ANNEX 1

Verifying and strengthening rural access to transport services

VIRGIL

DELIVERABLE 5
Final report
Including report on further research needs

Final edition
Version 4.0 –November 2000

Verifying and strengthening rural access to transport services

VIRGIL

Contract Number PL97-5006

DELIVERABLE 5
Final report
Including report on further research needs

Final edition
Version 4.0. –November 2000
Availability R

Project co-ordinator: *Langzaam Verkeer, Belgium*

Authors:
R. Jeuring, AVM, The Netherlands
G. Lightfoot, Bealtaine, Ireland
A. Majano, ETT SA, Spain
R. Sanfeliu, Cognivision Research, Spain
C. Vazuras, FORTH, Greece
J. Vanseveren, Langzaam Verkeer, Belgium
A. Veralli, SOTECNI SpA, Italy
J. Taylor, TAS Partnership, UK
PG. Anderson, TRIVECTOR Ab, Sweden
A. Merilainen, E. Kangas, SK Consulting, Finland

Main and final editing: *J. Vanseveren, Langzaam Verkeer, Belgium*

Leuven, October 2000

TABLE OF CONTENTS

EXECUTIVE SUMMARY **4**

GENERAL STATUS OF RURAL TRANSPORT IN EUROPE 4
IN DEPTH ANALYSIS AND SECTORAL ANALYSIS 4
CONSULTATION ROUND WITH KEY STAKEHOLDERS 5
FURTHER RESEARCH NEEDS 6

1. GENERAL OVERVIEW OF THE VIRGIL PROJECT **9**

1.1. GENERAL PROJECT DESCRIPTION 9
1.2. PHASES OF THE VIRGIL-PROJECT 9
1.3. THE PARTNERSHIP 10

2. INTRODUCTION TO RURAL TRANSPORT **13**

2.1. WHAT ARE RURAL AREAS? 13
2.2. PROBLEMS OF RURAL AREAS 15
2.3. PROBLEMS OF RURAL TRANSPORT 15

3. RURAL TRANSPORT: OVERVIEW OF THE FINDINGS **16**

3.1. BEST PRACTICES OF RURAL TRANSPORT: SUMMARY OF THE FINDINGS 16
3.2. IN DEPTH ANALYSIS: COMPARISON OF KEY ASPECTS OF RURAL TRANSPORT SYSTEMS 22
3.3. USER NEEDS IN RURAL TRANSPORT 30
3.4. STATE OF THE ART OF TELEMATICS (ICT) (COMPLETELY REVIEWED SECTION) 34

4. ACTION RESEARCH AND DEMONSTRATION PROJECT IDEAS **43**

4.1. RESEARCH NEEDS IN THE COUNTRIES OF THE EU 43
4.2. NEEDS OF TELEMATICS IN RURAL AREAS 49
4.3. PROPOSED RESEARCH TOPICS 53

5. CONCLUSIONS **53**

5.1. STATE OF THE ART 61
5.2. RECOMMENDATIONS AND FURTHER RESEARCH NEEDS 62

REFERENCES **63**

LIST OF VIRGIL DELIVERABLES 63
BIBLIOGRAPHY 63

ANNEXES **72**

ANNEX 1: CONTENT OF THE QUESTIONNAIRE SURVEY **73**

ANNEX 2: CONTENT OF THE STRUCTURED INTERVIEW INSTRUMENT **77**

ANNEX 3: GOOD PRACTICES HANDBOOK **80**

EXECUTIVE SUMMARY

General status of rural transport in Europe

The first section of the present report presents a general overview of the status of rural transport in the partner countries from the VIRGIL project. This includes jurisdiction on rural transport, policy and main service provisions.

Country	Jurisdiction	Policy	Service provision	
			Emphasis/mechanism	Future direction
Belgium	Regional	Regional accessibility	Reducing congestion with traditional rural bus	Feeder service Flexible Belbus
Finland	Provincial/ municipal	Regional and community Development	Increase mobility with flexible vehicle types	Information delivery Resource/cost sharing
Greece	State/ Prefecture	Economic development and European integration issue	Accessibility to rural setting local ad-hoc means	None specified
Ireland	State	Undefined	Regular bus services	None specified
Italy	State	Undefined	Regular bus services	Favours cost reduction
Netherlands	Regional (formerly Central	Intermodality and Chain mobility	Demand-responsive Technology-driven	Concessions to private operators
Spain	Autonomous Community	Undefined	Regular bus	None specified but moves to on-call
Sweden	Municipal/ County	Undefined but emphasises Rural integration	County transport companies co-ordinated with State rail	Market competition by subsidiary companies
United Kingdom	Central/ Local authority	No national statement Rural on accessibility	Franchised rail/bus services	Private transport

Table 1. Rural transport policy in the VIRGIL partner countries

In depth analysis and sectoral analysis

Consequently an in depth analysis of the best selected cases was carried out as well as a sectoral analysis. The identified potential cases were analysed in more detail with regard to their operational and financial viability, inputs and outputs required and the legal basis for their operation..

According to the main conclusions of the in-depth and sectoral analyses, the use of telematics in the demand responsive rural transport services is still at a preliminary phase, especially with regard to map and route applications and the use of other software. On the other hand, the use of mobile phones is very common. The need of telematics is largely dependent on the need for flexibility of the transport service. Regular public transport with a fixed itinerary and timetable is less dependent on telematics. Transport services, such as the demand-responsive systems, use telematics because of its need to be flexible towards routing, timetable and stops. Clearly, telematics provide possibilities for combining trips, integrating different user groups and providing cost savings in automated generation of management information, payments and reservations.

There are plenty of possibilities that have not been used in combining the passenger and freight transport services. Before a freight/passenger transport combination can be fully developed, conditions should be established which make such a system attractive to private and/or public operators. First, the legal framework should be developed by showing the advantages to both sectors. The most profound impact of a change in legislation would be the liberalisation of the entire operating conditions for freight and passenger transport. Secondly, an efficient matching system between the needs of

freight and people movements should be developed. Through the demand responsive systems, even more infrequent combinations of passenger and freight transports could be developed. The integration of freight and passenger transport is especially important in longer travelling distances where the benefit to co-ordinate the two different kinds of services can effectively balance the costs to manage the integrated transport.

The strategies dealing with the integration of multipurpose transport services between administrative sectors (i.e. transport services for different target groups simultaneously) are poorly developed at the European level. Consolidating the legal or administrative responsibility for transport services under a single body would be a usefull first step in countries where this integration has not been implemented yet. . School transport has the greatest potential for the development of multi purpose services: it is not technologically demanding and at the same time it is widely provided all over Europe. However these measures would require more advanced operation control and reservation centres, able to handle various types of travel requests.I.e. both stop to stop trips, door to door trips, chartered tours etc. have to be booked in one single system, whereas currently different reservation and routing systems or manual booking are applied by the operators.

Consultation round with key stakeholders

This consultation round moved the work of the VIRGIL Project from the past into the future. Key stakeholders were surveyed and interviewed to identify their needs, and this resulted in the development of future action research proposals.

The key findings are given below:

1. Policies, strategies and programmes

There are common aspects amongst the policies, strategies and programmes currently in place and under consideration. The key ones with regard to rural development are the importance of maintaining the level of the rural population and to ensure that viable economic and social activities remain located within rural communities. This is reflected in the equality policies in Finland, the 'basic mobility' policy in Belgium and the 'rural proofing' policy in Ireland.

The consultation with key stakeholders has drawn out the transport policies, strategies and programmes at local, regional and national levels in the VIRGIL partners' countries. There is a wide variety amongst the countries concerned, ranging from the comprehensive approach in The Netherlands with minimum levels of service for different sizes of population to the interurban networks operated mainly by public companies in Greece and Ireland where there are few very local rural transport services. In both Sweden and Finland, a key trend in the provision of rural transport has been the integration at local level of transport services for different groups in the population (school children, social welfare clients, the general public) and the use of telematics to assist in the scheduling and co-ordination of local services. Such services give a major role for taxis, which also feature strongly in rural services in Spain.

Another major trend relates to the way in which public transport is organised and financed. This is reflected in the delegation of responsibilities for planning and purchasing of public transport from the national level to the regional and local levels. This is particularly noticeable in Sweden, Finland, The Netherlands, Italy and Belgium, although this situation has existed in Britain for over twenty years in one way or

another. This contrasts starkly with the situation in Ireland where the main public transport operator is still owned by the State at national level and the State at national level is responsible for licensing and financial support. The decentralised approach has also caused the regional and local authorities to consider the potential for a more co-ordinated approach to the planning, purchasing and delivery of a range of passenger transport services. This approach has also enabled local communities to become more involved in the delivery of local transport services. Examples of this are very evident in Britain with specific regulations for the operation of Community Buses and the development of local transport partnerships and also in The Netherlands, where Buurtbuses driven by volunteers are integrated into the public transport networks and timetables.

The decentralised approach has also involved services being secured under contract following a tendering process, either on a network basis, as in Belgium, The Netherlands, Sweden, Finland and Italy or on a route/service basis for non-commercial services, as in Britain.

2. Future transport research needs

A key aspect of the need for future research will be to concentrate on determining demand, including latent demand, identifying the wide range of people and trip purposes and designing appropriate levels of service and types of service.

The future research related to these issues will have to include:

- the ways in which very local services can be integrated more effectively at local level and how they complement and interchange with longer distance (inter-urban) services
- the licensing environment for demand responsive services and the ways in which taxis can be incorporated into demand responsive service operations
- the institutional, legal and administrative barriers and implications associated with multi-functional cross-agency services
- the role of telematics, especially the thresholds at which different levels of sophistication are required (building upon the experience gained in the SAMPLUS project for example); this applies to the scheduling and management aspects for the operators and the information and booking aspects for the users
- designing more user friendly facilities, from bus stops through to local interchanges, as well as vehicle and service accessibility

Particular attention will have to be paid to the more sparsely populated areas, as they are likely to lose out in the new environment of liberalisation of transport operations and decentralisation of responsibility for planning and purchasing transport services.

Further research needs

In the “research needs” section the output from the previous sections was used to identify future research topics concerning rural access to services and rural transport.

Four different topics for further research needs on rural transport have been identified:

1 Innovative combinations of public transport services in rural areas
2 Legal, institutional and operational framework requirements in rural public transport
3 Rural community impacts of rural public transport services

4 Application of telematics (Information and Communication Technologies, ICT) in rural public transport systems

1. Innovative combinations of public transport services in rural areas

In rural areas the combination of low population and geographical isolation means that conventional approaches to passenger transport, based on people travelling together, gradually lose their viability. Throughout Europe there are various public transport concepts in rural areas, trying to challenge and solve the specific rural problems of obtaining value for money and a better staff and vehicle capacity utilisation. It is though likely that not all combinations between different services, user groups and travel purposes will have been identified and therefore analysed. In general, all the innovative systems, which enable or promote living in rural areas, where services (schools, hospitals, entertainment places, etc) are very sparse, are of exceptional importance. The positive impact of integrated, multipurpose transport services between administrative sectors at the public transport service level, the vehicle capacity utilisation and the transport costs contributes to a major interest in a further development of this task. Linked to the total integration of different services are the institutional, operational and legal requirements, which can be a barrier to integration. In addition, the viability of rural areas is dependent on access to service. New ways of using the combination of passengers and goods are of great interest for rural areas to obtain and strengthen their survival. As tourism has become a major occupation of inhabitants of several rural areas, the combination of goods (equipment such as bicycles and luggage) and passenger transportation is as well of great importance in this sector. Furthermore, there is a recent development of a reverse population movement from urban to rural areas, which also demands new solutions to providing services. Linked to these issues is how to make use of the rapidly developing opportunities of telematics applications, e.g. to manage the goods distribution as well as providing information about the transport service for tourists.

2. Legal, institutional and operational framework requirements in rural public transport

Rural transport is still a regulated service in all EU states; the degree of regulation varies from countries with extensive deregulation policies (like the UK) to countries with monopolistic situations (like Spain). This regulation severely limits the ability of interested parties to develop flexible solutions to the problems they face. In order to undertake any policy formulation effort it is necessary to have precise knowledge of the regulatory framework in force in countries, which have already implemented deregulation policies. Furthermore, the co-operation between administrative sectors is essential when implementing e.g. publicly funded multipurpose transport services, which will provide cost savings. These types of integration strategies are poorly developed in Europe. There is a need to investigate the most suitable structure for legal requirements and administrative responsibility to facilitate co-operation and integration. In many countries throughout Europe there is a need to combine freight and passenger transport. The main issues in preventing the integration of freight and passenger transport are the legislative barriers. Usually, the existing laws do not allow for the combination of freight and passenger transport in a systematic way. These combined services might be considered to compete directly with conventional transport licenses, mostly bus lines and taxis or freight agents.

3. Rural community impacts of rural public transport services

The interaction between transport services and socio-economic development in rural communities is somewhat ambiguous. On the one hand, improvements in transport services will lead to increased mobility, which have a positive impact on the social and economic development of a particular region by encouraging the relocation of people and additional small enterprises. On the other hand, socio-economic programmes influence the need for transport. Improving rural transport services is seen as a development and wealth redistribution policy. This situation highlights the need for detailed knowledge of the complex nature of the interaction and methodologies to assess existing and future transport service systems. Decision-makers in public transport planning increasingly require not only the information, mentioned above, about *how* to develop and supply an ideal public transport solution in rural areas, but also the possibility to investigate and identify *which requirements and needs* a modern rural public transport service have to fulfil to keep customers and attract new ones. This can only be defined if different groups of rural dwellers can be identified and the respective requests and obstacles measured and assessed.

4. Application of telematics in rural public transport systems

There is significant evidence from previous research that few of the rural services throughout Europe make extensive use of telematics. Even in countries where applications of telematics in public transport and in general are more common, the transportation measures in rural areas are often "low-tech". An explanation for this fact is that many times small communities are involved, where residents know each other. These users, often elderly, prefer to talk to the operator booking the service and have a more personal relationship with the driver. The growing popularity of schemes involving volunteers confirms the increased need for social interaction. On the other hand there is a recent development of a reverse population movement from urban to rural areas. These are professionals who take advantage of the explosion in mobile communications and the Internet. Many of them are "tele-workers", who work from rural home offices or "tele-cottages" part- or full-time. These new rural residents are not only familiar with information technology but are early adopters and are potential rural public transport users that will give new life and viability to existing services. Another area where telematics can be introduced is when integrating passengers and goods. For big delivery companies serving the rural customer is very costly, since it usually involves sending a truck from a regional centre for a single delivery. Furthermore, transport operators in rural areas have the comparative advantage of being familiar with a wide area. Moreover operators of on-demand systems often know where their customers live and are able to deliver a vehicle to their place of residence or very close to it, within a specified time frame. These characteristics are similar to the requirements of a door-to-door delivery service. Considering this information, the possibility of combining passenger and goods transport on rural services with the administrative help from telematics applications should be researched. Additionally the service should extend to offer delivery or pickup of goods to the door. New generations of shoppers, who order online, require that delivery times are kept relatively short. As long as the biggest volume of Internet shopping involves items such as books and CDs that are small and not sensitive to external conditions, e.g. temperature changes, Passenger service operators can easily undertake the rural leg of a delivery. In countries, where use of telematics is not that widespread, the social and educational characteristics of the rural population make the adoption of new technologies difficult. Therefore, every measure that relies on introduction of new technologies in rural areas should include a provision for training of the users. In transportation of passengers as well as goods, this also includes operators.

1. GENERAL OVERVIEW OF THE VIRGIL PROJECT

1.1. General project description

VIRGIL is a European research project on rural transport systems, which is carried out under the European Fourth framework program in 1999-2000. VIRGIL stands for: Verifying and strengthening rural access to transport services.

The objectives of the VIRGIL project are:

- inventory and assessment of existing practices on rural transport. Special emphasis is put on the use of telematic tools to ease the access to transport, and on integration of passenger and freight transport.
- Identification of further research needs in collaboration with the key stakeholders and rural citizens.

1.2. Phases of the VIRGIL-project

The specific components of VIRGIL are:

* identification of existing and past practices on rural access to transport.
  A database has been constructed containing existing practices but also past experiences.

* in depth analysis of a number of cases.
  The best examples identified in the previous phase have been assessed as to their cost effectiveness and operational effectiveness. In addition a number of sectoral issues has been analysed as well, such as the role in development of telematics, the socio-economic development and the development of combined passenger and freight transport.

* a broad consultation round with key stakeholders.
  To define future research VIRGIL organised a broad consultation round with key stakeholders such as rural development agencies, rural commissions, transport operators and other service providers. Therefore VIRGIL has organised a survey in rural areas across Europe.

* identification and validation of a number of research needs for the future
  Based on the previous activities (database of existing experiences, in depth analysis, consultation round with key stakeholders) a number of future research needs has been identified in a draft document. This draft document has been validated during an international seminar.

* dissemination of the results through: a VIRGIL brochure; a best practises handbook targeted at rural communities; a website; an international seminar; a round table conference in each partner country.

1.3. The partnership

The partners of the VIRGIL project are:

Consortium leader

Langzaam Verkeer
Jan Vanseveren
Minckelersstraat 43A 3000 Leuven BELGIUM
Phone +32 16 23 94 65
Fax +32 16 29 02 10
e-mail: jan.vanseveren@langzaamverkeer.be

Other partners

AVM:
Rob Jeuring / Joost Schafrat
Rhynspoorplein 28 NL-1018 TX Amsterdam THE NEDERLANDS
Phone:+ 31 20 6389756
Fax:+ 31 20 6389836
e-mail: avm@euronet.nl

COGNIVISION RESEARCH
Alberto Sanfeliu
Valencia 93 PRAC.1a 8029 Barcelona SPAIN
Phone:+34 93 3236365
Fax:+34 93 4512282
e-mail: cognivision@teleline.es

ETT
Pedro Puig-Pey Claveria
Explanada 8 - 1° A 28040 Madrid SPAIN
Phone +34 91 534 08 57
Fax +34 91 533 56 05
e-mail: ett@mad.servicom.es

FORTH
Poulicos Prastacos / Christos Vazuras
P.O.Box 1527 GR-71110 Iraklion GREECE
Phone +30 81 39 17 68
Fax +30 81 39 17 61
e-mail: poulicos@iacm.forth.gr baz@ath.forthnet.gr

SK:
Antti Merilainen
Kaikatu 3 00530 Helsinki FINLAND
Phone:+358 9 7742 3222
Fax:+358 9 7742 3211
e-mail: ame@skolmio.fi / antti.merilainen@skolmio.fi

SOTECNI:
Alessandro Veralli
Via Salaria 1317 00138 Roma ITALY
Phone:+39 6 886941
Fax:+39 6 88694300
e-mail: sotecni@rmnet.it

TAS
John Taylor
Britannic House, 1a Chapel Street PRESTON, PR1 8BU UNITED KINGDOM
Phone +44 17 72 20 49 88
Fax +44 17 72 56 20 70
e-mail: john@tas-part.co.uk

TLTC
Graham Lightfoot
Derg House Connaught Road Scariff Co. Clare IRELAND
Phone +353 61 92 11 21
Fax +353 61 92 16 93
e mail: tltc@bealtaine.ie

Trivector AB
PG Andersen
Annedalsvägen 9 227 64 Lund SWEDEN
Dir. Phone +46 46 38 65 04
Gen. Phone +46 46 38 65 00
Fax +46 46 38 65 25
e-mail: pg@trivector.se

The project has been initiated and supported by the European Commission, DG TREN (Energy & Transport). Local co-financiers have supported the project for the remaining 50%.

