and now it carries between 5000 passengers each working day, 3000 on Saturdays and 1500 on Sundays. This increase in the level of patronage has led City-Bahn to believe they are delivering what the customer wants. However bus routes that "competed" with the new light rail service were removed when the new rail service commenced and light rail has a monopoly for public transport journeys on the corridor. Previously, there were 1 rail and 4 bus routes running in the same corridor; the concentration on one improved rail service delivered gains in operating costs which can then be re-invested in other areas. This was possible for the bus companies that part-own City-Bahn. For the reason described, it is believed that 90% of patronage comes from existing public transport users with a 10% growth from modal shift or new trips. The tram has significant segregation (90%) whereas the bus had no priority.

The reasons for the success of Citybahn are given as providing a service that gives a competitive journey time (even taking into account slightly longer walking times, light rail is quicker than the bus it replaced, and also much quicker than the car for trips to city centre), operation of a frequent and reliable service and giving good access to the City Centre.

Düsseldorf (Regiobahn)

The Regiobahn HiTrans case study concerns a railway line along a corridor that runs from one side of Düsseldorf to another, and takes in the urban areas (counties and municipalities) of Kaarst, Neuss, Erkrath, Düsseldorf, Mettmann and Wuppertal. The line has been extremely successful – hence its inclusion as a Strand 5 HiTrans case study; the reasons for this success are explored below.

The municipalities through which the Regiobahn runs are all part of the Rhein-Ruhr area, one which has made a considerable change from an industrial area to a mix of industry and service oriented businesses. This change has been less significant in the big industrial centres of the coal and steel industry, but has been still visible. Remaining industries are more medium sized; and links to regional centres such as Düsseldorf are increasingly important for employment opportunities. In 2003 average income per head in the region was €29,005. Excluding Düsseldorf itself, the other counties and municipalities along the route have a combined population of around 280,000. Population is stagnating but there is a gradual move of households into suburban and rural areas which is tending to increase demand for motorised travel. Current modal split for the Regiobahn corridor is not known, but car ownership is around the German average and rising.

The responsibilities of different levels of government for public transport are similar to those in Freiburg (see above), except that in the State of North-Rhine Westfalia, in which Regiobahn is located, the state has given responsibility for tendering and ordering of railway services to several special units (passenger transport executives, in effect) one of which is the Verkehrsverbund Rhein-Ruhr (VRR), which has responsibility for Regiobahn.

In 1992 the urban areas (counties and municipalities) of Kaarst, Neuss, Erkrath, Düsseldorf, Mettmann and Wuppertal founded the company RegioBahn. The aim was to revitalise regional rail services on lines between Kaarst–Neuss and Düsseldorf–Mettmann. This was two years ahead of the process of rail sector restructuring, reorganisation and liberalisation (with open access for rail operations) in Germany.

RegioBahn. PHOTO: AXEL KÜHN

The partnership within RegioBahn took over track formerly owned by Deutsche Bahn from outside Düsseldorf westwards to Kaarst and east towards Mettmann. Through Düsseldorf urban area the S-Bahn infrastructure of DB is used and track access and station charges are paid to Deutsche Bahn AG to operate on their infrastructure. Services commenced in September 1999 at an hourly interval, increasing to a 20 minute frequency in May 2000. The capital cost of the improvements was €72 million.

Off DB rails, RegioBahn own the railway infrastructure and the trains. The company has awarded a contract to Connex (Rheinisch-Bergische Eisenbahn GmbH (RBE)) to supply drivers to drive the trains, maintain and repair vehicles and look after security and safety on trains. On the sections of infrastructure owned by RegioBahn new stations have been built or old stations refurbished. Stations are cleaned and maintained regularly to avoid vandalism and stations owned by RegioBahn are noticeably more modern,

clean, attractive and free from vandalism and graffiti than are their DB counterparts. Stations are covered by digital closed circuit television (CCTV) security cameras. Ticket machines are located on trains not stations; RegioBahn argue this reduces vandalism and makes maintenance easier. Diesel power was chosen instead of electrification as new rolling stock was cheaper, the costs of electrifying and modifying old freight lines for electrification would have been excessive and no suitable rolling stock was available at the time. RegioBahn received 90% funding for infrastructure improvements and 75% for rolling stock (this is above the normal 55% as rolling stock is sourced locally).

RegioBahn control operations on their infrastructure but control is passed over to Deutsche Bahn AG for operation on the S-Bahn network in the Düsseldorf urban area. However all trains are fitted with GPS, so RegioBahn control know the location of all trains even though they maybe outside their operational control. With the assistance of local authorities and the regional transport authority bus timetables at stations owned by RegioBahn have been revised to integrate bus and trains. Bus drivers are warned when a train is approaching so they can delay their departure to meet trains. There are concerns however as to whether bus feeders can be maintained at current levels as general bus use is in decline.

Passenger numbers have grown significantly since services began with actual ridership always above forecast . Currently 1.2million train kilometres are operated per year. The growth in ridership is now creating problems. During peak periods two car trains are operated but these suffer from serious overcrowding during busy periods. Park & Ride demand is also greater than current supply.

The success of RegioBahn is mainly attributed to the quality of the service and competitive journey time against car in a strong commuting corridor. On road approaches to Düsseldorf traffic congestion is significant and parking is limited and expensive in Düsseldorf. In regional public transport user satisfaction surveys RegioBahn regularly score highly.

There are plans to expand the service, including trains to Wuppertal. Overcrowding is not seen as a problem as these services will serve a different, more local travel market. This expansion project has been dogged with problems; it went through a lengthy public consultation and inquiry process, which eventually found in its favour. Now, due to government spending cutbacks, the likelihood of its being funded has reduced markedly.

Regiobahn is, in the context of HiTrans, an important example: the principle of the case study, whereby local control is taken of the local rail services in order to deliver improvements, could be transferable to other areas, provided national and local policy supports this and political support and funding is available.