2. INTRODUCTION TO RURAL TRANSPORT

2.1. What are rural areas?

Dozens of definitions are being used throughout Europe. In some countries, especially in the UK and Finland, definitions and numbers quoted – among which the numbers of inhabitants – vary significantly according to the competent government body or other organisation. The VIRGIL consortium tried to deduct a number of common elements in all these definitions. The criteria identified in one or more definitions of rural areas are listed below. Where significant figures are included in these definitions, they are mentioned as well.

2.1.1. Average population density

Rural areas have a low population density

- per sq km or in a radius of 1 km
- number of inhabitants or number of addresses

Countries: Netherlands, Finland, UK, Sweden
Concrete figures

- Netherlands: less than 500 addresses in a radius of 1 km (=3.14 sq km)

2.1.2. Total population

Some countries mention a total population in a certain area as criterion to be considered as a rural area.

Countries: France, Ireland, UK, Spain
Concrete figures

- France: municipalities with less than 2000 inhabitants in continuously built up area
- Northern Ireland: less than 10.000 inhabitants
- UK (except Northern Ireland): large range of different limits: less than 3.000, 10.000 or 25.000 inhabitants (depending on the competent government body)
- Finland:
    - sparsely populated areas and and built-up areas with population less than 500 inhabitants
    - areas which includes towns and municipalities with population less than 30,000 inhabitants
- Sweden: settlements of less than 200 inhabitants

2.1.3. Definitions related to predominant functions in rural areas

Predominantly agricultural functions and/or nature

Countries: Greece, Netherlands, Italy, Spain, EU Rural Development Programme (LEADER-II, LEADER+)
Concrete figures: none

2.1.4. Definitions related to land use

Rural areas are areas in which non built up areas (agriculture (incl.forestry), woods and other uncultivated surface) are predominant as compared to built up areas.

Countries: Belgium, Finland
Concrete figures

- Belgium: rural areas have more than 80% non built up areas

2.1.5. Geographical position

Some definitions mention geographical isolation and remoteness as a criterion to be considered as rural area.

Countries: Greece, Italy, Sweden, EU Rural Development Programme (LEADER-II, LEADER+)
Concrete figures

- Sweden: a remote rural area is at least a 45 minutes drive to the nearest village with more than 3000 inhabitants, a rural area is a 5 to 45 minutes drive to the nearest village with more than 3000 inhabitants.

2.1.6. Definitions related to income

According to other definitions, the inhabitants of rural areas have predominantly a low income.

Countries: Greece, EU Rural Development Programme (LEADER-II, LEADER+)

Concrete figures: none

2.1.7. Negative definitions = everything except urban areas

According to some definitions identified, rural areas are all non urban and non suburban areas.

Countries: France, Ireland, Finland
Concrete figures: none

2.1.8. Others

Other definitions are for local use only. They can hardly be used in an international context. Among the examples, we quote the definition referring to values as used in Finland (among others): “Rural area refers to peasant values, forest skills and other similar layers of meanings.” Some countries refer to the age structure, according to which the rural population is predominantly older than elswhere. This element is not generally spread however.

2.1.9. Conclusion : definition of rural areas

Areas considered as rural areas must meet at least three of the four following criteria:
- a low density area
- with a population living in small settlements
- at a long distance from major settlements
- with territory being used mainly for agriculture, forestry, uncultivated areas

2.2. Problems of rural areas

As the structure of the rural economy, particularly agriculture, fishing and extractive industries, has changed over the years, many rural areas have suffered relative deprivation. Migration to the cities intensified this process, making conditions worse for the people who remained in place.

Inherent in the nature of rurality is a relatively low density of population and geographical isolation. This can make the provision of effective services difficult. In some cases, services, including transport services, may be absent altogether. Telematics can play a role in delivering remote services, but it can only partly replace in respect of passengers, the human requirements to meet face to face and to attend at work, recreation and other social facilities and, in respect of freight, the need for goods to be delivered to and from the local area to enable independent life to continue and the local economy to function.

The more general services such as shopping, administrations, recreation, etc. are leaving the rural areas, the more rural transport becomes important in order to get rural dwellers to the nearest village or town to benefit from those services.

2.3. Problems of rural transport

The combination of low population density and geographical isolation means that conventional approaches to passenger transport, which are based on significant numbers of passengers travelling together, slowly lose their viability. The average passenger trip takes up more miles and more time than in an urban area, whilst the vehicle and staff utilisation rates are lower. This means that individual trip costs are higher and without a well-developed social subsidy system in respect of fares, some or all of this will get passed on to passengers. In turn, this induces a spiral of decline as people either reduce the amount of travel which they do, or change to other modes – principally the private car – thus reducing the economic basis of the transport arrangements even further.

On the freight side, this manifests itself in increased prices for goods and services in rural areas (for example, petrol prices) unless there is a pricing regime which has standard rates across a whole state or country (for example, postal prices). The net effect is well documented. Rural businesses which have a significant goods transport component, and particularly where the commodity is fairly basic, have difficulty competing because of their additional overheads. Individuals end up paying more for a significant proportion of their household purchases. One noticeable effect has been the loss of door to door produce and goods sales services and their replacement with on the one hand, people travelling long distances in private cars to make purchases at urban superstores and, on the other, by the growth in catalogue sales.

3. RURAL TRANSPORT: OVERVIEW OF THE FINDINGS

3.1. Best practices of rural transport: summary of the findings

This section gives a short general overview of the rural transport situation throughout Europe. It is a summary of the findings, which are accessible in an extended database. The database can be consulted on VIRGIL's website: www.bealtaine.ie/virgil.

3.1.1. Methodological remarks

The information was gathered through a review of the *literature* on the subject and a *survey* of relevant transport systems. Specifically, information on rural transport services was collected from Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Spain, Sweden and the United Kingdom.

The research emphasised, in particular, the use of *telematics* and transport system *integration* as the preferred tools to be applied in the design of future rural transport services.

The work undertaken followed three main stages:
1. Defining the structure of the database
2. Collecting and collating past and present experiences in rural transport
3. Constructing the database

The database structure was defined through the development of standard guidelines and refined during the building stage.

The data on rural transport practices comes mostly from the northern and western Europe. Nonetheless, this spread reflects accurately the state of rural access to transport across the European Union. Specifically, most of the information is concentrated in Holland,Germany, Belgium, Finland and in the United Kingdom. Overall, a total of 134 books and articles (of which 106 were reviewed) and 109 case studies were collected.

3.1.2. General overview of jurisdiction, policy and service provisions

The following table synthesises the situation across Europe with respect to rural transportation services.

Country	Jurisdiction	Policy	Service provision	
			Emphasis/mechanism	Future direction
Belgium	Regional	Regional accessibility	Reducing congestion with traditional rural bus	Feeder service Flexible Belbus
Finland	Provincial/ municipal	Regional and community development	Increase mobility with flexible vehicle types	Information delivery Resource/cost sharing
Greece	State/ Prefecture	Economic development and European integration issue	Accessibility to rural setting local ad-hoc means	None specified
Ireland	State	Undefined	Regular bus services	None specified
Italy	State	Undefined	Regular bus services	Favours cost reduction
Netherlands	Regional (formerly Central	Intermodality and chain mobility	Demand-responsive Technology-driven	Concessions to private operators

Spain	Autonomous Community	Undefined	Regular bus	None specified but moves to on-call
Sweden	Municipal/ County	Undefined but emphasises rural integration	County transport companies co-ordinated with State rail	Market competition by subsidiary companies
United Kingdom	Central/ Local authority	No national statement rural on accessibility	Franchised rail/bus services	Private transport

Table 2. Rural transport policy in VIRGIL partner countries

It is worthy to note the wide range of situations, conditions and limitations reported by the different researchers. One of the most important facts that became evident through the research was that none of the countries researched has *specific design/delivery standards* for rural transport systems, except for a minimum required coverage in some cases.

3.1.3. Overview per country

Belgium

In Belgium rural transport initiatives originate from the public sector nearly exclusively. Only one significant case has been initiated by a private initiative. The public rural transport policy is targeted at two aims: improving public transport supply for rural citizens and decreasing operation costs, as compared to traditional bus lines. The implementation of this policy consists of making gradually a distinction between attractive main bus lines and local loops, the latter often in typical rural forms.

These rural systems are being developed along two main types of measures: demand responsiveness and organisational measures. In the field of demand responsiveness the most widespread system is the demand responsive bus system. Taxi based systems are not in operation yet but are planned in the Wallonia region. In the field of organisational measures, the cost of the bus drivers is the main concern. Through drivers provided by other sources than the transport operator, considerable savings can be made or appear to be made.

Presently, there are no considerations as to integrate goods and passenger transport or to develop integration across agencies. Because of the relative population density of rural areas in Belgium, there is no urgent need for this type of measures.

For the future transport operators expect to develop the demand responsive transport mainly, organisational measures are less likely to be on top of the agenda. Hardly any research has been conducted however to compare different systems or types of measures from a point of view of cost effectiveness or improvements of accessibility, despite the fact that these are the main motivations to implement changes. Additional research on comparison of systems, is strongly recommended.

Finland

In Finland rural transport initiatives are mostly originated by the public sector but some private involvement is also included. The rural public transport services in Finland seem to be undergoing a change developing new service concepts seeking cost savings without decreasing the standard of service level. Also, in some cases the reason for development is to improve services and bring new areas into the range of public transport. Sometimes, new measures substitute or supplement regular rural line services.

The most popular mode for new kinds of rural transport services are regular service lines. They usually have more or less fixed routes and timetables and minor flexibilities are usually possible. However, there are some measures totally on-demand services. In on-demand services, timetables and routes are directed according to dial-a-ride. Services are based on contracts with the municipality and the operator, which could be a bus company or a taxi. Low-floor minibuses or big taxis are very usual in these kinds of services. Services are directed by the travel dispatch centre (TDC), which is operated by a private company or a municipality or another public community (e.g. the Social Insurance Institute).

For multipurpose services, the municipality decides the daily program of the vehicles. Vehicle time is utilised to various needs of different administrations in municipalities.

The integration of goods and passengers is quite usual in many cases of service lines and multipurpose services. The integration of special services across agencies is usually arranged by multipurpose services and service lines and sometimes by on-demand services.

It is evident in the future that on-demand public transport service concepts will become more common. Also, more cooperation within the municipalities, between administrations and also between municipalities is needed for coordinating and making the transport services more efficient. Feasible development possibilities still exist in the integration of passenger and freight services.

France

In France rural transport initiatives originate from all types of organisations, both private and public. Within the public sector, all levels from municipalities to regions can be initiators.

The public rural transport policy is targeted at two aims: improving public transport supply for rural citizens and decreasing operation costs, as compared to traditional bus lines. In many rural areas, quality of the regular public transport is or was particularly poor before the rural transport initiatives were started. Large areas don't have services at all, and especially in weekends, large white spots appear on the public transport map.
Most rural transport services are demand responsive, very often accompanied with organisational measures to decrease the costs (use of volunteers, taxi based systems, etc.). The vehicles range from individual cars and taxis to minibuses.

The use of telematics varies significantly from one case to another: many systems, especially the 'neighbourhood' help type of services are often low tech systems. On the other end of the spectrum a highly technological system in which trips on virtual lines have to be booked through a voice computer can be found. Anyway, the high tech systems are not necessarily the most user friendly systems.

Presently, as far as our information goes, there are no considerations as to integrate goods and passenger transport.

For the future it is expected that demand responsive transport initiatives will continue to raise in the next decade. Multi-purpose services may be considered to provide transport alternatives for small streams in a cost-effective way.

Greece

Unfortunately, the public transportation in Greece has not followed the progress that undergoes the country lastly. The legal framework and the organisational structure of inter-city and rural transport have remained unchanged for 40 years.

Transportation, as almost any other administrative and government function is organised at the prefecture level. Each prefecture is served by one transport operator, a peculiar form of organisation, where the bus owners are drivers and shareholders at the same time, closely supervised by the local (prefecture) and central government. Level and frequency of service and fares increases are controlled. Introduction of new services (on-demand) or integration of transport modes entails changes in the legal framework, a slow and complicated process.

Rural lines are not profitable and in practice are subsidised by other operator activities, such as general tourism offices, package tours, and student excursions. Other secondary activities include daily student transportation, small packages and newspapers transport.

Rural areas are primarily agricultural, remote and mountainous, connected by an antiquated and ill-maintained road network to regional local centres, thinly populated and an average per capita income far below national and EU averages. Even though car ownership is low, private car or pickup truck is the predominant mode of transport while youth and the elderly patronise public bus transportation.

Daily student transport is funded by the State and is the most significant service offered to rural areas. Of psychological importance to rural citizens is the delivery of daily newspapers.

Contact with operators revealed that although awareness about demand responsive measures available in rural areas throughout Europe is low. Lack of information about the innovative solutions achieved with the use of telematics does not help. Many operators expressed their interest to adopt similar services since the existing lines serving rural areas are not profitable.

Furthermore policy makers and government transportation authorities need to initialise the process of modification of legislation with the view of liberating the market and allowing municipalities to offer transportation services.

In conclusion, an improvement of public services is considered as one of the most significant factors that will stop or reverse the population loss, elevate the available income, improve the quality of life and revitalize rural areas.

Ireland

The current situation in the Republic of Ireland is likely to change in a number of ways over the next few years. There is recognition that new ways of delivering rural transport services need to be implemented and evaluated. There is recognition that new financial arrangements need to be put in place to enable new innovative services to be implemented and sustained. There is recognition that the regulatory framework, within which rural transport services are operated, needs to be altered. There is also recognition that all these new developments require a policy framework to ensure a consistent, coherent and comprehensive approach to rural transport issues and services.

Italy

From the institutional point of view transport policy in Italy is specially aimed at the solution of large transport schemes (for instance inter-city services or congestion of large urban areas). . The rural transport policy is only operated within the general public transport framework. So no special attention has been paid to the rural transport services.

The new Italian law for local public transport (decree of 4 August 1999) is not considering explicitly the case of rural area while it is mentioning special measures for low demand areas. Since quite always rural areas imply low demand level, special measures could be introduced in rural areas.

The new law states the maximum level of subsides is 65% of the operative costs while 35% is from other revenues. In doing that the law does not make difference between law demand areas and the rest. It could be envisaged that a public transport company operating only in a rural context can not reach the target. Thus in low demand areas and in particular in rural areas, the constraint to obtain revenues (theoretically not only from transport ticketing) of more than 65% of the operative costs addresses the services to small companies which, bearing lower structural costs, could answer more efficiently to the budget requirement and could be more flexible in respect to the demand and the drivers could participate deeply to the agency activity being directly involved.

Finally some areas of priority underlined in the study are not applicable for Italy because of legislative constraints or unsuitability of the measure for the Italian context. For instance the combined freight and passenger transport is not allowed by law: driving licences are to operate only passenger or only freight transport and the concession are for passenger public transport; the transport of goods on the buses or taxis is not allowed unless we are talking about small parcels. Thus the activity has been concentrated to on-demand services in rural environment.

Netherlands and Germany

Both in The Netherlands and Germany there is quite some experience with transport services in rural areas, including taxi-sharing, regular or for specific user groups, although the average population density is very high in both countries, rural areas exist in the northern, eastern and southern parts.

Some of the systems are widespread across the country. In The Netherlands the Traintaxi even covers about 70 percent of the populated areas. In Germany the AST is a uniform service provided almost throughout the whole country. Other taxi-sharing systems were originally meant for specific user groups, e.g. physically handicapped, but are now open for regular travellers as well.

Although the telematics provides possibilities for combining trips, integrating different user groups and cost-savings in automated generation of management information, payments and reservations is also an essential tool in the "chain mobility" concept., users prefer custom-made transport services, which is a burden on integration and therefore on the benefit-cost ratio of transport services in rural areas. It remains a challenge how to design the service in a way that it meets the different requirements of the user groups (e.g. speed, accessibility, areal reach, et cetera).

Finally, the relation between developments in transport and socioeconomical developments in rural communities is somewhat ambiguous. On the one hand,

improvements in transport services lead to increased mobility which has a possitive effect on the social and economical development of a particular region. On the other hand, socioeconomical development programmes influence the need for transport. Currently, mainly as a result of the increased emphasis on cost-efficiency, unprofitable public transport services are abolished and rural communities are becoming more isolated (especially elderly and people with reduced mobility). At the same time the post-urban development will lead to changing traffic and transport patterns characterised by diffuse transport flows between many centres, which are located nearer to the rural areas.

Spain

Spanish rural transport is challenged by big losses of traditional licenses mainly operating in this area (conventional bus and Taxi). Both regional administrations and municipalities are looking for new directions that depend on the implementation of deregulatory policies at a national and regional level. We forecast some issues:

1. Increasing the flexibility of conventional line bus services to become wide-area services which are contemplated in the Transport Act.
2. Improving on-demand transport for some specific services (health, educational, etc…)
3. Integration of passenger transport with some special services (mainly education)
4. Transforming local taxi services into sub regional services covering wider areas and supplying a door-to-door quality transport.

Sweden

The rural public transport service is important to enable people stay living in rural areas. In different regions in Sweden the principals, often with governmental subsidies, have implemented innovative solutions to make the rural PT service more attractive or to offer a service at all.

The implementations show positive results in many ways (e.g. socio-economics), which demonstrate the need of more of these solutions.

United Kingdom

A combination of the legal, regulatory and funding structures in respect of rural transport in the United Kingdom has resulted in widespread experimentation with different service designs.

Cost is the major driving factor in service development. This has influenced the development of approaches which:

- are volunteer organised or driven
- involve co-ordinated purchase, scheduling or operation
- are multi-functional
- replace buses with taxis.

In addition, whilst there is interest in telematics, cost has been a factor in deterring development in this field. In the absence of national guidelines or standards, there is relatively little concern with services specifically linked to delivering a certain level of rural accessibility. This is also reflected in the patchwork nature of much of the deep rural bus service coverage.

3.2. In depth analysis: comparison of key aspects of rural transport systems

3.2.1. Introduction and objectives

The purpose of the analysis was to study the existing and past practices on rural access to transport from various European countries. A screening system was developed for identifying a number of interesting (potential) cases both in the fields of passenger and freight traffic. Furthermore, the identified potential cases were analysed in-depth with regard to their operational and financial viability, inputs and outputs required by them and the legal base for their operation. Finally, a sectoral analysis was carried out based on the potential cases and national experiences and further research needs were introduced.

3.2.2. Methodology

The overall analysis was divided into 3 subtasks:

3.2.2.1. Development of a screening system and screening of services

The most interesting and potential cases were identified using a three step screening system. These steps include pre-screening, a simple matrix and secondary screening.

The objective of step 1 (pre-screening) was to identify the feasible cases, which have been introduced or experimented with in various countries. The criteria for selecting the feasible cases were:

- case complies with the 5 categories (presented in the simple matrix below)
- case operates in rural environment (urban cases are omitted)
- duration of case is long enough so that reliable historical data can be collected on its operation

The objective of step 2 (simple matrix) was to identify the types of activities which the 5 specified categories provide services for in various countries. The following matrix will identify various possible combinations among the wide range of transport activities identified.

Category →	Regular services	On-demand services	Integration of goods and passengers	Multi-purpose services	Special transport services
User groups					
Regular users					
School children					
Elderly people					
Disabled people					
Trip purpose					
Hospital trips					
Shopping trips					
Work/school trips					
Social trips					
Recreational trips					

Table 3. Rural transport categories and target groups

As a result of the pre-screening process (steps 1 and 2), a number of qualified cases was analysed in more detail in step 3. The objective of step 3 was to identify the potential cases which could be selected for in-depth analysis and which could be used in sectoral analysis.

The service characteristics of a particular case include e.g. the

- operational viability
- use of telematics
- possibility for integrated passenger/freight transport
- applicability
- economic (financial) viability
- geographical coverage
- social viability
- flexibility of service
- technical suitability of vehicle fleet
- training of personnel
- efficiency of reservation and data collection system
- reallocation of labour
- users' opinion
- marketing

All service characteristics cannot be considered as being equally significant. Therefore, the service characteristics were assigned weights to describe their significance to each other. All qualified cases were screened with this weighted system and as an outcome of step 3, a total "potential index" was calculated which displays the significance of each case. A threshold of the "potential index" was also defined and all cases exceeding this threshold were analysed in the in-depth analysis of services and were also used in the assessment of sectoral issues.

3.2.2.2. In-depth analysis of services (cases)

The purpose of this analysis was to examine the qualified cases from step 3 of the screening process in more detail with regard to the following tasks:

- examination of resource inputs and service delivery outputs
- identifying the legal base for the operation
- compiling of detailed information on the use of telematics
- compiling of detailed information on experiences of integrated passenger/freight transports

3.2.2.3. Assessment of sectoral issues

The purpose of this analysis was to provide an examination of relevant issues based on all identified cases as well as on national experience. The relevant issues to be analysed included:

- contribution to the use of telematics and demand-responsive systems
- contribution to the solutions for combined freight and passenger transport
- multipurpose transport services between administrative sectors
- contribution to the socio-economic development of rural areas

3.2.3. Main results and conclusions

3.2.3.1. Screening process

The screening process was extensive. The following table provides a summary of the number of cases collected from each country at different steps of the screening process.

Country	Number of cases			
	Initially collected in WP 1	Selected after steps 1 & 2 of the screening process	Selected after step 3 of the screening process	Finally selected for in-depth analysis
Netherlands	14	6	4	3
Germany	13	5	1	2
Spain	11	4	2	2
Greece	3	1	1	1
Belgium	10	6	3	3
France	6	2	1	1
Finland	12	9	3	3
Italy	5	3	3	3
United Kingdom	21	10	6	7
Ireland	2	1	1	1
Sweden	3	3	2	2
TOTAL	104	50	27	28

Table 4. Cases screened and selected per country

As a result of the secondary screening process, a total of 27 cases were selected for the in-depth analysis. The qualified cases were divided into three groups. Group 1 includes the best 20 cases according to their “potential index”. It was also decided that the best example (case) of every country involved was included in the in-depth analysis, even if it did not make the best 20 cases. Consequently, group 2 lists the best examples of cases in those countries. Finally, group 3 includes three cases, which were of special national interest and thus were included in the in-depth analysis. Two additional cases were included in this group for in-depth analysis as having special national significance. The following table shows the qualified cases for in-depth analysis by category after the secondary screening process.

The categories are:

1. regular services
2. on-demand services
3. integration of goods and passengers
4. multi purpose services
5. special transport services

Group 1: Best 20 of from screening, step 3

Rank	Case	Country	Category
1	Transport Co-ordination Service TCS/Devon	UK	1,2,3,4,5
2	Siilinjärvi service line	Finland	2,5
3	Meertaxi Haarlemmermeer	Netherlands	2,4,5
4	Nilsiä service line	Finland	2,3
5	Mobimax Achterhoek	Netherlands	5
6	Belbus Meetjesland	Belgium	2
7	65 Special service	UK	1,2
8	InterConnect 6 Service	UK	1
9	Taxiplus Oldambt [1]	Netherlands	2,4,5
10	A.D.A.P.T Brokerage Scheme	UK	4
11	Traintaxi	Netherlands	2
12	Ringbuss in Höör	Sweden	2
13	Videobus by ATC	Italy	2
14	Belbus Veume-Roesbrugge-Haringe	Belgium	2
15	Prontobus Alta Val di Nure	Italy	2
16	Terni area	Italy	2
17	Monari	Finland	1,3,4,5
18	Kuxabussar	Sweden	4,5
19	Cheshire Rural Rider	UK	4
20	Allarbus	Spain	1,4

Group 2: Best example of country (if not included in group 1)

1	Small packages service of KTEL of Magnisia	Greece	3
2	AST Dülmen	Germany	2
3	Taxitub	France	2
4	Lisdoonvarna Feeder Service Postbus	Ireland	3

Group 3: Case of special interest

1	Metro Rural Parcel Bus Service	UK	3
2	L'Alt Urgell	Spain	2
3	TaxiBus Lüdingshausen [2]	Germany	1
4	Buurtbus van Peer	Belgium	1
5	Border Courier [4]	UK	3

Table 5. Best cases found after the selection procedure

[1] Case dropped from the in depth analysis due to overlapping with other cases

[2] Case included in the in depth analysis due to special national significance

3.2.3.2. In-depth analysis

The in-depth analysis is based on the selected, potential case studies with regard to the following relevant issues.

Resource inputs and service delivery outputs

The number of vehicles varies a lot between the cases depending on the areal extent of cases. Some cases (e.g. Belbus Meetjesland in Belgium, Videobus in Italy, Nilsiä Service Line in Finland) are clearly built on one operator with one or few vehicles for serving the specified needs of transport. In these cases, all services are taken care of by the same operator and vehicles which are often committed to the service for the whole day. Sometimes, there can be supplementary services if the capacity of the ordinary operator is not sufficient.

Conversely, a number of cases (e.g. TaxiBus Lüdinghausen in Germany, Mobimax Achterhoek in the Netherlands, TaxiTub in France) is served by a certain kind of pool of operators (e.g. taxi centres). In these cases, the operator and vehicle could be selected according to the reservations and needs of transport. On the other time, the operator may serve other customers.

The capacity of the vehicles varies from conventional taxis with 4 seats (e.g. Traintaxi in the Netherlands, TaxiBus Lüdinghausen in Germany) to normal-sized buses. A conventional taxi is useful for example in feeder transport when passengers are collected to the main lines of trains or buses. However, in most cases (e.g. Lisdoonvarna Feeder Service Postbus in Scotland, Siilinjärvi Service Line in Finland) the larger taxis with 8 seats are utilised, which enable a more versatile use of vehicles. Respectively, the use mini or midi-buses with a capacity of 10 to 35 passengers is very common (e.g. Siilinjärvi Service Line in Finland, Allarbus in Spain). The benefits of this size of buses include e.g. some savings in investment and operating costs, serviceable size for operating in areas with narrow roads, more direct contact with the driver and better accessibility of the bus especially in the case of low floor vehicles etc.

In most cases the service is taken care of by “one vehicle and one driver” –principle. In a few cases (e.g. Cheshire Rural Rider in England) there is also an attendant in the vehicle for attending to children and elderly people. If the TDC is used in the case, it will naturally require more personnel.

More personnel is also required if the daily and weekly operating time is long. In studied cases, the daily operating time varies between 5 to 19 hours. In most cases, the operation is running 5 or 6 day a week. Vehicle-km/vehicle is mostly between 200 and 300 km per day.

The number of passenger trips per day varies a lot depending on the type of service. Usually the daily number of passengers per vehicle varies between 10 to 125 depending on the type of service. The exact number of passengers per vehicle is difficult to calculate due to varying number of vehicles in some cases. In most cases the development of the number of trips has been positive. Cost per trip varies between 1,7 to 11,58 Euro per trip and the cost coverage from revenues is between 0 and 65 % of costs depending on the fare policy of the case. Some of the cases (e.g. TaxiBus Lüdinghausen in Germany, Transport Co-ordination Centre/Devon in England, Kuxabussarna in Sweden, TaxiTub in France) have brought savings in municipal costs. On the other hand, the cases with increased costs have usually significantly improved

the level of supply of rural transport services (e.g. Belbus Meetjesland in Belgium, Siilinjärvi Service Line in Finland)..

Legal base and preconditions for operations

A normal licence for taxi or bus service is usually needed for rural transport services. In some cases (e.g. Belbus Meetjesland in Belgium, KTEL Combined Passenger/Freight Service in Greece) the service is provided by the region-owned transport company as a monopoly and no special license is needed. In cases where the license is needed (e.g. Lisdoonvarna Feeder Service Postbus in Scotland, Taxibus Lüdinghausen in Sweden, Siilinjärvi Service Line in Finland, Videobus in Italy, Mobimax Achterhoek in the Netherlands), the validity period varies between 1 and 10 years or the validity is depending on the contract of the service. The license is usually granted by a regional or central authority, in some cases by a municipal authority.

In most of the cases some kind of competitive bidding is in use and generally the bidding is open for any licensed operator. The length of the contract varies from one year to 5 years. The price is important for the evaluation of tenders but also the capacity, age and other standards (e.g. environmental) of the vehicles are sometimes taken into consideration. Safety regulations for the operations are the same as in normal taxi or bus services.

Use of telematics

The use of travel dispatch centres (TDCs) is quite usual in most of the selected cases (e.g. Belbus Meetjesland in Belgium, Siilinjärvi Service Line in Finland, TaxiTub in France, Videobus in Italy, Mobimax Achterhoek in the Netherlands). However, in some of the cases the reservations are made by mobile phone directly to the driver (e.g. Metro Rural Parcel Bus and Transport Co-ordination Centre/Devon, both in England). The use of computers with special software is in use in most of the cases where the TDC is utilised. Most of the TDCs are manned but in some cases the TDC is completely automatic (e.g. TaxiTub in France, Videobus in Italy). Electronic ticketing systems are also quite common. Special software is also in use or planned to be in use in some cases for the routing and positioning of the vehicles (e.g. TaxiTub in France, Videobus in Italy). In most of the cases, contact to vehicles is managed by mobile phones. Real-time information for passenger is still quite uncommon.

Experience on integrated passenger and freight transports

Experiences on integrated passenger and freight transports in studied cases are very rare even if it would be possible by the regulations. The integration is to a small degree in use only in Greece, Finland, Ireland, Spain and Sweden (e.g. KTEL Combined Passenger/Freight Service in Greece, Nilsiä Service Line in Finland, Lisdoonvarna Feeder Service Postbus in Scotland, Allarbus in Spain, Kuxabussarna in Sweden).

3.2.3.3. Sectoral analysis

The sectoral analysis is based both on national experience as well as the selected case studies with regard to the following relevant issues.

Telematics and demand-responsive systems

Generally, the use of telematics in the demand responsive rural transport services is still at a development phase, especially with regard to map and route applications and the use of other software. On the other hand, the use of mobile phones is very common. It has often been considered in smaller rural municipalities that the demand responsive services can for the most part be managed manually with the help of mobile phones. Mobile phones can also be used in an instant diversion of the route of the vehicle.

The need of telematics is largely dependent on the need for flexibility of the transport service. Regular public transport with a fixed itinerary and timetable is less dependent on telematics. Transport services such as the demand-responsive systems, use telematics because of its need to be flexible towards routing, timetable and stops. Moreover, demand-responsive services, which also integrate different user groups, benefit from the use of telematics, especially when two transport companies co-operate to provide door-to-door services beyond one service area.

Telematics has a main influence on the benefit-cost ratio is through cost savings. These savings can be gained through efficient trip combinations between different door-to-door travellers (no empty rides). Also, telematics can provide cost-savings in terms of reduced travel times and shortest route calculations using real-time information systems such as GPS. Furthermore, savings can be gained through automated generation of management information, ticket pricing, payments and reservations (both in terms of time and personnel). Benefits are gained when the use of telematics leads to an increased number of passengers.

Clearly, telematics provides possibilities for combining trips, integrating different user groups and cost-savings in automated generation of management information, payments and reservations. Also, telematics is an essential tool in the "chain mobility" concept. However, different user groups and travel motives demand different types of services and as a consequence users prefer custom-made transport services, which is a burden on integration and also on the benefit-cost ratio of transport services in rural areas.

Combined freight and passenger transport

There are plenty of possibilities that have not been used in combining the passenger and freight transport services. Before a freight/passenger transport combination can be fully developed, conditions should be established which make such a system attractive to private and/or public operators. First, an efficient matching system between the needs of freight and people movements should be developed. Through the demand responsive systems, even more infrequent combinations of passenger and freight transports could be developed. Furthermore, the coordination of freight transports between the regular bus services and the various service line concepts could be improved e.g. in picking up / delivering the goods or introducing a limited shopping delivery service.

The legal framework can then be developed by showing the advantages to both presently segregated sectors. The most profound impact of a change in legislation would be the liberalisation of the entire operating conditions for freight transport. This will also require incentives to new companies which are specialised exclusively to combined freight and passenger transport services in rural areas.

In financial terms, it would be necessary to evaluate the market size for passenger and freight and also to make revenue and expenditure projections. New entrants could find it a difficult market to break into and are likely to meet with strong resistance from existing courier firms/providers.

The integration of freight and passenger transport is especially important in longer travelling distances where the benefit to co-ordinate the two different kinds of services can effectively balance the costs to manage the integrated transport (terminals, special vehicles, goods handling costs, additional costs to manage integrated transport, etc.). An important aspect with regard to integrated transports is the fact that using “Freight bus”-type of arrangements as in Sweden and Finland the companies/customers can actively contribute to a better environment. No extra resources of transports need to be put in for the transport of goods. The journeys are carried out co-ordinated by timetable in the existing rural service.

Nevertheless, integration between goods and passenger transport could be very promising and therefore it is important to carry out further research on the opportunities and threats of integration.

Multipurpose transport services between administrative sectors

These types of integration strategies are poorly developed at European level. Some countries are ahead in this sense as with other measures. Even though very few applications can be transferred directly between countries, given the legal constraints, there are useful lessons to be learned in general:

- Consolidating the legal or administrative responsibility for transport services under a single body would facilitate integration. It seems like the municipal level of control is best suited for such a task.
- School transport has the greatest potential for the development of integrated measures: it is not technologically demanding and at the same time it is widely provided all across Europe.
- These measures normally require management centres to function properly. In this sense one can take advantage of the organisational structure already established for special services, such as health or social, to save cost and improve efficiency.

Rural transport services and socioeconomic development

The interaction between transport services and socioeconomic development in rural communities is somewhat ambiguous. On the one hand, improvements in transport services will lead to increased mobility which have a positive impact on the social and economic development of a particular region by encouraging the relocation of people and additional small enterprises.

On the other hand, socioeconomic programmes influence the need for transport. Improving rural transport services is seen as a development and wealth redistribution policy. On the development side, the policy gives traditionally isolated areas potential mobility not dependent on the private vehicle. With respect to wealth redistribution, the policy favours public transport “captives” and “poor” demand segments, such as elderly people, young people and other non-car users or owners. Thus, this emphasises the role of rural transport services as a rural development tool. However, in the rural areas with a high car ownership ratio the market share of rural transport is too low to generate significant impacts, but are rather a tool to improve local accessibility at a reasonable price.

The assessment is also influenced by the fact, as to which extent the cost-efficiency of transports can and will be measured. With regard to combined transport in particular, the comparison of costs should be done in relation to the so-called alternative modes of transport so that all costs are examined. This sets special requirements on the economic calculations of several organisations in public administration.

As most of the rural transport services already consist of subsidised transport systems, the state financing possibilities for supporting public transport services will also be limited in the future. As a result of the increased emphasis on cost-efficiency, unprofitable public transport services are ceased and rural communities are becoming more isolated, especially for their elderly and disabled residents. At the same time, post-urban development will lead to changing transport patterns. Consequently, it is difficult to forecast the future development. It cannot, however, be denied that improvements in transport services will have a significant impact on the economic and social development of rural communities.

3.3. User needs in rural transport

3.3.1. Introduction

The consultation with key stakeholders moved the work of the VIRGIL Project from the past into the future. In the earlier phases of VIRGIL, rural transport databases were developed and selected schemes were studied in depth. In this phase, key stakeholders were surveyed and interviewed to identify their needs, from which future action research proposals were developed in the final phase of the project.

3.3.2. Objectives

The main objectives of this phase were to:

- consult with key stakeholders in order to have a clear idea of their opinions on rural transport policies, strategies and needs, as a basis for proposals for future action research
- prepare a report on rural transport problems and needs, setting out the need for research, which will form the basis of the development of proposals for action research projects.

3.3.3. Description of activities

This phase of the project consisted of three specific activities:

- Identification of key stakeholders
- Surveys and interviews with key stakeholders
- Drafting a document on future transport research needs

3.3.4. Identification of key stakeholders

In order to identify the key stakeholders, it was necessary to determine the types and nature of services used and activities undertaken by rural dwellers and who is responsible for providing, managing and organising them. All partners participated in this activity. Initially this involvement included a workshop during the partner meeting in Madrid, September 1999. This workshop consisted of a brainstorm session in order

to ensure that we identified all rural services and activities and the people and organisations, which plan, manage and provide the services or activities. This resulted in determining that the range of services and activities might include the following:

- passenger transport (interurban and local);
- deliveries and courier services;
- agriculture, fishing, mining, forestry, tourism and recreation;
- general stores (food, hardware, farm supplies);
- schools and training facilities;
- light and heavy industry;
- administration;
- postal services;
- banks and other financial institutions (credit unions, building societies);
- libraries, including mobile ones;
- social, community and sports centres;
- religious worship;
- military, including bases and firing ranges;
- hospitals and medical centres;
- leisure and entertainment centres.

The key stakeholders therefore might include:

- rural development agencies
- transport operators
- national and regional government
- local authorities and public agencies
- other public service providers (e.g. hospitals, education, post, police, military)
- financial institution (e.g. bank, credit union, building society)
- farmers' organisations
- employee representative organisations
- chambers of commerce
- business associations
- tourism providers
- religious organisations
- community and voluntary initiatives, including people with special needs
- operators of leisure facilities.