Saarbrücken

The town of Saarbrücken has 196,000 inhabitants and 101,000 employees and is the capital of the Saarland, a region of around 1,000,000 people. The corridor served by the HiTrans case study has a population of around 250,000, whilst the total population within a half hour trip of central Saarbrücken is about 1.2 million.

Car ownership in Saarland is higher than the German average. It was 564 per 1000 people in 2000, further increasing to 594 in 2003 (German average: 521 in 2000, 541 in 2003). In 1980 there were 415,000 cars in Saarland, a number that had risen to 604,000 by 2000.

Saarbrücken itself is located close to the French border and is the centre of a German/French agglomeration of small towns in the region. Traditionally the city was a major centre for the steel and metalwork industries but following the demise of these industries the city is undergoing change. Around 80% of the jobs in the former coal and steel industries have now disappeared, but newly created automobile industry now offers about 23,000 new posts (Peugeot, Ford, Michelin, Bosch). Including suppliers and other related employers, about 40% of all jobs in Saarland today are in the car industry. Average income per head in 2003 was €23029.

In common with other areas of Germany, the levels of government in Saarland are the Federal (National) Government; the State (Land) Government; and the County or Municipality. In addition, there are co-operative entities that have been set up to co-ordinate and run public transport at various levels; their powers (where they have them) are ceded from County or Municipality. Saarland is one of the few regions of Germany not yet having fare and ticketing integration. There is no network ticket right now. A Passenger Transport Authority charged with developing a more integrated approach is being established at the present time.

Counties and municipalities are responsible for all local public transport, which includes taking over subsidies. The counties and the Saarbrücken agglomeration ("Stadtverband") have formed a purpose community Zweckverband Personennahverkehr Saarland (ZPS) to enable a joint co-ordination of local public transport with regard to regional bus services. ZPS is the other 50% shareholder in the Verkehrsverbund-Gesellschaft Saar mbH (VGS). Municipalities and counties are wholly responsible for local PT (local bus services), but these operate within the fare structure set by the Saarländische Nahverkehrsservice GmbH (SNS).

SNS was formed in 2004 to facilitate co-operation among the different (bus) operating companies in the Saarland (but including GSS/Saarbahn, the object of this case study). The targets of this alliance are strategic partnerships in order to increase efficiency, use of synergies, access to know-how, access to staff resources, access to new markets and new capital, safeguarding of existing market shares etc.. In reality this means cooperation in maintenance (joint use of depots), a joint bus fleet, network optimisation, joint concessions, staff exchange, joint marketing and procurement (no single buyers) and finally an integrated ticketing system for the whole Saarland. (It is worth noting that this kind of activity would be likely to be ruled an illegal cartel in the UK.)

Verkehrsverbund-Gesellschaft Saar mbH (VGS) is the Passenger Transport Authority for the whole Saarland. It was created in 1987 to play a similar role to that played by SNS now but, after restructuring in 1996, it is now the "directing-level" (Regie-Ebene) for the state (responsible for rail transport) and for ZPS (regional bus). It has also been responsible for the preparation of effective tariff integration ("Verkehrsverbund"), but it seems that this role will now change after the establishment of SNS.

As a result of a holding company which links the municipal public transport operating company to the municipal energy and water supply companies, profits on municipal energy and water suppliers are used to financially support public transport operation. This model of cross subsidy has been very popular in Germany with a strong history of municipally owned companies and it is in fact a tax-reduction model as the revenues of the energy supplier are taxed after the deficit of public transport has

Saarbahn on refurbished rail alignment crossing the French-German border.

PHOTO: AXEL KÜHN

been subtracted. EU-competition laws will however force Germany to skip this procedure and certainly the future economic capability and willingness of municipalities to support/subsidise public transport will be strongly influenced by those changes.

Tendering is foreseen for rail transport, but so far only one route has been tendered. All other rail routes in the Saar network are part of a contract with national rail operator DB, which lasts until 2008. There are no plans for tendering in the light rail field, as long as EU laws do not change the situation.

Publicly-subsidised bus services, which would be subject to tendering according to EU law, are relatively rare in the Saarland state. One that required subsidy has so far withdrawn from tendering to avoid jurisdictional risks. Competition was restricted only to tendering by the concession owner to get the most efficient sub-contractor. Although permitted legally since 1996, there has been no competition yet regarding the award of concessions.

After the closure of the old tramway system in 1965 the city developed its bus system and saw a passenger increase from 24 million. passengers in 1985 to 36 million passengers in 1995. This increase was largely due to parking restrictions (4000 places in city centre) and bus priority projects. The bus scheme was seen as at capacity and not able to cope with further demand. Modal split was at about 17–18% for PT, 54–55% car traffic.

The HiTrans case study concerns not the bus system, but a tram-train project, the Saarbahn, which has had a significant positive effect on total public transport ridership and also on public transport modal share. It has been chosen for inclusion in the research because it is an example of a successful tram train project that has achieved modal shift in an area of very high car ownership, and that also runs across an international border. It demonstrates how a local public transport system can be significantly enhanced by what is nonetheless a relatively incremental upgrade of existing infrastructure. It should perhaps be noted that there has been some criticism of the way in which passenger numbers have been measured on the Saar system, using the period during construction as a baseline, when passenger numbers were reduced.

The first Saarbrucken dual mode light rail line opened in 1997. The Saar region is an old industrial region with a rather dense railway network. Tram-train operation therefore was a logical choice, making it possible to connect the towns and villages in the region with the regional capital Saarbrucken. Built-up from scratch in its urban tramway sections, Saarbahn could be started as a modern low-floor system, without needing to compromise with regard to existing tram infrastructure and rolling stock.

The first section of line opened in 1997, was 19 kilometres long and ran from Cottbuser Platz in the western suburbs of Saarbrucken via Brebach just east of the town to the French border town of Sarreguemines in the southeast. From Cottbuser Platz to Roemerkastell the line is a tramway line, running through the streets of Saarbrucken, mostly on segregated track. Between Roemerkastell and Brebach is the system change-over. From Brebach the vehicles run under 15kv AC DB catenary to Sarreguemines, while the urban section is fed with 750V DC. Park and

ride is provided at one station but to date with only 50 parking spaces, due to expand to 70.

In 2000 a first part of the northern section to Rastpfuhl/Siedlerheim was opened and in 2001 Riegelsberg-Süd was reached. Having received building rights in 2004 (after a quite lengthy public inquiry process) the section through Riegelsberg centre is now under construction. This will then allow the line to re-join railway infrastructure, an old disused railway route from Lebach to Walpershofen. The Saarbahn received 90% funding for infrastructure: 60% from federal government, and 30% from state government. Line 1 has so far cost around €190 million (infrastructure, vehicles and planning). It is anticipated that the extension to Lebach will cost around another €120 million. These figures exclude operating costs.

The Saarbahn is somewhat unique in that it is both a regional and international public transport system (with links across river Saar into France) and runs both as a tram on street, as a tram train on Deutsche Bahn AG tracks and operates across the river Saar to terminate at a SCNF station in Sarreguemines.

Saarbahn is split into two parts; with a separate infrastructure company Stadtbahn Saar GmbH and the Saarbahn GmbH as the operating company. This brings advantages looking to (future) EU competition. The former bus company Strassenbahnen im Saartal AG (still keeping the tramway name after 1965!) ceased to exist in 2002, being integrated into the two new companies. Saarbahn GmbH was formed as early as 1992 to act as a managing unit during construction of the light rail project. Saarbahn is also shareholder in the newly formed private bus company SaarBus GmbH along with other private bus companies (which now operate 48% of the routes in the area). This company deals with regional bus services. Transport operations have been revised to be more competitive with lean management and new staff working practices. Current operations cover 85% of costs.

The opening of the TramTrain scheme resulted in further passenger increases and a modal shift towards public transport. Modal split in the whole urban area is now 22% for PT and 51% for car traffic. On a regional level PT has increased from 6% to 13% of all trips in the Saarbahn corridor, while car traffic has decreased from 69% to 65%. The total number of PT users increased to more than 42 million in 2001, a rise of 2.8% on the previous year.

The success of the tram-train service in the Saarland can be attributed to:

- Ticketing policy with fares at reasonable level and new flexible tickets such as a 9-hour day ticket.
- New tram-bus interchanges, such as that in Kleinbittersdorf, opened in 2001.
- Improved revenue protection.
- Strong political support across all parties for development of tram.
- Customer focussed through user groups and acting on complaints.
- Ongoing strategy to improve performance and efficiency.
- Customers believe that they have a quality product.

In conclusion, it is instructive that a region of about 1 million people and a city of 180,000 inhabitants can develop a new and successful tram-train system.

Stuttgart Region (Schönbuchbahn)

Stuttgart is the state capital of Baden-Wurttemburg, with approximately 580,000 inhabitants. The city covers 207 sq km and is located in a steep river valley which has constrained the expansion of surface level infrastructure and presented a technical challenge to public transport provision, with some routes having gradients of 6%. Due to this topographic situation, surrounding cities and regions have had to absorb the ongoing growth in population in the area for many years. This also puts pressure on commuting corridors and makes many main roads extremely congested.

The Stuttgart region is a centre of the German car industry (Daimler-Chrysler, Porsche). However, in common with many parts of Germany, there is restructuring towards service industries concentrated in regional centres, which adds to travel demand pressures on key corridors leading to these centres.

The Greater Stuttgart area is one of the most economically wealthy in Germany, with average GDP per head of €46,000. Car ownership has been increasing and there have been many new roads built over the years; in the corridor of interest in this case study, for example, in 2003 there were 658 cars/1000 population compared with at 519 in 1987.

In common with other parts of Germany, there are in Stuttgart four statutory and one non-statutory levels of government: Federal, State, "Regierungsbezirk" (a district made up of counties and providing more strategic level services), the County, and the Municipality. In most places, the County is normally the public transport authority but the municipality as well as the State (Land) and Federal Governments control roads. There are however some larger Kreisfreie ("County-free) towns and cities that also control public transport as well as local roads.

Special organisational units in the Stuttgart area are the Verband Region Stuttgart (VRS) – a regional body with responsibility for the management of regional (inter-county) public transport, including the S-Bahn – and the Verkehrsverbund Stuttgart (VVS), which provides ticketing/fare integration and carries out revenue allocation for public transport across the Stuttgart region. The counties of Böblingen (80%) and Tübingen (20%) have also formed the special-purpose unit "Zweckverband Schönbuchbahn (ZVS)", to manage the Schönbuchbahn when it was re-opened.

The regional transport plan contains the stated objectives of increasing transport efficiency, improving public transport, developing a traffic management system and encouraging mobility initiatives. The more detailed district-level transport plan includes policies and schemes to:

- Further extend the public transport network.
- Continue improving service quality and ease of use.
- Provide rail links to leisure facilities to shift the growing volume of leisure travel to public transport.
- Introduce new mobility concepts, such as car sharing and car pooling.

The HiTrans case study concerns a local rail service, the Schönbuchbahn. Taken over by local municipalities, this former freight-only line now has a highly successful passenger service that links into local bus services and to the Stuttgart S-Bahn. It is a good example of a low cost, local initiative that has had significant beneficial transport impacts.

The railway from Böblingen to Dettenhausen was closed for passenger service in 1966. In 1988 Deutsche Bundesbahn (today Deutsche Bahn AG) planned its complete closure and demolition, but the local communities showed an interest in taking over the infrastructure. After initial studies in 1989 the counties of Böblingen and Tübingen decided in 1993 to re-activate the railway and established a purpose community "Zweckverband Schönbuchbahn (ZVS)", in which Böblingen county has 80% of the shares, and Tübingen county 20%. Infrastructure was bought from DB for a symbolic 1 DM.

Demand estimates for the newly opened railway line were around 2500 daily passengers, compared with 2000 passengers on the bus service in the corridor. After a limited tendering process Württembergische Eisenbahn GmbH (WEG) was contracted in 1994 to operate the service. Infrastructure and

rolling stock costs for the re-opening totalled 28.5 million DM (about €16.5 million). The non-electrified route is operated with Regio Shuttle DMU's.