3.3.5. Administration of the surveys

Sets of stakeholders were identified in each country and asked to participate in the survey, which was undertaken by postal questionnaire and structured interview. In order to ascertain fully future research needs, it was agreed that partners consult with stakeholders in two separate regions. These were selected on the basis of one with good local transport provision (5 categories and /or telematics use) and one with poor. In each region 25 stakeholders were surveyed using the postal questionnaire. These 25 were selected to ensure a representative sample from each of the above categories of stakeholder. In addition, at least 3 stakeholders with a regional overview were interviewed in each region using the structured interview survey. The consortium also selected at least one organisation or expert per partner country for an in-depth structured interview, and as such gather expert opinion on a face to face basis. It was important to bear in mind that transport in rural areas is likely to be more an aspect of rural development than of transport *per se*.

3.3.6. Conclusions

3.3.6.1. Policies, strategies and programmes

The current situation with regard to rural development and rural transport varies widely across the countries and regions represented by the partners in VIRGIL. These variety shows how complex and multi-faceted rural communities are and that there is not a common understanding of how to tackle the inter-related issues and problems associated with rural development and access to services, activities and facilities by rural dwellers. At the beginning of the VIRGIL project it became apparent that there is no point in trying to define 'rurality' in absolute terms; villages of 5,000 inhabitants in the UK or The Netherlands would be considered to be medium sized towns in the west of Ireland; the dispersed settlement patterns in the north of Scotland, Sweden and Finland are very different to the dispersed settlement patterns of central Italy.

It is possible, however, to identify common aspects amongst the policies, strategies and programmes currently in place and under consideration. The key ones with regard to rural development are the importance of maintaining the level of the rural population and to ensure that viable economic and social activities remain located within rural communities. This is reflected in the equality policies in Finland, the 'basic mobility' policy in Belgium and the 'rural proofing' policy in Ireland. The location of business parks in rural areas of The Netherlands and the "Idé Smedjan" in Sweden, which enables individuals to study courses from a wide range of educational institutions throughout Sweden without having to leave the area and which supports training for local enterprises, through the use of ICT – Information and Communication Technologies, are further examples of approaches to ensuring the viability of rural areas.

The earlier phases of VIRGIL have already indicated the wide range of transport service types in rural areas throughout Europe and the broad policy and legal frameworks within which they are operated. The consultation with key stakeholders has drawn out the transport policies, strategies and programmes at local, regional and national levels in the VIRGIL partners' countries. Again, there is a wide variety amongst the countries concerned, ranging from the comprehensive approach in The Netherlands with minimum levels of service for different sizes of population to the interurban networks operated mainly by public companies in Greece and Ireland where there are a few very local rural transport services. In both Sweden and Finland, a key trend in the provision of rural transport has been the integration at local level of transport services for different groups in the population (school children, social welfare clients, the general public) and the use of telematics to assist in the scheduling and co-ordination of local services. Such services give a major role for taxis, which also feature strongly in rural services in Spain.

Another major trend relates to the way in which public transport is organised and financed. This is reflected in the delegation of responsibilities for planning and purchasing of public transport from the national level to the regional and local levels. This is particularly noticeable in Sweden, Finland, The Netherlands, Italy and Belgium, although this situation has existed in Britain for over twenty years in one way or another. This contrasts starkly with the situation in Ireland where the main public transport operator is still owned by the State at national level and the State at national level is responsible for licensing and financial support. The decentralised approach has also caused the regional and local authorities to consider the potential for a more co-ordinated approach to the planning, purchasing and delivery of a range of passenger transport services (not just those for the general public) in rural areas, as described above. This approach has also enabled local communities to become more

involved in the delivery of local transport services. Examples of this are very evident in Britain with specific regulations for the operation of Community Buses and the development of local transport partnerships and also in The Netherlands, where Buurtbuses driven by volunteers are integrated into the public transport networks and timetables.

The decentralised approach has also involved services being secured under contract following a tendering process, either on a network basis, as in Belgium, The Netherlands, Sweden, Finland and Italy or on a route/service basis for non-commercial services, as in Britain. In the case of the latter, this process has been in force since 1986, and there are some worrying recent developments, where contracts are being re-tendered. Local authorities are finding that the cost levels being submitted by operators are much higher than in the previous contracts. So, although in the first 10-15 years following deregulation, the levels of subsidies may have been reduced or held steady, the future scenario is of ever increasing levels of subsidy to maintain the current services. This is despite the major input of financial support from Central Government specifically for new rural services over the past two years. Given that countries, which are following the policy of tendering for transport services, see this as a way of reducing the overall levels of subsidy, for example from 85-90% down to below 65% in Italy, it is important to bear in mind the British experience.

3.3.6.2. Future transport research

Some countries suggested transport research topics, which others might consider to be "too advanced" or even somewhat "esoteric". This is related in particular to the use of telematics, which in the case of Finland and Sweden is a key aspect to their communities attempting to improve co-ordination and integration of different providers in connection with a variety of trip purposes. Whereas countries such as Greece and Ireland are starting from a position where there is little very local transport of any sort in rural areas and virtually no integration or co-ordination similar to that in Sweden and Finland.

It is clear that the environment in which rural transport operates is undergoing major changes, both in the context of rural development and the policies and programmes for public transport. These changes will impact upon the levels of service in rural areas and the travel behaviour of rural dwellers, which in turn will impact upon the demand for transport and therefore the levels and types of service available to rural dwellers. So, a key aspect of the need for future research will be to concentrate on determining demand, including latent demand, identifying the wide range of people and trip purposes and designing appropriate levels of service and types of service.

The future research related to these issues will have to include:

- the ways in which very local services can be integrated more effectively at local level and how they complement and interchange with longer distance (inter-urban) services
- the licensing environment for demand responsive services and the ways in which taxis can be incorporated into demand responsive service operations
- the institutional, legal and administrative barriers and implications associated with multi-functional cross-agency services
- the role of telematics, especially the thresholds at which different levels of sophistication are required (building upon the experience gained in the SAMPLUS project for example); this applies to the scheduling and management aspects for the operators and the information and booking aspects for the users

- designing more user friendly facilities, from bus stops through to local interchanges, as well as vehicle and service accessibility

Particular attention will have to be paid to the more sparsely populated areas, as they are likely to lose out in the new environment, in particular where there is an attempt to maintain the existing services and networks for more populous areas, such as urban fringes and along the main inter-urban routes.

3.4. State of the art of telematics (ICT) (completely reviewed section)

3.4.1 General state of the art for telematics

When considering an increased usage and development of telematic applications into the rural public transport system it is important to identify the ability of the different European countries to access and absorb information and information technology. Without a mature level of technology awareness in the country, high-developed telematic applications will be of no use. The most suitable type of application can only be estimated if the general state-of-the-art for telematics in respective country is evaluated.

For the purposes of this analysis, we have considered that the term “telematics” (ICT, Information and Communication Technologies) includes all elements related to computing and telecommunications applied to the supply of or the demand for public transport.

3.4.1.1. Access to computer

Among the countries of the VIRGIL project there exist great disparities concerning access to PCs both at home and at work. The Nordic countries have reported the highest rates that in Sweden reach the 73% of the population, while in Ireland 41% of the population has access to a personal computer and in Italy the number drops to 11,6%. At the household level similar differences occur, with a high 49.5% of the Swedish, 45% of the Dutch and 42% of the Finnish households having access to a PC. In Greece only 10% of the households have access to a PC.

3.4.1.2. Access to mobile phone

Nordic countries were the pioneers in adopting mobile telephony. Today, while these countries exhibit the higher rates of ownership, the rest of Europe catches up and the gap is narrower. In fact, the rate is explosive everywhere: in the Netherlands by the end of last year usage increased from 20 to 45%, in Italy for the first time were more than 20 million devices (increase 68%) in use last March and in Ireland reached the 54%. Finland, clearly the most mobile of the European countries, with 58% of inhabitants and 76% of the households owning a mobile phone, experienced a growth of 38% in 1998.

3.4.1.3. Access to Internet

Europe was not as fast as the US and Canada in accepting the Internet as a new medium of accessing information, entertainment and commerce. Only today, European countries are experiencing the explosive growth of the Internet and a transformation of the traditional way information is transmitted and transactions are conducted. Again in the Nordic countries, the highest rates of usage are encountered. In Sweden, 49% of the population between the ages 12 and 79 uses the Internet while in Finland 22%. Internet usage is comparatively high in Ireland where 28% of the inhabitants are users

and drops to around 20% in the Netherlands and 7.9% in Italy. Finally, only 4% of the Greeks use the Internet.

3.4.2 State of the art for telematics in public transport

The following overview is a state of the art for telematics mainly in rural transport accompanied with extended references to urban transport. Since the market for rural transport is very small, all technological innovations are first implemented in the far bigger urban market. Where appropriate, the potential for transferability of telematics from urban to rural transport is examined. It is important to possess the current state of the art to be able to identify further research needs or discuss the transferability to rural transport.

3.4.2.1. Ticketing

Price structure, mechanisms of ticketing, ways of purchasing and physical representation are very different from country to country.

A national system that has uniform ticketing in all modes of public transport is still not realised anywhere in the world. In the countries participating in the VIRGIL project, differences and similarities exist on the national level. Rural transport in general follows the trends of mass public transport in a smaller scale, but there are some notable exceptions and some methods of ticketing that are not applicable outside of urban centres.

- In cities and rural areas

In each country the predominant model is that each operator utilises its own ticketing mechanism and does not accept tickets from a different operator. This model is based on the geographical area of coverage. The only country where an almost national system exists is the Netherlands where the National Tariff System covers the whole country when regular transport is used irrespectively of urban or rural location. Sadly this universality in the Netherlands breaks down in cases of demand responsive rural systems that are of main interest here. (For example "Meertaxi" or Mobimax use a different pricing and ticketing system). A national system also exists in Finland in the form of the smart card. This is the most noteworthy attempt to establish a national unified system of ticketing that covers both urban and rural areas. Today the national card system co-exists with other regional or local card systems that are in use.
A slightly different model (used in Sweden and Belgium) allows the main provider of public transport to a regional level to establish a uniform ticketing system. This is the case of each county in Sweden and the Flanders and Wallonia regions, where the same system is used in urban and rural locations. Still, the systems are not unified on a national level.
The wide fragmentation of the transport market in England that was a result of the liberalisation of the market has not allowed different and competing operators to utilise a common ticketing scheme. In most cases there are different operators in urban and rural areas.
The situation is similar in Spain, Italy and Greece where every operator has a separate ticketing mechanism for the areas served resulting in a different ticketing schemes in rural and urban settings.
In reality, only the smart card technology offers a reliable mechanism for the establishment of national ticketing systems. These efforts are under way in Finland, Sweden and the Netherlands and they are planned to cover both urban and rural areas.

The practice of discounted ticketing for certain user groups is universal irrespectively of urban or rural setting; children, adolescents, students, handicapped and the elderly pay less than the standard ticket price or travel for free (in some areas in Flanders everybody under 12 or over 65 travels for free). Discounts are also universally realised in return tickets, multiple ticket cards and monthly cards. In Finland and Sweden another type allows the loading of a certain amount money and travel until the exhaustion of funds. (Magnetic in Sweden, smart card in Finland). The wider acceptance of the smart card in Finland enabled the creation of different ticket types, such as regional tickets, off-peak tickets and student tickets.

- On buses

In rural areas on bus ticketing concerns only the case of regular bus service.
In almost all countries it is possible to buy tickets on-bus and off-bus. The only exception is Greece where it is not possible to buy a ticket on-bus in urban areas. On the other hand off-bus ticket buying is not common in the United Kingdom, with the exception of London and Birmingham.
Stationary electronic ticket machines are widely used everywhere in Europe, but are mainly targeted at urban areas.
Today the existing types of ticketing include paper, magnetic stripe on paper or on plastic, contact, contactless and dual contact/contactless smart cards.

- Smart cards

Smart cards offer tremendous possibilities in cost savings, ease of use and passenger overall comfort that we feel that deserve special mentioning. It is a technology used today almost exclusively in urban centres but will also make inroads to the less sophisticated rural areas. Smart cards are plastic cards with an embedded chip and are widely used as telephone cards, SIM cards for mobile telephones, for security identification and for vending.
Contact cards require that the card to be inserted in a special reader machine for the transaction to take place. Contactless cards have embedded a radio-transmitting chip that communicates with a receiver in the terminal. The cardholder just waves the card in front of the terminal to complete the transaction. Contactless cards are ideal for public transport applications where speed is important and can save time for the boarding passengers. The cards are reloaded with funds in special terminals or in ATM machines.

Smart cards also are gaining acceptance in public transport systems, so far mainly in urban systems.
Wit regard to rural areas today smart cards are used regularly in Finland where the national smart card is based on the contact system and in two counties in Sweden (Uppsala and Luleå). There is a number of undergoing pilot projects in the Netherlands, one in Groningen with dual contact/contactless smart cards and the other in Zeeland with contact cards that can be reloaded through an ATM machine. Also operators in the U.K. and TEC in Wallonia (Belgium) plan to introduce regional smart card AFC systems.

What makes the use of smart cards so attractive is the fact that can be used to store personalised information and other relevant data. This is exploited in multi-purpose smart cards that can be used to access services as the city card in Finland that can be used for instance as a library card and to pay health charges.
Finally there is experimentation in using smart cards to pay taxi fares in the Netherlands and in Finland (urban and rural obviously)

- In taxis (Both urban and rural)

The more common form of payment for taxi services is cash and credit card. A special charge card geared to taxis has been introduced in the UK, while 80% of taxis in Finland accept a nation-wide magnetic card. Smart cards will be accepted in taxis in Finland in the near future.

3.4.2.2. Information on the vehicle

- Route number and destination

Route number is displayed on front of the buses in almost all public transport systems and the same information is displayed on the side or the back of the bus in the majority of the systems. In rural areas this imformation is more common on regular service bus. This is common with local buses that may also serve a rural area, trams and some local trains.
Destinations are displayed also at the same positions in most urban systems and on long distance buses and trains. LED displays are commonly in use.
The county of Skåne (urban and rural areas) has a telematic information system that feeds route information to the display.

- Next stop on display and in audio

These systems are becoming widespread throughout Europe, but in urban areas nearly exclusively.

3.4.2.3. Information at stops

- Real time information at stops

The time of the next arriving bus is a very useful information for passengers waiting at bus stops. The system is currently in use partly in urban areas only. Use in rural areas has not been reported yet, although there are plans for the system to be deployed in the Dalarna County in Sweden and Essex County in the UK.

A medium very appropriate for the presentation of this information is the Internet. In fact, the same screens that are produced at the traffic control centre can be transmitted over the Internet. Usually a GIS software package is used allowing the user to perform map operations (zoom, pan etc). This information is not available for rural areas with the exception of the Cape Cod project3 in the US. On the relevant site, the location of all buses for all lines and their direction are presented inside an area the user selects together with the time that the position was registered. The main drawback of the system is that it is not possible to calculate the time of an arrival of the bus at a given stop; the speed of the vehicle can be approximated by its position on the map.

An interesting proposal is to deliver real time information to bus stops exploiting cheap mobile telephone technology and the feasibility will be examined in an experiment in a rural area of Lancashire. Another proposal coming from Belgium mentions the development of a system that will deliver similar information to mobile phones.

[3] http://geolab.moakley.bridgew.edu/scripts/esrimap.dll?name=capeavlmapper&Cmd=Map

- Timetable information at bus stops (no real time)

Printed timetables are universally present at bus stops in urban areas. This information usually concerns the line that passes from the stop and sometimes fare information (UK). In bus stations information is occasionally presented on television screens that are passive displays.
In rural areas printed timetables are mostly rare with the exception of central villages that are major interchanges. The large majority of bus stops of rural areas throughout the Netherlands and in the Flanders region (Belgium) are equipped with printed timetables.

- Loudspeakers at bus stops

Loudspeakers at bus stops announcing the arrival of the bus are almost completely absent with the exception of some stops close to train stations in the Netherlands. Noteworthy is an experiment in the UK with "talking bus stops" to assist the visually impaired.
More common is the use of loudspeakers in bus terminals.

- Help for disabled at bus stops (connection to dispatch or information centre)

At the present time help for the disabled at bus stops is available only in Sweden in the form of measures that improve the accessibility: higher platforms, special flagstones to guide blind passengers, pictograms for simplified information. This system is present in rural villages, but hardly outside the villages. Low floor buses are also widely in use everywhere and in Sweden there are buses equipped with external speakers announcing the arrival of the bus.
Requests for help to the dispatch centre from stops are not possible anywhere with the exception of a limited number of urban locations in the UK. The driver provides help to embarking and disembarking disabled passengers in Finland, unless an aide is available on board in some special service lines. This is the case in both rural and urban areas.

- Other forms of information dissemination

Operators have established telephone centres that can be reached for timetable information and in Spain, the Netherlands and Germany also provide help to plan a complete optimal itinerary. Most of these centres use human operators although automated ones are gradually introduced. The number of cases is limited however and – even if used in rural areas – the system is not designed for the rural market as such. The quoted countries cover all types of public transport, including rural transport. In the Netherlands, specific rural transport schemes, such as collective taxis, demand responsive buses and multipurpose services are fully integrated in this information system. Operators provide assistance to make the necessary bookings for the demand responsive and multi purpose services.
A recent development is that information about schedules, routes, frequencies of service and static maps are available over the Internet. An increasing number of operators establish a WWW presence through a site in every country. Some of these allow queries that help the passenger to assemble an itinerary. Examples are the Railtrack site that provides information for all train operators in the UK and the site of the National Express coach operator that also allows booking and purchasing of tickets on-line. Internet terminals are available for passengers at 3 stops in Liege in Belgium. There is a plan to install enquiry terminals in village post offices in rural Lancashire.

Security concerns about on-line purchasing of tickets are voiced by the Government of the Netherlands, where an otherwise forward looking policy about traffic information provision has been promulgated. Government commitment for national traffic information availability through telephone enquiry has been also expressed in the UK.

Also, WAP experiments have been introduced (e.g. in the city of Oulu in Finland) for delivering timetable information, although this is not real-time information, yet.

At present time these services concern mostly long distance inter-city travel, but these methods of supplying information can be used for rural transport as well assuming that their cost will drop.

3.4.2.4. Traffic control

- On line/ real time

Traffic control centres monitor the movement and the position of the vehicles in the system in real time. These are used by public operators – mostly in urban centres – that need a constant flow of information for the operation of the system without delays. The Traffic Control Centre is in position and has the authority to modify the movement of the vehicles in a case of an accident or other failure, dynamically adapt the capacity of the network by adding or subtracting vehicles and generally has the operational responsibility for the transport system. In rural areas similar systems are not met with the exception of one county in Sweden that plans the deployment of a real traffic control system in every rural and urban area served.
About 50 % of the taxis in both urban and rural areas in Finland are co-ordinated by computerised dispatch system and the positioning of taxis are done manually by the drivers. However, an automated positioning and information delivery system has been already adopted in the Lahti region in Finland.
A number of on-demand services examined in the VIRGIL project keep track of vehicles in real time. Some of the on-demand services track the vehicles used in real time, as is the case with "Belbus" in Belgium. Also most on-demand services in the Netherlands use some method of real time control.