The line runs from Dettenhausen via Holzgerlingen to Böblingen and journey time to central Stuttgart is around an hour from Dettenhausen, including interchange time. For the Schönbuchbahn, the sub-centre where the railway connects with the S-Bahn for trips into the city centre is the city of Böblingen, with 46,000 inhabitants. Other towns and villages alongside the 17km railway have 5,000 to 12,000 inhabitants, the total corridor having about 75,000 inhabitants. One of the main workplaces in the Böblingen area is the huge Daimler-Chrysler car factory, reached by a bus from the nearest station. The share of traffic within the corridor that is internal is about 70–80% – thus only 20–30% of the passengers are using the interchange to the S-Bahn to continue their trip into Stuttgart.

After the re-opening of the railway in 1996 passenger numbers grew within a very few months to 4500 per day. In 1999, a daily total of 5000 passengers was reached and, in 2001, 6,000 passengers used the line in one day. To deal with increasing demand new rolling stock has been added; this allows double or even triple traction in peak hours. This success is due to the railway's high speed compared with congested parallel road corridors, as well as its high quality.

The Schönbuchbahn operates in an integrated environment within the Verkehrsverbund Stuttgart (VVS), the Passenger Transport Authority of the Stuttgart area. This means integrated tariffs, but also direct interchanges from the Schönbuchbahn to S-Bahn services and vice-versa, and quality bus interchanges to the Schönbuchbahn.

The re-opening of the railway line was a local initiative and perhaps because of this there have been some good examples of new developments in Böblingen county being planned around the railway in order to increase ridership; that is co-ordination of land-use and transport at the local level.

The Schönbuchbahn is a typical example of a public initiative by local communities to keep or improve rural rail services. Looking at the total population in the corridor and the high car availability (and orientation) the success of this low budget solution is quite impressive.

Conclusion to corridors chapter

It can be seen that there are some commonalities and some important differences between the Hi-Trans case studies of corridors. These are compared and analysed in much more detail in Chapter 12, but include:

- The amount invested in infrastructure and new vehicles.
- That the amount invested does not appear to bear much relationship to the level of success achieved, where this success is measured in patronage growth.
- That local control appears to have been a factor in the success of some of these schemes.

12 Comparison of case studies

Previous chapters have reviewed a large number of case studies and the success that they have enjoyed in increasing public transport patronage, maintaining or increasing public transport mode share, improving perceptions of public transport, and/or working more efficiently. In this Chapter of the report, some comparisons are drawn between the case studies where possible. However, a discussion of the reasons why these case studies have achieved success is given in the final Chapter of the report.

Mode share

The table on page 79 compares mode share for the different cities and corridors reviewed. Where possible, it also presents time series data so that the trend in modal shift in each location can also be discerned. In about one third of cities, car use has reduced as a proportion of total trips. In the other cases, there have been small increases in car use. In the face of increasing trip lengths and rising demand for motorised travel, these are no mean achievements.

The German examples, and also (especially) Basel stand out because of the very high percentage of trips made by public transport and cycling, compared with the UK and French examples. As well as in Germany and Switzerland, walking remains a very important mode in the two French case studies, perhaps because of the high density of their urban centres. The fact that the UK data are for trips to work also probably overstates the importance of public transport in overall trip making. Thus success is defined in different ways in different countries

Case study background

Background data on the case studies, as presented in tables page 80–81, demonstrates that it is difficult to see any obvious connections between the demographic and regulatory situation and the success or otherwise of the public transport system in each network or corridor.

The table page 82 summarises data on fares, ridership increases and investment costs in each area. (It should be noted that use of single fares is falling sharply as a proportion of total ticket sales in most areas.) The final column in this table should be seen as giving an order of magnitude indication only of costs per unit increase in ridership, since it is notoriously difficult to gather perfectly comparable cost data.

Nonetheless, once again, it is extremely difficult to discern any patterns. There is clearly no direct link between the amount spent and the ridership increase secured; areas spending very similar amounts have achieved very different changes in ridership, and vice versa (different amounts of

Mode of travel – % of total trips

	Year	Car	Bus/tram	Train	Walk	Cycle	Other
Achterhoek	1994	48	2	2	17	30	1
(Gelderland)	2003	50	1	1	17	29	1
Angers	1989	56	12	< 1	26	5.5	
	1998	60	9	< 1	24	5.5	
Basel	1990	26	32		25	17	-
	2000	27	32		24	17	-
Brighton*	1991	57	11	10	21	2	-
	2001	54	14	10	19	3	-
Flanders	1998/99	52	6	3	23	16	-
Freiburg	1992	42	18		21	19	-
	1998	39	21		21	19	-
Grenoble	1992	54	14		27	5	-
	2002	53	14		30	3	-

spending achieve similar changes in ridership). Nor does it obviously appear to be the case that areas with low levels of ridership per head can obtain more spectacular increases than those with more mature public transport markets.

Furthermore, there does not appear to be a relationship between the ownership of public transport, or the regulatory situation, and the degree of ridership increase achieved. York and Brighton achieved considerable percentage increases at quite low cost, but similar achievements have been seen in Jönköping, Saarbrücken and Achterhoek. The corridor studies show that relatively little investment in corridors with poor existing public transport can lead to enormous increases in patronage – so it is possible to conclude that a low existing base level of usage in a single corridor is an easier "nut to crack" than improvements to a network and may sometimes may be a better, more motivating starting point, than trying to improve an entire network all at once.

It is also possible to conclude from two of the three UK examples and from Angers that investing in buses and on-road bus priority is vastly cheaper than spending on rail based public transport. However, it should be noted that these three towns/cities have far lower percentages of trips made by public transport than their German counterparts – indicating that it may be necessary to invest in rail-based systems if mode share for public transport is to get close to the 20% barrier. It may of course be that a 20% mode share for public transport is seen in some areas as an unattainable target; unfortunately it was not possible to obtain information about measurable local transport targets and so no conclusions can be drawn on the extent to which local targets reflect local circumstances.