Generally a fully integrated system of traffic control has the following components:
On the vehicle side: A system that calculates the geographical co-ordinates of the vehicle in real time, sensors that collect other data about conditions on the vehicle (ranging from engine temperature to ticketing data, odometer readings, and door operation), a computer that collects all data and prints reports or messages from the centre or is connected with a display device and a communication device that transmits and accepts information to the Traffic control Centre. Additional there can be voice communication between the driver and the centre either over radio or with a mobile phone.

On the Traffic Control Centre side there is also a communication device that is capable to broadcast information to all vehicles or engage in synchronous transfer of data with more than one vehicle (multi-channel). Computer systems that plot the position of the vehicles on an electronic map, process the data accepted and aid the decision making process by scheduling vehicles or assigning vehicles to routes in real time. Also these systems keep and produce statistical information about the operation of the system.

Also noteworthy are a series of measures that implement selective vehicle priority. These measures are exclusively used in urban transport and in the majority of cases are bus priority or trolley bus/tram priority measures.

- Number of vehicles in the system

The number of the vehicles in a traffic control system varies widely in practice

- Type of vehicles in the system

In urban areas the vehicles are buses, trolley buses, trams and light rail. In rural areas where real time traffic control is exclusively used in conjunction with on-demand transport systems, the vehicles are minibuses and taxis.

- Positioning system

GPS is the system of choice for the determining the position of vehicles in real time. The system requires direct line contact with at least 3 of the 24 US military satellites in orbit and in public transport differential correction from ground station is employed for better precision.
Tachometer readings are usually combined with the GPS for higher accuracy. Dead reckoning systems are rare today.

Use of the Carin system has also been reported in the Netherlands for one on-demand rural service. It uses signals from 18 satellites and inputs from the vehicle odometer and a gyroscope. Digital maps on a CD-ROM are available and an on-board computer is used for navigational purposes (calculates shortest path, alternative routes). Instructions are displayed on a screen or generated with a computerised voice synthesiser.

Many interurban public transport operators simply use the positioning capabilities of GPS to keep track of their fleet without combining it with control functions (this is primarily the case in Spain and Greece). GPS is also used in Belgium for all vehicles of the De Lijn service (urban, suburban, rural and demand responsive services).

3.4.2.5. Traffic planning

- Timetable planning

Use of software tools to plan the timetables for regular public transport services is common for urban operators in all countries. At rural level, only in Sweden and Belgium use of these tools was reported. In Belgium the services of De Lijn (urban, suburban and rural services) uses the “Hastus” software and a similar system is also in use in the Wallonia region.
On-demand services require software that generates individual passenger pick-up times almost on real time. (Most require that all reservations to be made at least 1 hour beforehand). In most of these cases the route planning software automatically calculates and arrival times at the places where the request originated. The notion of timetable does not apply to these on-demand services (e.g., "Meertaxi" in the Netherlands)
Some services, as the AST in Germany, operate on a semi-fixed timetable; there are scheduled times but the vehicle runs only when there is actual demand.

- Route planning

Route planning in urban and inter-city operators traditionally assumes that demand is constant for a given time horizon. With the use of GIS and other planning tools cost

effective routes are produced that also take into account socio-economic characteristics of the areas served, the topology of the street network and local traffic conditions. Route planning in an urban area is art and science at the same time and is a long and complicated process.
In rural areas routes are usually prepared manually unless they are offered on demand. On-demand services require routes to be calculated on almost real time; this is the primary function of the Traffic Dispatch Centres. Systems where only one vehicle serves an area or the geography is restrictive (Italy) route planning can be prepared manually.
When the vehicle is equipped with an on-board navigation system (Carin and Prometheus for Mobimax and Meertaxi respectively in the Netherlands), each driver produces the optimal route with the aid of the system immediately as a request is received.

- Use of vehicle

Part of the transport service planning function is the decision to assign a vehicle to a route taking into account the demand level and the capacity of the vehicle.. Large urban systems operating a mixture of buses, trams and light rail are constantly phased with deciding what mode to use to serve a particular area with fluctuating demand.

In rural areas the decision what vehicle to use is rarely a complex problem given the availability of only one or types of vehicles and the low levels of demand. The same applies for most of the on-demand systems examined in VIRGIL. Only in Finland some TDCs plan to introduce computer-aided selection of the use of vehicle dispatched.

3.4.2.6. Reservation of service

- Pre-booking of demand responsive services

The following paragraph examines the use of technology only in rural on-demand services collected by VIRGIL although there are similar services in urban areas. In a sense, every taxi trip requires pre-booking.

As the name implies, the passenger requests the use of a vehicle for a specific time by phone. These requests are made either directly to the operator of the service or to a Traffic Dispatch Centre that relays the information by phone or fax to the operator.
Calling the operator of the service is the more common method for pre-booking a trip. In fact, where a taxi service is involved this is always the case (Spain, France, the Netherlands, Germany and Finland). Also the operator is called in cases such as the Belbus in Belgium and 2 Italian cases (Prontobus and Telebus).
Reservations to a regional TDC that forwards the information to the operator have been reported in Sweden (Ringbus) and Finland (Siilinjärvi and Nilsiä service lines).
At the other end of the phone connection the prospective user of a demand-driven service will almost always find a human operator. Automated telephone reservation systems (telephone responder) are used only in the French Taxitub systems and is considered not user-friendly, since the user has to type a personal code that is renewed yearly. The other notable exception is the Videobus system in Italy; reservations are made through a home terminal that the operator provides. At the time the system was introduced, it was considered technologically advanced. Today, Internet makes possible connections at insignificant cost and with an open protocol; characteristics absent in the Videobus reservation system.
The booking system is still manual in a variety of cases, usually those providing services to small rural communities. Where the service is more extensive, special software is used mostly developed from software houses. The "Ring" software, used in

the Belbus service, was developed in-house by the operator and is built as an application in Access, a very common and easy to use desktop database product. Other systems in Italy and the Netherlands are based on Oracle databases.
The complexity and the ease of use, maintenance and upgradeability of the booking software are an important issue for the majority of rural operators with limited resources.

- Pre-booking of seats

This most often doesn't apply to rural areas, apart from the booking of demand responsive services cited above.

- Booking of connecting modes

Presently the possibility to book connecting modes is available to some degree only in Finland and in the UK.
In some cases in Finland, reserving a taxi as a connection to the bus service is possible. Moreover, travelling on combination bus/ferry, bus/train and bus/plane routes is possible on a single ticket on some routes.
This service is useful for long distance trips originating in rural areas and not for the majority of the trips that usually are been made within the limits of the small or moderate service areas common in the cases examined in the VIRGIL project.

4. ACTION RESEARCH AND DEMONSTRATION PROJECT IDEAS

4.1. Research needs in the countries of the EU

One of the objectives in the VIRGIL project was to congregate the output from the research needs from existing and past practices on rural access to transport and from topics identified by key stakeholders. The following information describes the output, which formed and assisted when developing the final output of the VIRGIL project: **the research ideas**. One part of the research needs was concentrating on identifying new ways of implementing telematics into the rural public transport field.

4.1.1. Future research needs from existing and past practices on rural access to transport

The major development and future research needs in the EU area based on the in-depth analysis of selected cases and the national overviews of sectoral issues include the following topics and related arguments:

4.1.1.1. Computerised systems, telematics, demand-responsiveness

This includes the improvement of booking, ticketing, on-vehicle communications, statistics as well as route planning systems. Through these improvements, better and more flexible services can be provided, costs will be reduced, user groups could be integrated more efficiently as well as more efficient information production can be guaranteed. The applicability of various demand responsive systems to different contexts (e.g. requirements of the systems with regard to the size of the area, population, other public transport services etc.) should be analysed. Moreover, the possible integration of demand responsive systems with organisational savings: i.e. demand responsive systems operated by volunteers should also be examined.

4.1.1.2. Vehicle stock

It should be ensured that the vehicles used are well suited to the service provided and the special needs of different user groups must be addressed.

4.1.1.3. Studies on the level of service

The following should be examined:

- the required level of service in different areas
- the interrelations between changes in the level of service and travel behaviour
- changes in the level of service
- changes in public financing.

Special attention should be paid to trip chains. Finally, the ultimate aim for the level of rural transport services should be defined.

4.1.1.4. Impact studies of development projects

These should include how the different development projects have influenced the travel behaviour of people and what is the behaviour and attitudes of the non-users of public transport services, especially the needs of elderly people and disabled people. Furthermore, the interrelations between the level of service in public transport and socioeconomic development should be further evaluated.

4.1.1.5. Integration of freight and passenger transports

This includes the promotion of combined freight and passenger transport which provide benefits in capacity planning, product design as well as in positive environmental impacts. Also, the ordering of goods or shopping deliveries could be done through the Internet and transported with the help of the Travel Dispatch Centre using the dial-a-ride systems and combining the deliveries with other transport.

4.1.1.6. Applicability

This includes an analysis of the possibilities to apply innovative and feasible service line concepts to different contexts, e.g. to other European countries or to other areas within one country.

4.1.1.7. Coordination of multi-purpose transport services

This coordination will promote the cooperation between administrative sectors and improve inter-municipal cooperation in providing transport services. This will also provide for cost savings and reallocation of labour force.

4.1.1.8. Cost structure

A further analysis of the differences in cost structure between regular and demand responsive transport is requested, as well as the differences between a taxi based and a bus based system. There should also be a harmonised way of presenting the cost structure.

4.1.2. Future research needs identified by key stakeholders

This section summarises the topics identified by key stakeholders for future transport research. They have been categorised under the following headings:

- policies, strategies and programmes
- specific issues of social exclusion
- regular scheduled transport services
- demand-responsive transport services
- the potential for combining passenger and goods in the same service
- the potential for operations serving multiple functions (e.g. general public/ health/education)
- the potential for cross-agency procurement or operation of services
- the potential for the deployment of telematics

4.1.2.1. Policies, strategies and programmes

There have been a number of proposals for future transport research, which are concerned with the identification of the market and its size, clarifying the nature of that market and determining demand. There is a need to clarify and test the demand for

very local transport services and to define the appropriate levels of such transport services. Research is needed, which is concerned with identifying the users and the non-users, what information they need and how and when this information should be provided. This last issue was highlighted by the situation in The Netherlands, where in the past, there were only two types of public transport: bus and train. Everyone knew how it worked and what it cost. Recently, an increasing number of small-scale transport services have appeared. They all have different names, image, tariffs, rules and telephone numbers. Therefore communication between (potential) user and service-provider becomes of vital importance. Techniques and tactics on how to communicate with users, through which medium and when are therefore essential for operators in this new situation.

Research needs to include impact studies on how different development projects have influenced the travel behaviour of people. Studies are needed on the level of service looking at:

- goals and studies of the level of service in different areas and municipalities
- correlation and impacts between the changes in the level of service and travel behaviour
- correlation and impacts between the changes in the level of service and the changes in public financing
- interrelations between the level of service in public transport and socio-economic development

In order to make sense of new developments in rural areas, research is needed, which systematically records all social, economical, land use and population changes in rural areas and which can forecast future growth in order to design a transportation policy that counters urbanisation. It would therefore be important to design a monitoring system to examine the needs and wants of different public transport users (and potential users) and how they change over time. A generic public transport travel pass could be a promising cost-efficient and cost-effective tool to identify individual preferences and transport patterns.

Another area for future research involves the design of a national legal, administrative and operational framework for rural transport using key findings of the VIRGIL project. One example of this might include a plan for a legal and administrative environment that will allow rural municipalities to own and operate local transportation systems that will cover a variety of local needs. In terms of a specific operational matter concerning taxis, it is interesting to note that licence restrictions can limit the capacity of some transport services. Research is therefore required on extending taxi license areas to cover several municipalities to improve supply conditions, increase the demand and make possible more technological investment in information, operation control, and system safety.

A number of topics have been proposed, which relate to the organisational and financing framework for rural transport. These include the following:

Co-ordination of existing transport resources in the community. This would involve exploring the potential of establishing a co-ordinating agency; the potential for inter-municipal co-operation in providing transport services and for communities to establish their own transport services in rural areas.

Clarification of the landscape that will emerge from liberalisation of passenger transport services and devising a mechanism that will guarantee that rural areas maintain a level of service, similar to the assessment procedure developed in Northern Ireland. In addition to assessment procedures, it is also important to research how a change of

attitude towards public transport amongst rural inhabitants, often highly motorised, can be made. This can be assisted by professionally managed information, e.g. service centres using mobility management techniques. Links with EPOMM – The European Platform on Mobility Management would therefore be valuable.

It is important that any future research also incorporates the identification of potential sources of funding, sources of equipment and human resources in order to implement transport services. Given the highlighting of the poor state of roads in rural areas such research would also need to include the identification of ways to direct funds to rural areas to complete the transportation infrastructure and make available a steady flow earmarked for maintenance work.

A number of research topics were also proposed, which relate to operational frameworks and ways in which action research needs to play an important part in future research. A development project in a sparsely populated region could be used to investigate different measures and their degree of influence on public transport. The potential should be investigated for the involvement of social economy enterprises in the provision of transport services, including those related to tourism. Another topic proposed is to find ways of changing the patterns of transportation from the rural periphery to a local urban centre by encouraging inter-regional flows. This leads on to the need for research to be conducted on the principles and layout of transfer points between main routes and local (possibly demand responsive) routes.

A particular topic of concern in The Netherlands relates to the need to examine if there are other means to improve safety (reduce speeding) in residential areas without impacting on public transport. This was highlighted by practices to reduce speeding in residential areas where many streets are "equipped with" speed ramps. Most of these ramps are too high for buses (especially low-floor buses, which are designed to improve accessibility). To deal with this, transport companies have changed their bus routes around residential areas. As a result, travel times have increased and walking distances to and from bus stops expanded.

4.1.2.3. Specific issues of social exclusion

Similar to the research topics outlined in the previous section, issues of social exclusion focus attention on the need to identify the market and its nature. Research is needed, which examines and refines methods to estimate the number and characteristics of people with reduced mobility, who are dependent upon public transport for their mobility needs. In addition, research would need to assess the impact of transport deprivation on socially-excluded groups, in particular women, young people and small farmers. This would need to include obtaining information regarding employment opportunities and the linkage to adequate transport provision in rural areas. Research is also needed to find out the travel needs of rural dwellers as this could help to define local networks for basic mobility.

Topics have been proposed, which are concerned with the financing of rural transport, for example assessment of the contribution, which specific funding programmes, such as the Rural Transport Fund in N.Ireland, make to reduce social exclusion. Research is also proposed to examine more effective ways of delivering services to pupils with special needs.

Other topics include the identification of appropriate transport provision for people with special needs by improving access to services and vehicles for elderly people, young people and disabled people. This would need to include services, which would enable elderly people, especially older women, to retain their independence and to make use

of the Free Travel Concession; particularly relevant in Ireland. Another aspect of designing appropriate transport services for people with special needs is to find ways of increasing accessibility for elderly and disabled through the development of new vehicles.

An important aspect related to combating social exclusion is to research ways to enable participation in programmes offered by local community development projects, how to tackle the issue of participation in community life in general and to overcome isolation. Local transport is a key to enabling this participation.

4.1.2.4. Regular scheduled transport services

Research topics in this category as in the previous sections also include market research to find out trip purposes (home to work, leisure, shopping) and especially research to find out trip chains and the possible role of public transport.

Operational research topics include methods of identifying appropriate frequencies and to delineate network structures between peak and off peak times. Currently most networks are similar at peak and off peak times, with small deviations. Research should make clear whether this is functional and market oriented or not. Further research is also proposed with regard to the development of regular services in the rural context that are efficient and effective.

4.1.2.5. Demand-responsive transport services

Research topics proposed in this category include topics of integration, such as how DRT services can best link with regular scheduled services and to connect with longer distance routes, how they can provide local accessible services (for people with special needs) and how the use of taxis might supplement DRT services.

Other topics related to organisational aspects of DRT operation include the following:

- Development of mobility management service centre to provide information and to optimise bookings by on-demand services
- The investigation of the reasons why on-demand services have so far failed to make an impact and how this situation might be reversed. One approach suggested for countries without the experience of DRT services would be to set up demonstration pilot projects, selecting a representative rural area, training the respective transport operators and operate the service for a period of one year. This would serve to introduce operators in different areas to the concept of on-demand transportation.
- Determining thresholds for customers when using demand responsive transport (e.g. being reluctant to make reservations, especially when using highly electronic systems (e.g. voice computers)
- Extending current demand responsive systems to a door to door service
- Possibilities of cross (national) border demand responsive transport systems.

Topics are proposed regarding the financing of DRT services, in particular to provide a comparison of the cost of regular services with those of demand responsive services and to increase the potential of DRT to improve its financial position by targeting recreational trips in addition to the more common ones of work, health, education and shopping.

Topics are also proposed to explore new ways of defining licensing regulations, which at present are route based rather than area based. This would reflect more accurately

the flexible operational characteristics of DRT operations and would enable them to qualify as *bona fide* public transport services.

4.1.2.6. The potential for combining passenger and goods in the same service

There is only a limited experience with such services in most European countries and so research proposals are limited to a small number of topics and are related to researching the potential for building upon existing services and service types. Proposals include:

- examining ways in which existing parcels services can be extended to provide a home delivery service, in particular in conjunction with demand responsive services;
- examining the potential for post bus services based on existing delivery and collection services
- exploring the potential of goods operations to become combined services, which in the case of certain parts of the west of Ireland include operators supported by the regional authority to overcome barriers of distance to the markets for local produce.

An important aspect of the ability to provide combined services is related to the nature of the vehicles involved. Hence the proposal of an action research project to test a vehicle, which could carry out both functions, though not necessarily at the same time and the need to explore the possibility of a mobile facility for use as playgroup and/or day care centre.

4.1.2.7. The potential for operations serving multiple functions (e.g. general public/ health/education)

The potential benefits and savings made by the introduction of multi-functional transport systems have been highlighted in support of the implementation of effective rural transport services. Research is therefore proposed in order to establish ways of introducing such systems, including the institutional, legal and administrative implications.

One of the common features of rural transport throughout Europe is the provision of dedicated school transport services. Research has been proposed to improve the delivery of such services, in particular a more cost-effective way of delivering services to pupils with special needs, as well as an examination of the role of school transport in providing the basis for a more general public service. In parallel to this another topic for research is to investigate the potential for increased utilisation of existing vehicles, such as school buses, for other purposes.

4.1.2.8. The potential for cross-agency procurement or operation of services

This category is in many ways an adjunct to the previous category and so the research topics proposed are similar even though the context is related to the way in which agencies secure services rather than the operation of them.

The potential benefits and savings made by the introduction of multi-functional transport systems have been highlighted in support of the implementation of effective rural transport services. Research is therefore proposed in order to establish ways of introducing such systems, including the institutional, legal and administrative implications.

One of the common features of rural transport throughout Europe is the provision of dedicated school transport services. Research has been proposed to improve the

delivery of such services, in particular a more cost-effective way of delivering services to pupils with special needs, as well as an examination of the role of school transport in providing the basis for a more general public service. In parallel to this another topic for research is to investigate the potential for increased utilisation of existing vehicles, such as school buses, for other purposes.

4.1.2.9. The potential for the deployment of telematics

The deployment of telematics in rural transport is still relatively new and most countries have little experience of them. Comprehensive research is therefore proposed into the viability and operational characteristics of using ICT in integrated ticketing, real time passenger information, scheduling and booking for demand responsive services.

4.2. Needs of telematics in rural areas

There is significant evidence from the in-depth analysis of selected cases that few of the rural services make an extensive use of telematics. Even in these countries that use of telematics in public transport (see under 3.4.2) and in general applications (see under 3.4.1) is more common, in rural areas transportation measures are often "low-tech". An explanation for this fact is that many times small communities are involved, where residents know each other. These users, often elderly, prefer to talk to the operator booking the service and have a more personal relationship with the driver. The growing popularity of the volunteer schemes can be contributed to the increased need for social interaction.
In those countries, where use of telematics is not that widespread, the social and educational characteristics of rural populations make difficult the adoption of new technologies. Therefore, every measure that relies on introduction of new technologies in rural areas should include a provision for training of the users. In transportation, this includes also operators.
Another factor will play a role is the recent development of a reverse population movement from urban to rural areas. These are professionals who take advantage of the explosion in mobile communications and the Internet. Many of them are "tele-workers", who work from rural home offices or "tele-cottages" part- or full-time. These new rural residents are not only familiar with information technology but are early adopters and are potential rural transportation users that will give new life and viability to currently operating services.
It has been proposed that research concerning telematics in rural transportation needs to be undertaken in two areas: the user and the operator.

4.2.1. User side

The user side involves the "communication - reservation", "information" and "ticketing" aspects of transportation systems.

4.2.1.1. Information delivery

Information about transportation services that is reliable and almost real-time should be available to the user of rural services. Research is proposed in two areas: Internet and mobile telephony delivery of information.

Some topics of research concerning Internet based delivery of information to the end user of rural transport services are:

- Evaluate the best methods to design sites dedicated to rural transportation. What type of information should be contained? Timetables real-time position of buses, taxis and other vehicles in the system? Calculate remaining type to reach a selected stop? Calculate the length of a trip? Connections to other transportation? Partners have suggested that more and more transportation alternatives are offered to users, as in the Netherlands where the last few years new services have emerged in addition to trains and buses. Is an Internet site the best way of combining information about the new services?
- Build dedicated rural transportation sites or rural portals where other information about social services, local businesses, entertainment is available? Sites that offer tourism information should include links to rural transport and encourage tourists to use local transport.

The WAP protocol that is already being shipped with new mobile telephones and PDAs (Personal Digital Assistants) will add browser capabilities to these devices. Internet sites will be accessible to users of mobile telephones. Obvious limitations are the small size of the screen and the keyboard that does not allow typing with the exception of small messages. Sites will be redesigned in such a way that parts of them will be cap Therefore, potentially all these sites that were described and will contain information about rural transport should be designed taking into account the requirements of the WAP protocol.
The new GPRS standard will allow mobile phones to be continuously connected to a server. This raises tremendous opportunities for on-demand services. Software can be configured to deliver messages about the status of a booked trip. Also information about delayed connections on chain trips can be available on real time to handheld devices.
The overall growth of mobile telephony will continue at an explosive rate: today there are about 300 million mobile phones and 400 million PCs worldwide. But within the next 3 years, it is expected that while the number of PCs will rise to 500 millions, there will be 1 billion WAP phones, all with built-in Internet browsing capabilities.

A partial list of research areas on delivery of information to the rural user of transport services via WAP enabled mobile telephony is:

- Research on the information that will be available to mobile phones. What should be included? What is the best interface? Graphics will be included and how? (There exist already applications that deliver graphical traffic congestion news to mobile subscribers). Should the user be able to enter the number of a flight or an inter-city bus route and get information about the status (on time, delayed)?
- Research on voice activated browsing is very important for the elderly and technologically challenged users in rural areas. Navigating with voice commands will simplify not only the access of information but the booking process as well.

4.2.1.2. Reservation of services

Today most of the reservations of on-demand systems are made through a TDC or directly to the operator by telephone (land-based or mobile). Internet sites that will act as getaways to rural transport all incorporate rural transport information should offer the options to make on-line reservations. There is enough experience with airline and long distance bus reservations. It has been pointed out that real time information is an important factor for on-demand systems.

- Research on simplifying the on-line booking process. In what ways information about booking legs of a trip with different operators should be displayed?

- Research on booking a trip with a mobile phone. What is the role of WAP? Will voice always be a part of the booking process in rural areas? What are the attitudes of the users?

4.2.1.3. Ticketing

The booking process will be incomplete if does not allow the user to pay for the trip at the same time. Security of electronic payments remains an important issue, as many users do not feel comfortable to make purchases on-line. Europe is slow in embracing electronic commerce and is expected that rural areas will be even slower to shop on-line. A solution to this may be the smart card that allows greater security and is more widely accepted. Smart cards will contain an electronic purse where funds will be deposited and then made available for purchases. New and exciting possibilities for combining mobile phones with smart cards and electronic commerce have been investigated. The scheme requires the user to download funds to the smart card through a dedicated machine or through a device connected to a PC over the Internet or with a mobile phone that has a connection to an electronic bank. When the mobile phone has browser capabilities the user can connect to on-line merchants, make bookings and order tickets and point to a purse symbol on the phone screen and make the payment. Funds from the electronic purse are automatically subtracted and transferred to the merchant's account. This is described as m-commerce for mobile commerce.
Crucial is the capability that in rural areas users will be able to deposit money to smart cards from their homes or over a mobile phone and that they will not have to travel to a nearby city to have access to a reloading stationary machine.

- Research on ways of unifying ticketing for public transport at least at national levels. This will help users to purchase tickets that will be valid on different transport modes and facilitate chain trips.
- Research on the ways that smart cards will allow users to pay for tickets. Range of offerings: how users will be able to load a "travel" purse on the card with different travel options and ticketing plans.
- Research on smart cards that will allow users to have access to social services, will hold personal and health data and contain information about travel destinations and repeat trips, preferred seating, preferred meals etc.

4.2.2. Operator side

From the operators point of view research should be undertaken in almost all areas of planning, traffic management systems, reservations, and ticketing and on-demand services.

4.2.2.1. Planning

- Research on what methods and software will be used to address the design of routes, designation of stops, service areas, location and layout of transfer points. Partners have identified that research in better comprehending and identifying the characteristics of present systems is needed. This will include peak and off-peak network times, the characteristics of local users and their travel patterns and will require the use of statistical and planning software packages.

4.2.2.2. Transport management

Partners have proposed that: "There is a strong need for lighter software for routing the service traffic in rural areas. Vehicle positioning through mobile phone system would be accurate enough for the needs of rural service transport. This would probably be more inexpensive than the GPS-systems. This could be one possible idea for demonstration cases."
It is obvious from the analysis of the analysis of the state-of-the-art in AVL (Automatic Vehicle Location) systems that transponders, induction loops embedded in the road are not appropriate for rural areas where traffic flows are light and the geographical coverage is wide. New technology will make possible that the position of a mobile phone will be detected when the device transmits any signal. This solution is not hardware based; it only requires software that analyses the way the signal is distorted when bounces on objects on its way to the cell antenna or the time differences in signal arrival times to adjoining cell antennas. The possibilities are exciting; since most vehicles operating on rural routes are equipped with mobile phones and an operator will be able keep real-time track of fleet. This is very important when on-demand services are considered, since the optimal routing of vehicles will be easy to implement. Also the position of the customer making a request for a trip will be automatically known. In a real-time situation this will ease the aggregation of demand and the routing of the vehicle to service the users.

Another area of research is the "development of vehicle management to optimise the degree of capacity utilisation could also be a field of research for telematics in rural areas according to key stakeholders in public transport."

4.2.2.3. Reservation system

It has been pointed out that: " At the moment reservations are made by phone through the TDC or directly to the drivers. In the case of the TDC, the technology and software are often too heavy for the purpose of rural service line. That is why simpler and lighter software systems would be in place for the needs of rural traffic."

Experience from the best practices of rural transport and the in-depth analysis of selected cases has showed that a "lighter" reservation system can be functional and easy to implement, for example the "Ring" software used in Belbus. A rural operator does not usually proceed a significant amount of daily requests, as the service area is limited and the number of customers is moderate to small. Advantages of this system are that does not require extensive maintenance and that can be used to develop other applications and to keep simple statistical data.

- Research is proposed on identifying the needs of a typical rural operator and the design criteria for a compact, easy to maintain and portable reservation software package.

Other partners have suggested that " information exchange between different transport systems is insufficient, e.g. the rural transport service feeding a regional commuter transport system". This information is many times essential in completing a co-ordinated transport.

- Research on designing a system that will provide real time information about all available transport modes on a regional or national level. This will require that operators will freely make available information that will be collected centrally and presented in a common format. An Internet site is the ideal venue for such data. The site will be open to the operators that contribute information and a lighter

version for the public. Information also could be broadcast to mobile phones of subscribers as described in part 2.1.1.

4.2.3. Combining goods and transport - The Internet

Transport operators in rural areas have the comparative advantage of being familiar with a wide area. Moreover operators of on-demand systems often know where their customers live and are able to deliver a vehicle to their place of residence or very close to it, within a specified time frame. These characteristics are similar to the requirements of a door-to-door delivery service.
Many partners have proposed that the possibility of combining passenger and good transport on rural services should be researched. Additionally the service should extend to offer delivery or pickup of goods to the door. For big delivery companies serving the rural customer is very costly, since it usually involves sending a truck from a regional centre for a single delivery. New generations of those shoppers who order online require those delivery times are kept relatively short. The biggest volume of Internet shopping involves items such as books and CDs that are small and not sensitive to external conditions, e.g. temperature changes. Easily, passenger operators can undertake the rural leg of a delivery.
The same software that is used to book a trip can be used to schedule a delivery with minor modifications.

4.3. Proposed research topics

As a result of the screening process of future research needs a number of research themes were identified:

1. When investigating the issue of new combinations it became clear that many research needs identified in the different regions in Europe already have been investigated and in some cases as demonstration projects implemented. Therefore it's utterly important to disseminate the investigated good examples from this project to increase the rural access to transport service. Although identifying several already existing good examples of combinations of rural transport activities, the screening process identified combination topics insufficient or not at all investigated.
2. Not only new combinations of service categories, travel groups and travel purposes should be focused, but the screening process of future research needs in the different countries additionally showed a strong need for overarching research topics in the field of:
   institutional, legal and operational framework requirements
   rural community impact of rural public transport
3. In the field of telematics (ICT) the potential for the use of telematics (ICT) to improve the effectiveness of the existing combinations and of new combinations is very high. The research must not focus on developing new, high-technology tools, but should concentrate on the adaptation of already existing telematic tools, e.g. from the urban public transport area.

Based on these themes a number of research topics were specified. Below they are thoroughly depicted to enable a detailed view of the problems, which have given rise to the research ideas, the description of the most important tasks when performing the research and the expected results from the investigations. A natural step in the process of strengthening rural access to transport services is to make use of the new research ideas and initiate specific demonstration projects in suitable areas.

4.3.1. Topic 1: Innovative combinations of public transport services in rural areas

Problem description

In rural areas the combination of low population and geographical isolation means that conventional approaches to passenger transport, based on people travelling together, gradually lose their viability. Throughout Europe there are various public transport concepts in rural areas, trying to challenge and solve the specific rural problems of obtaining value for money and a better staff and vehicle capacity utilisation. It is though likely that not all combinations between different services, user groups and travel purposes will have been identified and therefore analysed. In general, all the innovative systems, which enable or promote living in rural areas, where services (schools, hospitals, entertainment places, etc) are very sparse, are of exceptional importance.

The positive impact of integrated, multipurpose transport services between administrative sectors at the public transport service level, the vehicle capacity utilisation and the transport costs contributes to a major interest in a further development of this task. Linked to the total integration of different services are the institutional, operational and legal requirements, which can be a barrier to integration.

In addition, the viability of rural areas is dependent on access to service. New ways of using the combination of passengers and goods are of great interest for rural areas to obtain and strengthen their survival. As tourism has become a major occupation of inhabitants of several rural areas, the combination of goods (equipment such as bicycles and luggage) and passenger transportation is as well of great importance in this sector. Furthermore, there is a recent development of a reverse population movement from urban to rural areas, which also demands new solutions to providing services. Linked to these issues is how to make use of the rapidly developing opportunities of telematics (ICT) applications, e.g. to manage the goods distribution as well as providing information about the transport service for tourists.

Research topic description

The aim is to focus on the most appropriate questions, identified above, concerning the development of innovative ideas, improving and strengthening rural access to transport. The topic can be divided into a number of research proposals. These research proposals will develop relevant demonstration projects, which are able to measure and consider the impacts of pioneering efforts in the field of rural transport service.

Research proposal 1: Innovative integration of multipurpose transport services between administrative sectors
This proposal will concentrate on analysing the implementation of a new service, supplying the same service for all inhabitants in a rural area independent of user group. The new idea of this combination is to integrate general public transport and all publicly funded transport services in the same vehicle at the same time or at different times, depending on needs. Integration of publicly funded journeys has already been developed and implemented in some countries, but an integration of all groups in the same service is new. Another multipurpose transport service not yet investigated is the integration of passengers and stationary social services (for children, elderly people) in the same vehicle, providing e.g. parents the opportunity of leaving their children in the bus when they do their shopping.

One major activity is to locate and verify regulations and institutional problems due to co-ordination and integration. In addition experiences of booking, co-ordination of various publicly funded services and flexible vehicles adapted to environmental claims from a number of previous projects could be used and further developed in this project. In addition new vehicles adapted for all passenger groups and facilities, drivers with special training to enable an optimal care of all groups, extensive information campaign especially for elderly people and disabled people are essential for the success of such a project.

Research proposal 2: Innovative integration of passenger and goods
This proposal will develop and analyse the utilisation of innovative rural services carrying equipment and goods as well as passengers. The service can be based on an on-demand public transport service as well as an existing courier service. Through the demand responsive systems, even more infrequent combinations of passenger and freight transports could be developed. Furthermore, the coordination of freight transports between the regular bus services and the various service line concepts could be improved e.g. in picking up / delivering the goods or introducing a limited shopping delivery service.

The role of telematics (ICT)-infrastructure, change of legal regulations and restrictions and development of new vehicles will be analysed. The results of the project are environmental benefits due to better vehicle capacity utilisation, economical benefits for provider and user, and for tourism, an image gain for the region by focusing on environmentally sensitive tourism.

The topic can help strengthening the rural community by developing innovative ideas concerning rural access to transport services for rural inhabitants and -in the case of tourism- for visitors to the area. The new services will contribute to a decrease in the isolation of rural inhabitants. In addition environmental gains due to better capacity utilisation and a better supply of transport services (decrease in car-borne traffic and freight transport) will be a result of the research.

4.3.2. Topic 2: Legal, institutional and operational framework requirements in rural public transport

Problem description
Rural transport is still a regulated service in all EU states; the degree of regulation varies from countries with extensive deregulation policies (like the UK) to countries with monopolistic situations (like Spain). This regulation severely limits the ability of interested parties to develop flexible solutions to the problems they face. In order to undertake any policy formulation effort it is necessary to have precise knowledge of the regulatory framework in force in countries, which have already implemented deregulation policies.

Furthermore, the co-operation between administrative sectors is essential when implementing e.g. publicly funded multipurpose transport services, which will provide cost savings. These types of integration strategies are poorly developed in Europe. There is a need to investigate the most suitable structure for legal requirements and administrative responsibility to facilitate co-operation and integration.

In many countries throughout Europe there is a need to combine freight and passenger transport. The main issues in preventing the integration of freight and passenger

transport are the legislative barriers. Usually, the existing laws do not allow for the combination of freight and passenger transport in a systematic way. These combined services might be considered to compete directly with conventional transport licenses, mostly bus lines and taxis or freight agents.

Research topic description

The aim is to look at the identified problems above, regarding impacts of legal, institutional and operational transport regulations on the rural area viability. The topic can be divided into a number of research proposals. These research proposals will develop methodologies and demonstration projects, which are able to measure and consider the socio-economic impacts of new framework requirements.

Research proposal 1: Liberalisation and integration of rural transport services
This proposal should be aimed at gathering sufficient information on legal and institutional issues in a systematic manner, and presenting it in a way that facilitates comparisons and allows conclusions to be drawn. This detailed information will further be used when drawing up demonstration projects in this research field. The main topics to be researched would include: institutional arrangements, type of regulation, financing/funding, operational arrangements, organisation of operators and transport, prospects for harmonisation.

Research proposal 2: Integration of passengers and goods
Before a freight/passenger transport combination can be fully developed, conditions should be established which make such a system attractive to private and/or public operators. Showing the advantages to both currently segregated sectors it can then be possible to develop the legal framework. The aim of this proposal is to analyse the impact of a change in legislation. The most profound amendment would be the liberalisation of the entire operating conditions for freight transport. This will also require incentives to new companies, which are specialised exclusively on combined freight and passenger transport services in rural areas. In financial terms, it would be necessary to evaluate the market size for passenger and freight and also to make revenue and expenditure projections. New entrants could find it a difficult market to break into and are likely to meet with strong resistance from existing courier firms/providers.

The integration of freight and passenger transport is especially important in longer travelling distances where the benefit to co-ordinate the two different kinds of services can effectively balance the costs to manage the integrated transport (terminals, special vehicles, goods handling costs, additional costs to manage integrated transport, etc.).

The topic could emphasise the need of a development of framework requirements, which would be a contribution to the process of harmonisation of the legal and institutional framework throughout Europe. A complete harmonisation is not realistic, but an approach of the frameworks in the countries of Europe would be of great importance in the future e.g. for the possibilities of cross-border transport services. Advantages of the possibility of implementing cross-agency, multipurpose transport services. Policy changes would mean new services being provided where they are not allowed at present even if the technology and resources are available. Potential benefits could be derived at EU, national and regional levels.

4.3.3. Topic 3: Rural community impacts of rural public transport services

Problem description
The interaction between transport services and socio-economic development in rural communities is somewhat ambiguous. On the one hand, improvements in transport services will lead to increased mobility, which have a positive impact on the social and economic development of a particular region by encouraging the relocation of people and additional small enterprises. On the other hand, socio-economic programmes influence the need for transport. Improving rural transport services is seen as a development and wealth redistribution policy.