This Chapter has presented some basic comparisons of the case studies in this research. The final Chapter of the report now goes on to explain some of the reasons for success in the different case study networks and corridors, and to discuss the extent to which such success factors might be transferable.

Case study background key facts – networks

	Population and trend*	Car ownership	Mode share for PT	PT use (total patronage) – trend	Levels of government	Rail regulator	Urban/ regional PT regulator	Integration of land use and transport planning
Achterhoek	350,000	1.9ph	Down	Up	4	State	Province	At Provincial level only
Angers	222,300	Not known	Down	Up	4	State	National Government	At policy level
Basel	600,000 down	0.541 pp	Static	Up	2	State	Canton	Yes
Brighton	249,000	0.87 ph	Up	Up	2	State	None	Some
Flanders	6,000,000	0.530 pp	Down	Up	4	State	Province	Little
Freiburg	615,000	0.500 pp	Up	Up	4	State	County	Yes
Grenoble	400,000	1.26 ph	Up	Up	4	State	National Government	At policy level
Jönköping	118,000	0.5 ph	Up (city centre)	Up	3	State	County	Yes
Nottingham	625,000	0.55 ph	Slightly up (city centre/ tram corridor)	Up	2/3	State	None	Some
York	181,094	0.73 ph	Up	Up	2	State	None	Yes, within City

*trend is upwards unless shown otherwise.

ph = cars per household, pp = cars per person (population)

Case study background key facts – corridors

	Population and trend*	Car ownership	Mode share for PT	PT use (total patronage) – trend	Levels of government	Rail regulator	Urban/ regional PT regulator	Integration of land use and transport planning
Amsterdam	500,000	1 ph (region)	Down	Up	4	State	Provincial	Some
Chemnitz	120,000 (in corridor) down	0.509 pp (region)	Down	Down (outside corridor)	4	State	County	Some
Düsseldorf	280,000 (in corridor)	0.561 pp (corridor)	Up (in corridor)	Up	4	State	County	Some
Saarbrücken	250,000 down	0.594 pp (region)	Up (in corridor)	Up	3	State	County	Some
Stuttgart	87,000 (in corridor)	0.658 pp (corridor)	Up (in corridor)	Up	4	State	County	Yes, on corridor

*trend is upwards unless shown otherwise.

ph = cars per household, pp = cars per person (population)

Key aspects of case study PT services

	Single fare (10 km trip)	Monthly integrated fare (10 km radius area)	Public transport frequencies (per hour)	Approx % of operating costs covered by fares	Operator – private or state owned
Networks					
Achterhoek	1.4€	15.25€ – low	2–4	40%	Public
Angers	1.0€	31€	2–6	40%	Mixed
Basel	2.9€	40€	8	68–112%	Public
Brighton	1.9€	65€	8–12 (core routes)	100%	Private
Freiburg	2€	40€	8	70%	Public
Flanders (Gent)	1€	25€	8–10 (tram)	25%	Public
Grenoble	1.2€	38€	15	50%	Mixed
Jönköping	2.5€	49.7€	2-3	70–100%	Private
Nottingham	1.6€	51€	4-8	100%	Private
York	3€	60€	4–6 (core routes)	100%	Private
Corridors					
Amsterdam	3.0€	53€	6–8	50%	Public
Chemnitz (corridor)	1.6€	38€	4	70%	Private
Düsseldorf (corridor)	1.85€	47€	3	60%	Private
Saarbrücken	2.4€	49€	8 (tram)	85%	Public
Stuttgart	2.10€	56.5€	3	70%	Private

Annual growth in patronage (simple average)	Number of years over which growth measured	Annual ridership after improvements (m)	Annual trips per capita (city/area or corridor)	Capital cost of improvements (€m)	Cost per % point growth in total patronage (€m)
7.8%	4	13	37	67.40	2.16
3.25%	4	25.3	114	50	3.85
4.5%	12	154	257	not known	not known
4.5%	10	35.27	142	45	1.00
7.5%	12	66	107	not known	not known
13%	5	362.2	60	not known	not known
2%	10	60	150	470	23.50
2.5%	6	11.5	97	18	1.20
0.6%	3	73	117	330	183.33
10%	3	10.5	58	75	2.50
7%	3	not known	not known	275	13.10
10%	1	1.5	13	40	4.00
550%	6	5.4	19	72	0.02
10.40%	6	14	56	90	1.44
40%	5	2.08	24	16.50	0.08

13 Reasons for success

This chapter considers the reasons why the individual cities, regions and corridors studied have achieved some measure of success. This is obviously key to being able to generalise from the results of HiTrans Strand 5. The chapter attempts to address issues such as:

- Are success factors entirely site-specific, or are there commonalities between case studies?
- What role did any market research with users or non-users play in the specification of the measures then implemented in the different case studies?
- Did the case studies actually design and implement measures that address what "citizens" require – as explored in the Strand 5 Stage 1 work, and also in the questionnaire research in Stage 2?
- Do the same factors have the same (magnitude of) effect in all places?
- How important is a combination of smaller measures compared with one or two single but major measures (by plotting number of measures implemented against patronage growth per year)?
- Is there a direct relationship between money spent and effectiveness of measures?
- Is there a limit to the success of bus-based systems?
- Are all the different measures examined in the case studies available to all countries in the North Sea Area and other parts of Europe?

The question of what constitutes success is an important one. Mode shift to public transport is one form of success, but to the passenger, this is important only insofar as it feeds through into improved services. On the other hand, using the degree to which citizens' needs are met as the only measure of success is also unreasonable – many public transport systems have also to take into account cost-effectiveness, for example, and this may run contrary to meeting the citizens' needs in some cases. On the other hand, if efficiency gains are achieved, they can be used to improve services for existing and new users – thus helping to satisfy citizen's needs for high quality public transport. Thus it could be argued, for example, that Chemnitz achieved success in that the same number of passengers are now carried in the Pilot Tram corridor more efficiently by tram than by the previous bus services. Some mode shift has also been achieved but efficiency savings might be seen as the key achievement.