This situation highlights the need for detailed knowledge of the complex nature of the interaction and methodologies to assess existing and future transport service systems. Decision-makers in public transport planning increasingly require not only the information, mentioned above, about *how* to develop and supply an ideal public transport solution in rural areas, but also the possibility to investigate and identify *which requirements and needs* a modern rural public transport service have to fulfil to keep customers and attract new ones. This can only be defined if different groups of rural dwellers can be identified and the respective requests and obstacles measured and assessed.

Research topic description
The aim is to look at the identified problems above, regarding the correlations between the situation and requests of different groups of rural dwellers and rural transport services. The topic can be divided into two research proposals. These research proposals will develop methodologies and demonstration projects, which are able to measure and evaluate the impacts, both existing and possible, of rural public transport on rural communities.

Research proposal 1: Rural transport and local socio-economic development
This proposal should be aimed at gathering sufficient information on socio-economic effects of rural transport service measures, or the lack of these measures in a systematic manner. The role of rural transport service and the level of service in the issue of social exclusion, especially targeting specific disadvantaged groups (elderly people, disabled people, women and young people), and travel behaviour will be analysed. The detailed information will further be used when drawing up demonstration projects in this research field.

Research proposal 2: Identification of the characteristic transport requirements of rural dwellers
The aim is to define, develop and perform a methodology to measure and assess transport needs and wants of various groups of rural dwellers. These investigations should cover identified public transport users as well as potential users and also possible conflicts between and/or within the groups. Particular attention will be paid to the needs of elderly people and disabled people, which can be offered enhanced accessibility through technological innovations e.g. by further development of vehicle standards.

The topic will enhance the understanding about the complex nature of providing transport services in rural areas. Set of project results and schemes, useful for local/regional authorities, operators and transport planners will be produced.

4.3.4. Topic 4: Application of telematics in rural public transport systems

Problem description

There is significant evidence from previous research that few of the rural services throughout Europe make extensive use of telematics. Even in countries where applications of telematics in public transport and in general are more common, the transportation measures in rural areas are often "low-tech". An explanation for this fact is that many times small communities are involved, where residents know each other. These users, often elderly, prefer to talk to the operator booking the service and have a more personal relationship with the driver. The growing popularity of schemes involving volunteers confirms the increased need for social interaction. On the other hand there is a recent development of a reverse population movement from urban to rural areas. These are professionals who take advantage of the explosion in mobile communications and the Internet. Many of them are "tele-workers", who work from rural home offices or "tele-cottages" part- or full-time. These new rural residents are not only familiar with information technology but are early adopters and are potential rural public transport users that will give new life and viability to existing services.

Another area where telematics can be introduced is when integrating passengers and goods. For big delivery companies serving the rural customer is very costly, since it usually involves sending a truck from a regional centre for a single delivery. Furthermore, transport operators in rural areas have the comparative advantage of being familiar with a wide area. Moreover operators of on-demand systems often know where their customers live and are able to deliver a vehicle to their place of residence or very close to it, within a specified time frame. These characteristics are similar to the requirements of a door-to-door delivery service. Considering this information, the possibility of combining passenger and goods transport on rural services with the administrative help from telematics applications should be researched. Additionally the service should extend to offer delivery or pickup of goods to the door. New generations of shoppers, who order online, require that delivery times are kept relatively short. The biggest volume of Internet shopping involves items such as books and CDs that are small and not sensitive to external conditions, e.g. temperature changes. Passenger service operators can easily undertake the rural leg of a delivery.

In countries, where use of telematics is not that widespread, the social and educational characteristics of the rural population make the adoption of new technologies difficult. Therefore, every measure that relies on introduction of new technologies in rural areas should include a provision for training of the users. In transportation of passengers as well as goods, this also includes operators.

Research topic description

The aim is to investigate and clarify the questions, discussed above, regarding the possibility of taking advantage of telematics inventions in rural transport services. The topic can be divided into three research proposals. These research proposals will develop relevant projects, which are able to measure and analyse the impact of various telematic schemes on rural transport services.

Research proposal 1: Telematic solutions for the users of rural transport services

The main objective is to facilitate the usage of rural PT services for the users. Research on how to disseminate information about rural transport services, communicate and in particular make a reservation and pay for the ticket with the help of telematics is an important and innovative step towards future demand for a reliable, fast and modern PT service. One important issue is to identify not only the need for

information of the inhabitants in the area, but also the need for information of visitors of the area.

Application of telematic tools such as Internet and mobile phones, in particular the possibilities of the WAP-technology, to ease the use of the rural PT service is essential.
Information:

- Internet: real-time position of vehicle, information about connecting modes, WAP-technology, which makes Internet sites accessible to users of mobile telephones (e.g. for Personal Dynamic Information, which informs the passenger in real time on the trip).
- The new GPRS standard will allow mobile phones to be continuously connected to a server. This raises tremendous opportunities for on-demand services. Software can be configured to deliver messages about the status of a booked trip. Also information about delayed connections on the journey can be available in real time via handheld devices.

Reservation/booking:

- Internet: on-line booking from computer and mobile phone (WAP)

Ticketing:

- unifying ticketing for public transport
- smart cards with different functions such as payment, storage of information

Research proposal 2: Telematic solutions for the operation of rural transport services
The main objective is to facilitate the operation of rural PT service. Research on how to use telematics for planning, traffic management systems (e.g. positioning, vehicle utilisation), reservations and ticketing in both regular and on-demand services are important issues when providing a fast, reliable and attractive service for the users and an economically sustainable service for the operators.

Application of telematic tools such as Internet and mobile phones to ease the operation of the rural PT service is essential.
Planning:

- Transference of planning tools used in urban areas

Traffic management:

- Mobile phone: lighter software for routing the service traffic in rural areas. Vehicle positioning through mobile phone system would be accurate enough for the needs of rural service transport. This would probably be less expensive than the GPS-systems.
- Internet: Designing a system that will provide real time information about all available transport modes on a regional or national level. This will require that operators will freely make available their information , which will be collected centrally and presented, in a common format. An Internet site is the ideal location for such data. The site will be open to the operators that contribute information and a less complex version would be available for the public. Information could also be broadcast to the mobile phones of subscribers (WAP).

Reservation systems:

- Development of lighter software systems in the TDC

Research proposal 3: Telematic solutions for the operation of integrated goods and passenger transport

The aim is to investigate the possibility of implementing existing telematic applications when combining goods and passenger transport. Research should consider the implementation of telematics on both the user and the operator side. The same software that is used to book a trip could be used to schedule a delivery with minor modifications and an efficient matching system between the needs of freight and people movements should be developed.

The topic can develop new telematics applications adapted to the special needs of user and operator of rural transport service. To take advantage of telematic innovations in rural transport service is essential in order to retain and increase the number of passengers, in addition to making the operation more efficient and, therefore economically sustainable. An application of telematic tools provides the user with a more attractive, reliable, modern and faster access to rural transport. Such measures furthermore strengthen the rural community and makes living in a rural area viable.

5. CONCLUSIONS

5.1. State of the art

5.1.1. Telematic applications

According to the main conclusions of the in-depth and sectoral analyses, the use of telematics in the demand responsive rural transport services is still at a preliminary phase, especially with regard to map and route applications and the use of other software. On the other hand, the use of mobile phones is very common. The need of telematics is largely dependent on the need for flexibility of the transport service. Regular public transport with a fixed itinerary and timetable is less dependent on telematics. Transport services, such as the demand-responsive systems, use telematics because of its need to be flexible towards routing, timetable and stops. Clearly, telematics provide possibilities for combining trips, integrating different user groups and providing cost savings in automated generation of management information, payments and reservations.

5.1.2. Combination of passengers and freight transport

There are plenty of possibilities that have not been used in combining the passenger and freight transport services. Before a freight/passenger transport combination can be fully developed, conditions should be established which make such a system attractive to private and/or public operators. First, the legal framework should be developed by showing the advantages to both sectors. The most profound impact of a change in legislation would be the liberalisation of the entire operating conditions for freight and passenger transport. Secondly, an efficient matching system between the needs of freight and people movements should be developed. Through the demand responsive systems, even more infrequent combinations of passenger and freight transports could be developed. The integration of freight and passenger transport is especially important in longer travelling distances where the benefit to co-ordinate the two different kinds of services can effectively balance the costs to manage the integrated transport.

5.1.3. Multi purpose services

The strategies dealing with the integration of multipurpose transport services between administrative sectors (i.e. transport services for different target groups simultaneously) are poorly developed at the European level. Consolidating the legal or administrative responsibility for transport services under a single body would be a usefull first step in countries where this integration has not been implemented yet. . School transport has the greatest potential for the development of multi purpose services: it is not technologically demanding and at the same time it is widely provided all over Europe. However these measures would require more advanced operation control centres, able to handle various types of travel requests.

5.1.4. Expectations for the future

Improvements in transport services and accessibility will lead to increased mobility which has a positive impact on the social and economic development of a particular

region by encouraging the relocation of people and additional small enterprises. This is especially the case for remote areas in the less populated countries throughout Europe.

On the other hand, as a result of the increased emphasis on cost-efficiency, unprofitable public transport services will be discontinued and rural communities are becoming more isolated, especially for their elderly and disabled residents. At the same time, the post-urban development will lead to changing transport patterns. Although, it is difficult to forecast the future development, it cannot, however, be denied that improvements in transport services will have a significant impact on the economic and social development of rural communities.

5.2. Recommendations and further research needs

5.2.1. Recommendations

The specific characteristics of rural transport provision are based apparently upon the concern to provide some kind of mobility for rural citizens at a reasonable cost. The efforts undertaken aim at avoiding social exclusion for citizens without car on one hand. On the other hand if these social goals are to be achieved by providing regular public transport, the cost effectiveness would be very low. Rural authorities would be unable financially to provide the service. Hence the need for specific rural transport solutions.

Improvements can be achieved through:

- operational flexibility: demand responsiveness instead of regular lines
- organisational measures: co-operation with taxi-operators or volunteer associations instead of professional bus drivers.
- Integration of various types of services into the regular passenger service: freight, multi-purpose services (e.g. school transport, transport of disabled, etc.)

The best results in quality level and cost-effectiveness are achieved if various actions are combined. The transport provision is getting more complex then and consequently telematic tools – especially reservation and routing systems – will be inevitable to provide a smooth and efficient service.

5.2.2. Research needs

The main stakeholders have had the opportunity to express needs for future research on rural transport. The main research subjects are:

- the ways in which very local services can be integrated more effectively at local level and how they complement and interchange with longer distance (inter-urban) services
- the licensing environment for demand responsive services and the ways in which taxis can be incorporated into demand responsive service operations
- the institutional, legal and administrative barriers and implications associated with multi-functional cross-agency services
- the role of telematics, especially the thresholds at which different levels of sophistication are required (building upon the experience gained in the SAMPLUS project for example); this applies to the scheduling and management aspects for the operators and the information and booking aspects for the users
- designing more user friendly facilities, from bus stops through to local interchanges, as well as vehicle and service accessibility

REFERENCES

List of VIRGIL deliverables

- D1. 'Overview of best practices in rural transport'. Report on the results of WP1. Available.

- D2. 'In-depth analysis of selected cases, including sectorial analysis'. Report on the results of WP2
  Available

- D3. 'Report of surveys with stakeholders'. Report of the results of WP3. Available.

- D4. 'Good practice Handbook' (P).
  English version: expected end June 2000
  Other languages (Dutch, Finnish, French, German, Greek, Italian, Spanish, Swedish): expected July 2000

- Website: www.bealtaine.ie/virgil

Bibliography

- Adviesburo Voor Mobiliteit, .. Problem finding in the Rijnstreek and Duin- en Bollenstreek region. [Probleemverkenning Rijnstreek en Duin- en Bollenstreek]. Adviesburo Voor Mobiliteit. Amsterdam. 1998. The Netherlands (NL).
- Albrechts, L.. Basic mobility 2. [Basismobiliteit 2]. Flemish ministry of transport and land use. Leuven. 1996. Belgium (BE).
- Ambrosino, GA. A Project to Implement a Demand Responsive Transport Service (DRTS). [.]. Symposium on Transportation Systems - Crete. Symposium on Transportation Systems - Crete. 1997. Italy (IT).
- Anttila, J.. How will the rural services be secured?. [Miten maaseudun palvelut turvataan?]. Min. of Interior, Publication of the Cooperative C. Helsinki. 1996. Finland (FI).. Helsinki. 1996. Finland (FI).
- Area Development Management Ltd., .. Rural Ireland - Waiting for a Lift. [.]. Area Development Management Ltd.. Dublin. 1997. Ireland (IR).
- Astrop, A. The Trend in Rural Bus Services Since Deregulation. [.]. Transport and Road Research Laboratory. Crowthorne. 1993. United Kingdom (UK).
- B&A Groep, .. Evaluation Collective Demand-responsive Transport, evaluation scheme, inventory projects May 1998. [Evaluatie CVV, Opzet evaluatie-onderzoek - Inventarisatie projecten mei 1998]. Adviesdienst Verkeer en Vervoer. Rotterdam. 1998. The Netherlands (NL).
- Banister, D. The Role of the Voluntary Sect. [.]. Journal of Rural Studies. Pergamon Journals Ltd. 1988. United Kingdom (UK).
- Bannister, D. Transport Needs in Rural Areas. [.]. Transport Reviews. Pergamon Journals. 1983. United Kingdom (UK).

- Bartolini, LB. The SAMPO system in Florence. [.]. Conference - Florence. ATAF. 1997. Italy (IT).
- Beaucire, F.. Mobility expectations and needs in non urban areas. [Attentes et besoins de mobilité dans les espaces non urbains]. n/a. Metz. 1999. France (FR).
- Bihn, F.. Multi-level differentiated transport operation – transport services in cases of large and small demand. [Differenzierte Bedienungsweisen - Nahverkehrsbedienung zwischen großem Verkehrsaufkommen und geringer Nachfrage]. Verband Deutscher Verkehrsunternehmen. Köln / Düsseldorf. 1994. The Netherlands (NL).
- Boeri, FB. An Integrative Demand Responsive Public Transport for the Alta Val di Nure in the Piacenza province. [.]. Conference - Siena. ACAP. 1997. Italy (IT).
- Börjesson, M. The right to local decision - making on transport in Pauträsk village. [Kopllektivtrafik efter lokala önskemål, Pauträsk, Västerbotten]. Swedish Transport Research Board (TFB). Stockholm, Sweden. 1990. Sweden (SW).
- Burkhardt, J.. TCRP Report 34: Assessment of the Economic Impacts of Rural Public Transportation.. [.]. Transportation Research Board. Washington DC, USA. 1998. United States (US).
- Carlson, P. Ringbuss in Höör - five years later. [Ringbuss i Höör - fem år efteråt]. KFB (KommunikationsForskningsBeredningen). Stockholm, Sweden. 1998. Sweden (SW).
- CHATZISTERGIOU, TH. PUBLIC TRANSPORTATION SERVICES OF THE MUNICIPALITY OF KOS - A SUCCESFUL BUSINESS VENTURE. [.]. PROCEEDINGS OF THE "LOCAL GOVERNMENTS AND MUNICIPA. TECHNICAL CHAMBER OF GREECE. 1993. Greece (GR).
- Claroni, CC. Speech at the conference. [.]. Conference - Florence. ATAF. 1997. Italy (IT).
- Community Transportation Association of America, .. Managing Medicaid Transportation. [.]. Community Transportation Association of America. Washington DC, USA. 1997. United States (US).
- Crampin, J. Will the Bus Grant be Sufficie. [.]. Local Transport Today. Landor Publishing Ltd. 1998. United Kingdom (UK).
- Csernak, U.. Ten years AST (dial-a-taxi), experiences and perspectives of a flexible service. [Zehn Jahre Anruf-Sammeltaxen, Erfahrungen und Perspektiven einer flexiblen Verkehreinrichtung]. Der Nahverkehr. VDV. 1994. The Netherlands (NL).
- D&P Onderzoek en Advies, .. Collective Demand-responsive Transport in the province of Noord-Brabant. [CVV Noord-Brabant]. D&P Onderzoek en Advies & DTV Consultants. The Hague. 1998. The Netherlands (NL).
- D&P Onderzoek en Advies, .. Collective Demand-responsive Transport in the province of Noord-Brabant, appendix. [CVV Noord-Brabant, Bijlagenbundel]. D&P Onderzoek en Advies & DTV Consultants. The Hague. 1998. The Netherlands (NL).
- De Boer, E.. Transport possibilities for rural areas. [De vervoersoptie voor het platteland]. Delftse Universitaire pers. Delft. 1990. The Netherlands (NL).
- De Smet, K.. Free public transport. Small municipalities are ahead. [Gratis openbaar vervoer: Kleinere gemeenten nemen het voortouw]. VVSG. De Gemeente. 1998. Belgium (BE).

- Dupas, J.. Measures for people with reduced mobility in different transport means and in different countries. [Mesures en faveur des personnes a mobilité reduite dans les différents moyens de transport et les différents pays]. Conseil national des transports. Paris. 1998. France (FR).
- Edelkoort, L.. From public transport to public delight. [Van Openbaar Vervoer naar Openbare Vervoering]. Studio Edelkoort. Paris. 1998. The Netherlands (NL).
- editorial, .. Groningen organises demand-responsive city transport. [Groningen organiseert vraagafhankelijk stadsvervoer]. Verkeerskunde. ANWB. 1996. The Netherlands (NL).
- editorial, .. Integration of transport of physically handicapped and general public in Alkmaar succesful. [Integratie WVG-vervoer en OV in Alkmaar succesvol]. Verkeerskunde. ANWB. 1996. The Netherlands (NL).
- Ekholm, P. Co-ordination of goods traffic and passenger service with public bus traffic in the counties of Småland. [.]. Swedish Transport Research Board (TFB). Stockholm, Sweden. 1987. Sweden (SW).
- EPYPSA, .. Substitution of regular passenger road transportation concessions in Extremadura Region. [Sustitucion de las concesiones de transporte regular de viajeros por carretera de titularidad de Junta de Extremadura]. Ministerio de Obras Publicas y Transporte. Madrid. 1991. Spain (ES).
- Evers, K.. Urban and rural dwellers in dialogue with alderman Pieters-Stam. [Stadjers en ommelanders in dialoog met wethouder Pieters-Stam]. Verkeerskunde. ANWB. 1996. The Netherlands (NL).
- Farruggio, VF. Euristic tecniques for th management of a public transport system supply in low-demand condition. [.]. Informatics Department. Pisa University. 1996. Italy (IT).
- FGSV, .. Public transport, proposal for developing transport plans - summary. [Öffentlicher Personennahverkehr - Vorschlag zur Aufstellung von nahverkehrsplänen - Kurzfassung]. FGSV. Köln. 1995. The Netherlands (NL).
- Fiedler, J.. Mobility management – what is it and what is it not. [Mobilitätsmanagement - was es ist und was nicht]. Mobilitätsmanagement 5. IVV. 1999. The Netherlands (NL).
- Fiedler, J.. Stop and Go – Guideance through chaotic traffic. [Stop and Go - Wege aus dem Verkehrschaos]. Kiepenheuer & Witsch. Köln. 1992. The Netherlands (NL).
- FRANTZIS, CH. THE INTERACTION OF ROAD, RAIL AND AIR TRANSPORT IN A DEREGULATED MARKET - THE CASE OF LOW DENSITY AND ISOLATED AREAS. [.]. PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON THE. PROFILIDIS V. (EDITOR). 1994. Greece (GR).
- Furness, .S. Rural Rides: A Handbook for Developing Rural Trans. [.]. NIACE. Bristol. 1988. United Kingdom (UK).
- Gemeente Hillegom, .. Tailor-made transport, executive regulation. [Vervoer op Maat, Uitvoeringsregeling]. Gemeente Hillegom. Hillegom. 1997. The Netherlands (NL).
- GIANNOPOULOS, G. PUBLIC URBAN TRANSPORT, VOL. 1: BUS OPERATIONS. [.]. PARATIRITIS. THESSALONIKI. 1994. Greece (GR).
- Gurrera, J.. The Seu d'Urgell passenger public transport. [El transporte publico de viajeros. La Seu d'Urgell]. Direccion General de Medio Ambiente MOPU. Madrid. 1988. Spain (ES).