Discussion

To begin this process of analysis, the chapter first looks at the reasons for patronage growth in different areas, as summarised the tables. The tables give a useful summary of the measures that have been put in place in each area. There is a small number of examples – Basel and Freiburg in particular – which can be argued to have undertaken almost the whole range of measures but over a long period of time, rather than (as in many of the other examples) introduced one or two major changes in a relatively short period of time and seen a major increase in patronage as a result.

The changes/improvements to local public transport that are considered here are those that were introduced as part of the case study, not the already-existing environment into which the improvement is implemented. Nonetheless, it has to be recognised that certain changes (e.g. introduction of a light rail scheme) will lead to others (e.g. some traffic restraint); and the environment into which a scheme is introduced (e.g. level of environmental consciousness in the local population) will have some impact on its success.

The chapter now deals with some of the questions posed in the introduction. It is worth noting that judging the "success" of case studies poses some problems given the nature of the data supplied. In particular, patronage increases have been measured over many different periods and this raises the issue of whether or not increases over relatively short periods will be sustainable in the longer term. It is also important to remember that patronage growth will be easier to obtain when starting from a lower base (this may help to explain the much higher rates of growth in Brighton and York (immature bus markets) compared with Nottingham (a mature market), in spite of the application of similar measures). These

Measures put in place in each area

	Case studies utilising each measure	Count
Pull measures		
Network simplification	Jönköping, Angers, Grenoble, York, Nottingham, Brighton, Achterhoek	7
Fares simplification	Brighton, York, Nottingham, Flanders	4
New on-road infrastructure for buses	Brighton, Angers, Grenoble, Basel, Nottingham, York, Amsterdam Region	7
New tram lines (on and off-road)	Chemnitz, Grenoble, Nottingham, Basel, Freiburg, Saarbrücken, Gent	6
New railway lines	Stuttgart, Chemnitz, Dusseldorf	3
New rail vehicles	Achterhoek, Stuttgart, Düsseldorf, Chemnitz, Freiburg	4
New buses	Brighton, Nottingham, Achterhoek, Amsterdam, York, Grenoble, Angers, Jönköping	8
New light rail vehicles	Nottingham, Basel, Freiburg, Saarbrücken, Grenoble, Chemnitz	6
New integrated ticketing	Basel, Freiburg, Jönköping, Nottingham, York	5
New/revised bus services	Brighton, Nottingham, York, Amsterdam, Basel, Freiburg, Grenoble, Angers, Jönköping, Achterhoek, Gent	10
New interchanges	Acterhoek, Nottingham, York, Basel, all German cases, all French cases	13
New Busway	Amsterdam	1
Discounted/concessionary fares or season tickets	Brighton, Basel, Freiburg, Flanders	4
New publicity/advertising	Brighton, York, Flanders, Freiburg, Basel, Nottingham	6
Targeted marketing e.g. at employers, personalised assistance	Brighton, Dutch examples, Nottingham, York	5
Real time information	Jönköping, Grenoble, Brighton, Basel and Freiburg	5
Community/local authority control of rail line	Stuttgart, Düsseldorf	2
Park and ride	Nottingham, York Freiburg, all other German examples	6
Push measues		
Increases in city centre parking charges as deliberate policy to encourage PT use	Brighton, Nottingham, Basel, Freiburg, York	5
Traffic restraint e.g. 30 kph zones	Freiburg, Basel, York, Grenoble, Saarbrücken, Gent	3

caveats should be borne in mind when considering the following section of this Chapter and, in particular, when using patronage growth rates as a proxy for "success".

Are success factors entirely site-specific, or are there commonalities between case studies?

Clearly there are commonalities between the case studies. These include:

- Speeding up services, either through the introduction of a new mode (tram or railway line) or introducing bus priority or, in one case, a busway.
- Network simplification, particularly in large bus networks, which boosts (perceived) reliability by increasing frequency, and also, therefore, reduces journey times by reducing waiting times. Simple networks are also easier to publicise and understand.
- Improvement in the quality of infrastructure (e.g. new stops, refurbished stations) and new vehicles – rail, tram and bus as appropriate.
- Tariff integration.
- Improvements in interchange opportunities, and quality of interchange infrastructure.
- Parking restraint and/or supportive land-use planning have proven important in certain case studies.
- In the UK case studies, and in Sweden, co-operation between local authority and public transport operator has also proven important, as these are separate bodies or companies that do not always co-operate with each other very well. In a number of the German examples, delegation of authority over local rail services to a more local level of government has played a role in the success of a new or re-opened railway line.

It also goes without saying that, since all the case studies required some level of investment, the ability to secure this funding was critical to their success – though the actual mechanics of so doing were not examined in each case study.

What role did any market research with users or non-users play in the specification of the measures then implemented in the different case studies?

It appears that in the majority of cases market research was quite limited. Operators and local authorities have instead followed what they believe to be "sensible" courses of action based on known best practice to improve the speed, reliability and frequency of local public transport. In the German examples of rail line re-openings, this "sensible" approach was doubly pragmatic in that they could only go ahead because disused or little used railway lines happened to be available in certain corridors and were therefore candidates for relatively low-cost improvements.

That said, where investment in new infrastructure was carried out, this was preceded by modelling and appraisal exercises in order to predict likely demand. This was the case for the Zuidtangent busway, the Nottingham tram and the German railway lines. The degree of modelling work carried out prior to investment in trams in Freiburg, Grenoble and Basel is not known. However, such research is normally not of the form of market research – asking people what they want – but, rather, consists of subjecting various options for investment to a modelling process based on the generalised cost of trips.

Market research has been carried out after investments have been made, to monitor attitudes of users to their public transport system.

Did the case studies actually design and implement measures that address what "citizens" require – as explored in the Strand 5 Stage 1 work, and also in the questionnaire research in Stage 2?

It is clear that reliability, frequency and price have to a greater or lesser extent been addressed in most of the case studies. Thus, even if market research was not carried out in each case, operators and local authorities seem to have some understanding of what citizens want and act to satisfy this.

Summary of service aspects deemed important from Motif research and HiTrans Stage 1 research

Relative importance	NL	France	Germany	Portugal	Spain	UK	HiTrans Stage 1
1st	Price	Travelling speed	Price	Safety	Safety	Information	Reliability
2nd	Security	Regularity	Connections	Punctual, reliable	Security	Reliability	Frequency
3rd	Punctual, reliable	Punctual, reliable	Punctual, reliable	Frequency	Punctual, reliable	Frequency	Price

Do the same factors have the same (magnitude of) effect in all places?

The answer to this question is a qualified no. The case studies show that similar types of investment or improvement have had more or less spectacular results in different areas: the results from the Chemnitz rural rail service have been less impressive than for some of the other rail line re-openings, for example. Similar measures in Nottingham have not had as spectacular proportionate effect on bus ridership as those in York and Brighton. Freiburg continues to demonstrate growth in public transport ridership and mode shift away from car whilst Basel, which has pursued similar policies, does not. Clearly, there are site specific factors – local nuances of land-use, economics and demographics – that influence the level of change that will be achieved with a given measure.

How important is a combination of smaller measures compared with one or two single but major measures

It would be simplistic to say that any single case study featured only one measure – in the case of rail re-openings, for example, these were accompanied by interchange and bus service integration, and took place in an already-integrated environment – a very important consideration. However, those case studies that concerned a network as opposed to a corridor tended to include a wider range of measures. Conversely, it was the corridor case studies that tended to demonstrate higher rates of patronage growth. However, it would be wrong to conclude from this that there is a negative relationship between the number of measures implemented and the patronage growth achieved; rather, it is more probable that it is relatively easier to achieve patronage growth in a single concentrated corridor that was previously rather poorly served, rather than across a network as a whole.

Factors judged by interviewees to be most effective in case study success

Amsterdam region	Angers	Achterhoek Region	Basel	Brighton	Chemnitz	Düsseldorf	Flanders
High frequency • High quality image (new infrastructure and vehicles) • Higher speed (due to new alignment) • New high quality bus services	Bus priority measures • Interchange • Network simplification • New vehicles • Tariff integration	Higher speeds (rail) • Improved interchange • New vehicles (rail and bus) • Tariff integration (between modes)	Consistent political support • High frequency • Improved access to city centre by tram • Low fares (monthly season ticket) • Some parking restraint and 30 kph zones • Supportive land-use • Tariff integration (between modes, across region)	Fare simplification (Flat fare system) • High frequency • Network simplification • Parking restraint (on-street parking charges) • Real time information • Targeted marketing	High frequency • Higher speeds (faster than car) • Improved access to city centre • Reliability	Community ownership of railway line • High quality of service • Journey time • Limited and expensive parking in city centre	High quality image • Low fares • New tram line • Service expansion (routes and frequency)

Top three service aspects suggested from local research as important for users

Amsterdam region	Angers	Achterhoek Region	Basel	Brighton	Chemnitz	Düsseldorf	Flanders
1 Reliability 2 Frequency 3 Connections	1 Speed in service 2 Reliability 3 Accessibility	1 Frequency 2 Reliability 3 Price	1 Price 2 Travelling speed 3 Cleanliness	1 Reliability 2 Frequency 3 Cleanliness & security	1 Travelling speed 2 Level of service 3 Reliability	1 Travel speed 2 Overall quality of service	1 Punctuality 2 Reliability 3 Ease of interchange

As part of HiTrans Strand 5 Stage 1, three key factors required by citizens from their public transport were identified. These were, in descending order of importance, reliability, frequency and then price. The different case studies were asked to compare this with their own experience. The results are shown in the table above. Whilst the order changes somewhat, there are few case studies that indicate factors other than reliability, frequency and price as the key elements of providing a high quality of service. Cleanliness and travel speed, are the

Freiburg	Grenoble	Jönköping	Nottingham	Saarbrücken	Stuttgart	York
Consistent political support • High frequency • Higher speeds • Land-use planning supportive of transport • Low fares (monthly season ticket) • Parking restraint and 30 kph zones • Service expansion (routes and frequency)	Bus priority measures • Higher speeds than previous bus • Network simplification and integration of bus and tram • New tram lines Some parking restraint • Tariff integration (between modes)	Council/ operator co-operation • Higher speeds than previously • Location of major new land-uses in city centre • Network simplification • New vehicles Real time information	Bus priority measures • Council/ operator co-operation • Improved access to city centre by bus and tram • Local authority ownership of city's bus operator • Low fares • Network simplification • New tram • New vehicles	Consistent political support • Customer focussed service • High quality stations • Higher speeds than previously • Improved efficiency of service • Improved operational efficiency compared to national rail operator • Land-use planning supportive of transport	Community ownership of railway line • Cost of parking in city centre • High quality infrastructure • Higher speeds than previously • Interchange New high quality vehicles	Active promotion of travel plans • Bus priority measures • Car parking restraint in city centre • Council/ operator co-operation • Fare simplification • Network simplification • New vehicles P & R facility growth

Freiburg	Grenoble	Jönköping	Nottingham	Saarbrücken	Stuttgart	York
1 Frequency and reliability 2 Price 3 Information	1 Travelling speed 2 Frequency 3 Accessibility	1 Frequency 2 Reliability 3 Price	1 Frequency 2 Reliability 3 Price	1 Punctuality, reliability 2 Comfort and Information 3 Accessibility	1 Frequency 2 Reliability 3 Connections	1 Frequency 2 Reliability 3 Price

most commonly cited "other" factors.

Note:

Amsterdam and Achterhoek based on expert estimates, not local market research.

York based on market research with users and non-users of public transport

Is there a limit to what can be achieved with entirely bus-based systems

It appears that there is indeed a limit to what can be attained with bus-based systems. Saarbrücken is a case where increased patronage and mode share to bus was achieved, but this growth effectively reached its limit and thus it was necessary to move to some form of rail based transport on the most densely-used corridor. The German and Swiss network examples, and indeed the cities of Düsseldorf and Stuttgart within which two corridor cases are based, show markedly higher mode shares for public transport than do two of the bus-based cases from the UK. Angers too appears to have effectively reached its limits for growth by the use of buses alone. These differences cannot be attributed to differences in culture alone.

There are examples from elsewhere in the world – such as Curitiba in Brasil – where bus based public transport has achieved a very high modal share, but this is because buses have been provided with segregated rights of way and purpose built stops that give them rail-like characteristics. Curitiba has grown with its bus based system but in existing European cities it may be politically impossible to retrofit that level of priority for buses into an existing streetscape, but acceptable if the priority is afforded to a rail-based system.

Is there a direct relationship between money spent and effectiveness of measures?

The work has not been able to gather data to demonstrate that there is a relationship between money spent and effectiveness. However, it does appear that rail-based schemes achieve higher mode shares for public transport (as long as they can guarantee quicker journey times than car) and, since rail based schemes in general cost more than bus schemes, this would imply the need to spend more to achieve a higher mode share for public transport. This is not always the case – the Grenoble tram scheme was expensive but did not lead to a mode share for public transport much higher than in many British cities – but most of the case study results suggest that it is to a greater or lesser extent a reasonable supposition.

Are all the different measures examined in the case studies available to all countries in the North Sea Area and other parts of Europe?

With the exception of Nottingham, the UK case studies are based around relatively modest investment in infrastructure and new buses. This is a product of the regulatory and funding environment in this country. In other case studies, there has been rather greater investment in infrastructure and services – due in part to the greater level of transport funding available there! This is particularly the case for the French case studies, which have the benefit of the versement transport. The control of local rail services that has been ceded, in certain German states, to regional PTAs, has proven important to the success of these case studies. In contrast, the extremely problematic state of the UK rail industry practically rules out such initiatives to UK local and regional authorities at the present time.

Thus, the specifics of national transport organisation and funding do without doubt play a role in what localities are and are not able to achieve in the implementation of high quality public transport. However, this does not mean that the case studies do not provide valuable lessons for small and medium-sized cities in other countries.

	Stage 2
13	Reasons for success

14 Conclusions

The aims and objectives of this second Strand 5 report were to find out how medium-sized cities have delivered high quality public transport, and from this to draw conclusions as to what they think this shows about what "citizens want from a high quality PT system".

It is clear that the case study cities have delivered high quality public transport that has at least to some extent met the needs of citizens, as demonstrated by the rates of patronage growth in all cases, some of which have been spectacular. In general, the attributes of the public transport system that have been addressed are journey time, reliability, frequency, quality/comfort and price, with some emphasis also on security and interchange. Journey time has been addressed in one or two ways: route simplification and/or the provision of rail based modes (or in one case bus rapid transit) where there were none before.

It appears that, from this small sample, rail-based systems (i.e. heavy rail or light rapid transit (trams), or a mixture) deliver higher mode shares for public transport and greater growth rates in patronage over the periods measured in this research. The average annual growth rate in patronage on the rail-based networks was 5.3% compared with 4.5% on the bus-based networks (corridors excluded); and patronage growth was measured for a greater number of years on the latter than the former.

To achieve best practice in delivering public transport systems that meet citizens' needs, therefore, it appears that medium sized cities should do the following to increase usage amongst both existing users and current non-users of their public transport systems:

- Speed up their core services, preferably by converting them to some form of segregated rail-based mode, or otherwise by simplifying the routes and introducing bus priority.
- Simplify routes more generally: focus on high frequency on core corridors.
- Start with corridors, because these are easier to grow than networks as a whole.
- Both the above measures will improve reliability, which is also key.
- Cut fares through the provision of integrated season tickets.
- Integrate services across modes.
- Provide high quality modern, clean, safe vehicles, stations and stops.

Reduced parking availability/increased parking prices, traffic calming, traffic congestion on key road corridors paralleled by rail-based services and a land-use planning framework that works to assist public transport will all lead to greater patronage increases and modal shift although they may not necessarily be defined as what the citizen would want from their public transport system.

In final conclusion, the case studies presented in this report are most valuable because they demonstrate that high quality public transport can be delivered in medium sized cities at a cost that is not prohibitive, and that these improvements, once delivered, can produce results.

HiTrans Best practice guide 5
Public transport – Citizens' requirements

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HiTrans

HiTrans is an EU sponsored Interreg IIIB (North Sea Region) project seeking to improve public transport in medium sized cities with 100,000–500,000 inhabitants. The full official project title is *Development of principles and strategies for introducing High Quality Public Transport in medium sized cities and regions*. "High Quality" refers to modes that are perceived as offering higher quality than ordinary bus-solutions. However HiTrans also recognises the important role buses will have to play in any medium sized city.

HiTrans is a partnership between

- Rogaland County Council, Norway (lead partner),
- Edinburgh City Council, Scotland,
- Helsingborg City Council, Sweden,
- Jernbaneverket (The Norwegian National Rail Administration),
- NEXUS (PTE of Tyne and Wear), England,
- NSB (Norwegian National Rail Operator),
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- Stavanger and Sandnes City Councils, Norway,
- Sunderland City Council, England,
- Aarhus County Council, Denmark.

For more information on HiTrans, visit www.hitrans.org

HiTrans best practice guides

As part of its activities, the HiTrans partnership has produced five best practice guides:

1 Public transport & land use planning
2 Public transport – Planning the networks
3 Public transport & urban design
4 Public transport – Mode options and technical solutions
5 Public transport – Citizens' requirements.

5

Best practice guide 5

Public transport – Citizens' requirements

This report investigates what the citizens of medium sized cities require from the public transport system. The report is split into two parts. Part 1 is a desktop study analysing the findings of previous research into the requirements of both users and non-users of public transport. Part 2 presents case studies of medium sized cities and regions that are perceived as being successful in providing high quality public transport. The study identifies the qualities that have made a difference, as for example fare structure, speed, reliability and frequency.

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