- Hablé, A.. telematics: unmistakable link in mobility chain. [Telematica: onmiskenbare schakel in ketenmobiliteit]. Verkeerskunde. ANWB. 1996. The Netherlands (NL).
- Hämäläinen, E. New opportunities of rural traffic. [Maaseutuliikenteen uudet mahdollisuudet]. Ministry of the Interior, Service Project of Rural. Helsinki. 1995. Finland (FI).
- Herbert, S. New Ideas in rural Development No2, Action on Scot. [.]. The Scottish Office Central Research Unit. Edinburgh. 1996. United Kingdom (UK).
- Herbert, S. Scottish Rural Transport Action Guide: Practical A. [.]. The Scottish Central Research Unit. Edinburgh. 1996. United Kingdom (UK).
- Jansen, A.. Recreational transferium Renesse. [Recreatie-transferium Renesse]. Verkeerskunde. ANWB. 1995. The Netherlands (NL).
- KAFETZIS, A. MODERNIZATION OF PUBLIC INTERURBAN TRANSPORT. [.]. PROCEEDINGS OF THE "TRANSINTER /TRAFFIC - TRANSPO. TRADEMCO LTD. 1994. Greece (GR).
- Kennes, R.. Accessible transport for everyone. Public and demand responsive transport for people with reduced mobility. [Toegankelijk vervoer voor iedereen: openbaar en vraagafhankelijk vervoer voor mensen met een beperkte mobiliteit]. n/a. Kluwer. 199
- KOKKINOS, N. PUBLIC TRANSPORT FOR SPECIAL NEEDS PEOPLE. [.]. PROCCEEDINGS OF THE "TRAFFIC IN THE CENTER OF ATHE. HELENIC INSTITUTE OF TRANSPORTATION ENGINEERS. 1989. GREECE (GR).
- Koning Boudewijn Stichting, .. The missing link between individual and collective transport – New types of mobility in Belgium. [De ontbrekende schakel tussen privé- en openbaar vervoer - Nieuwe vormen van mobiliteit in België]. Koning Boudewijn Stichting. Brussels. 1996. The Netherlands (NL).
- Ljungberg, C. "Kuxa" buses in Ockelbo. [Kuxabussarna, en rapport om kollektivtrafiken i Ockelbo kommun]. KFB (KommunikationsForskningsBeredningen). Stockholm, Sweden. 1997. Sweden (SW).
- Lundborg, G. Experiment with co-ordnination of transport service and travelling service - Piteå as a model area of the project. [.]. Swedish Transport Research Board (TFB). Stockholm, Sweden. 1987. Sweden (SW).
- Macdonald, .R. Routes to Rural Opportunities. [.]. Oxford Brookes University. Oxford. 1988. United Kingdom (UK).
- Makkink, Th.. Line taxi: breakthrough or everlasting promise?. [Baantaxi: doorbraak of eeuwige belofte?]. Verkeerskunde. ANWB. 1997. The Netherlands (NL).
- Malucelli, FM. Models for public transport in low-demand areas. [.]. Electronics Department. Perugia University. 1997. Italy (IT).
- METAXAS, V. TRANSPORT ECONOMICS. [.]. PAPAZISIS. ATHENS. 1986. Greece (GR).
- Ministerie van Verkeer en Waterstaat, .. Regulation normative cost level public transport 1999. [Regeling normatieve kostenniveau openbaar vervoer 1999]. Koninklijke drukkerij Broese & Peereboom BV. Breda. 1999. The Netherlands (NL).
- Ministerie van Verkeer en Waterstaat, .. Regulation transport revenues 1999. [Regeling vervoeropbrengsten 1999]. Koninklijke drukkerij Broese & Peereboom BV. Breda. 1999. The Netherlands (NL).

- Ministry of Transport and Communacations in Finland, .. Effect of the financing of public transport. [Joukkoliikenteen rahoituksen vaikutus]. Publications of the Ministry of Transport and Comm. Helsinki. 1997. Finland (FI).
- Ministry of Transport and Communications in Finland, .. The SAMPO-project, conclusions and recommendations. [SAMPO-projekti. Tulokset, johtopäätökset ja suositukset]. Publications of the Ministry of Transport and Comm. Helsinki. 1998. Finland (FI).
- Ministry of Transport and Communications in Finland, .. Committee report for cost savings in passenger traffic. [Henkilöliikenteen säästötyöryhmän mietintö]. Publications of the Ministry of Transport and Comm. Helsinki. 1995. Finland (FI).
- Ministry of Transport and Communications in Finland, .. Cost savings through the development of public transport. [Joukkoliikennettä kehittämällä säästöihin]. Publications of the Ministry of Transport and Comm. Helsinki. 1996. Finland (FI).
- Ministry of Transport and Communications in Finland, .. Development guidelines for service lines and passenger transport. [Palveluliikenteiden ja henkilöliikenteen kehittämiskansio; palveluliikenteet Suomessa]. Publication of the Ministry of Transport and Commu. Helsinki. 1998. Finland (FI).
- Ministry of Transport and Communications in Finland, .. Needs of users and purchasers in rural public transport. [Käyttäjien ja ostajien tarpeet maaseutumaisessa joukkoliikenteessä]. Publication of the Ministry of Transport and Commu. Helsinki. 1995. Finland (FI).
- Ministry of Transport and Communications in Finland, .. Public transport expenses in municipalities. [Kuntien henkilöliikennekustannukset]. Publications of the Ministry of Transport and Comm. Helsinki. 1997. Finland (FI).
- Ministry of Transport and Communications in Finland, .. Studied effects of service lines. [Palveluliikenteen vaikutustutkimus]. Publications of the Ministry of Transport and Comm. Helsinki. 1998. Finland (FI).
- Missini, PM. The Demand Transport Responsive Systems. [.]. Conference - Florence. ATAF. 1997. Italy (IT).
- Nickel, S.. Product profiles and communication in bus traffic. [Produktprofilierung und -kommunikation im Busverkehr]. Nahverkehrs...praxis. DINO. 1999. The Netherlands (NL).
- Non, .. RUTEX: Blackmount Services. [.]. Transport and Road Research Laboratory. Crowthorne. 1979. United Kingdom (UK).
- Nutley, S.C. 'Unconventional Modes' of Tran. [.]. Journal of Rural Studies. Pergamon Journals Ltd. 1988. United Kingdom (UK).
- Pettinelli, FP. The esperience of ATAF on Demand Responsive Services. [.]. Conference - Florence. ATAF. 1997. Italy (IT).
- Poté, R.. Legal aspect of new mobility systems. [Juridische aspecten van nieuwe mobiliteitssystemen]. n/a. Koning Boudewijnstichting. 1996. Belgium (BE).
- Price, B.R.. Mobility: Key to Welfare Reform. [.]. Community Solutions Newsletter. Community Transportation Association of America. 1995. United States (US).
- Price, B.R.. Pooling CommunityResources Makes Accessible Transit Affordable. [.]. Community Solutions Newsletter. Community Transportation Association of America. 1996. United States (US).

- Price, B.R.. The Link to Employment: Case Workers as Mobility Managers. [.]. Community Solutions Newsletter. Community Transportation Association of America. 1997. United States (US).
- PROFILLIDIS, V. TRANSPORT ECONOMICS. [.]. GIACHOUDIS - GIAPOULIS. THESSALONIKI. 1993. Greece (GR).
- Projectbureau IVVS, .. Combine transports of passengers and goods. [Combineer personen- en goederenvervoer]. Verkeerskunde. ANWB. 1998. The Netherlands (NL).
- Province Noord-Brabant, .. Passenger transport of tomorrow, a renewal programme for public transport. [Personenvervoer van morgen - een vernieuwingsprogramma voor het openbaar vervoer]. Studio Guido van der velden BV. Zeewolde. 1998. The Netherlands (NL).
- Province Noord-Brabant, .. Vision on public transport. [Visie op het Openbaar Vervoer]. Studio Guido van der velden BV. Zeewolde. 1997. The Netherlands (NL).
- Provincie Groningen, .. Public transport on the move – policy note. [Openbaar vervoer in beweging - beleidsnota]. Dienst Centrale Ondersteuning, Provincie Groningen. Groningen. 1998. The Netherlands (NL).
- Schaefer, B.. Demand responsive transport. State of the art and perspectives. [Le transport à la demande, état de l' art et perspectives]. Predit/GART. Paris. 1997. France (FR).
- Straight, A.. Community Transportation Survey. [.]. American Association of Retired Persons. Washington DC, USA. 1997. United States (US).
- Tennyson, L. Brokerage is key to success in. [.]. Community Transport. Community Transport Association. 1996. United Kingdom (UK).
- TERROVITIS, TH. NATIONAL DEVELOPMENT PLAN 1988 - 1992: TRANSPORTATION SECTOR. [.]. CENTER FOR PLANNING AND ECONOMIC RESEARCH. ATHENS. 1989. Greece (GR).
- The TAS Partnership Ltd, .. Country Lifelines - good practice in rural transport. [.]. Rural Development Commission. Salisbury. 1996. United Kingdom (UK).
- TRADEMCO, LTD. FORECATING THE IMPACT OF NEW TECHNOLOGIES ON THE TRANSPORT SECTOR OF GREECE. [.]. TRADEMCO LTD. ATHENS. 1994. Greece (GR).
- Transport Advisory Services, .. Rural Transport Problems and Needs. [.]. The Rural Development Commission. Salisbury. 1993. United Kingdom (UK).
- TSAMPOULAS, D. TRANSPORTATION SYSTEMS MANAGEMENT. [.]. NATIONAL TECHNICAL UNIVERSITY OF ATHENS, DEPT. OF . ATHENS. 1990. Greece (GR).
- Valgalier, J.L... Evaluation of demand responsive transport systems. [Bilan des transports à la demande en 1992]. CETUR. Paris. 1993. France (FR).
- Van Dam, F.. Examining an unsatisfied transport need in rural areas in The Netherlands. [Op zoek naar een onvervulde vervoerbehoefte op het Nederlandse platteland]. Verkeerskunde. ANWB. 1998. The Netherlands (NL).
- Van den Eede, D.. Demand responsive transport in the Meetjesland area. More than 1000 satisfied customers per month. [Vraagafhankelijk vervoer in het Meetjesland, Meer dan 1000 tevreden reizigers per maand]. De Gemeente. VVSG. 1998. Belgium (BE).

- Van der Maas, C.. What is the benefit?: an inventory of measures and their effects on the field of influencing modal split. [Wat levert het op?: een inventarisatie van maatregelen en hun effecten op het gebied van vervoerswijzekeuzebeïnvloeding]. Adviesdienst Verkeer en Vervoer. Rotterdam. 1997. The Netherlands (NL).
- Van Moerkerke, B.. Belbussen. [Belbussen]. n/a. Kluwer. 1997. Belgium (BE).
- Van Sevenant, P.. Inventory of innovative mobility systems. [Inventarisatie van innovatieve mobiliteitssystemen]. Koning Boudewijnstichting. Leuven. 1995. Belgium (BE).
- Van Sevenant, P.. The missing link. [De ontbrekende schakel]. Koning Boudewijnstichting. Brussel. 1996. Belgium (BE).
- Van Sevenant, P.. The missing link. [Le chaînon manquant]. Fondation Roi Baudouin. Bruxelles. 1996. Belgium (BE).
- Various, .. Florence: from mass transport to Personalbus.. [.]. ATAF. Florence. 1997. Italy (IT).
- Vatteroni, BV. Speech at the conference. [.]. Conference - Florence. ATAF. 1997. Italy (IT).
- Verband Deutscher Verkehrsunternehmen, .. Public transport and traffic - examples. [Öffentlicher Personennahverkehr und Verkehrsberuhigung - Beispielsammlung]. Verband Deutscher Verkehrsunternehmen. Köln. 1993. The Netherlands (NL).
- Verdiesen, R.. Individual and collective transport in one system. [Individueel en collectief vervoer in één systeem]. Verkeerskunde. ANWB. 1996. The Netherlands (NL).
- Vereniging van Nederlandse Gemeenten, .. Collective tailor-made transport – research report of 10 systems for the transport of physically handicapped people. [Collectief Vervoer op maat - Onderzoeksrapportage van 10 systemen voor leefvervoer van WVG-gerechtigden]. VNG Uitgeverij. The Hague. 1994. The Netherlands (NL).
- Verkeersadviesburo Diepens en Okkema, .. Examples of collective transport in rural areas in the province of Zuid-Holland. [Voorbeeldenboek collectief vervoer landelijk gebied Zuid-Holland]. Verkeersadviesburo Diepens en Okkema. Delft. 1994. The Netherlands (NL).
- Viatek Tampere Ltd, .. Logistics study in the Koillismaa region, recommendations for development. [Koillismaan logistiikkaselvitys, kehittämisehdotuks]. Oulu Chamber of Commerce, Koillismaa department. Oulu. 1999. Finland (FI).
- VLASTOS, TH. MUNICIPAL AND INTER-MUNICIPAL NETWORKS OF MINI BUSES. A STRATEGY FOR COMPETITIVE MUNICIPAL TRANSPORTATION SERVICES.. [.]. PROCEEDINGS OF THE "LOCAL GOVERNMENTS AND MUNICIPA. TECHNICAL CHAMBER OF GREECE. 1993. Greece (GR).
- VNO-NCW, .. Model contracts carpooling from January 1st 1998. [Modelovereenkomsten carpoolen vanaf 1 januari 1998]. VNO-NCW. VNO-NCW. 1998. The Netherlands (NL).
- Welfare Reform Task Force, .. Child Care & Transportation: Strategies for Rural Communities. [.]. National Rural Development Partnership. Washington DC, USA. 1998. United States (US).
- Werkgroep lokaal vervoer gehandicapten & ouderen, .. Transport for physically handicapped people in Hillegom – On the way to collective tailor-made transport. [Vervoer gehandicapten & ouderen in Hillegom - Op weg naar Vervoer op Maat].

Werkgroep lokaal vervoer gehandicapten & ouderen. Hillegom. 1997. The Netherlands (NL).

- X, .. 250th Transport Grant. [.]. Community Transport. Community Transport Association. 1990. United Kingdom (UK).
- X, .. A Vision for Rural Public Transport. [.]. The Institution of Civil Engineers. London. 1995. United Kingdom (UK).
- X, .. Cumbria's Rural Transport Init. [.]. Local Transport Today. Landor Publishing Ltd. 1996. United Kingdom (UK).
- X, .. Lets Get Going: An Action Guide for Rural and Comm. [.]. The Community Transport Association and the Rural. Hyde. 1998. United Kingdom (UK).
- X, .. Low floor bus project for Corn. [.]. Community Transport. Community Transport Association. 1997. United Kingdom (UK).
- X, .. Mobility and rural areas. [Mobiliteit en platteland]. Landelijke Gilden. Leuven. 1993. Belgium (BE).
- X, .. Mobility contract cities and municipalities, a selection of data. [.]. De Lijn. none. 1998. Belgium (BE).
- X, .. New Dial -a- Ride signals gro. [.]. Community Transport. Community Transport Association. 1997. United Kingdom (UK).
- X, .. New Thrapston Ring & Ride bus. [.]. Community Transport. Community Transport Association. 1998. United Kingdom (UK).
- X, .. Public transport and future of the rural areas. [Transports publics et avenir des zones rurales]. Transdev/La Documentation Française. Paris. 1998. France (FR).
- X, .. Public Transport to the Countryside. [.]. Countryside Commission. Manchester. 1987. United Kingdom (UK).
- X, .. Rural 'Dial -a- Ride' launched. [.]. Community Transport. Community Transport Association. 1997. United Kingdom (UK).
- X, .. Rural Rides: Experiments in rural public transport. [.]. National Consumer Council. London. 1978. United Kingdom (UK).
- X, .. RUTEX: Colsterdale Car Service. [.]. Transport and Road Research Laboratory. Crowthorne. 1980. United Kingdom (UK).
- X, .. RUTEX: Hackforth and District Car Sharing Service. [.]. Transport and Road Research Laboratory. Crowthorne. 1980. United Kingdom (UK).
- X, .. RUTEX: Ruralink Service. [.]. Transport and Road Research Laboratory. Crowthorne. 1981. United Kingdom (UK).
- X, .. RUTEX: South Ayrshire Hospital Service. [.]. Transport and Road Research Laboratory. Crowthorne. 1981. United Kingdom (UK).
- X, .. RUTEX: South Exmoor Car Service. [.]. Transport and Road Research Laboratory. Crowthorne. 1980. United Kingdom (UK).
- X, .. RUTEX: Stair Service. [.]. Transport and Road Research Laboratory. Crowthorne. 1980. United Kingdom (UK).
- X, .. RUTEX: The Exe Valley Market Bus. [.]. Transport and Road Research Laboratory. Crowthorne. 1978. United Kingdom (UK).
- X, .. RUTEX: The Mid Devon Lift Giving Scheme. [.]. Transport and Road Research Laboratory. Crowthorne. 1979. United Kingdom (UK).

- X, .. RUTEX: The Northallerton Hospital Transport Service. [.]. Transport and Road Research Laboratory. Crowthorne. 1980. United Kingdom (UK).
- X, .. RUTEX: The Ripon Flexibus. [.]. Transport and Road Research Laboratory. Crowthorne. 1979. United Kingdom (UK).
- X, .. RUTEX: The Taw Valley Car Service. [.]. Transport and Road Research Laboratory. Crowthorne. 1980. United Kingdom (UK).
- X, .. Scottish Rural Bus Grant could. [.]. Local Transport Today. Landor Publishing Ltd. 1998. United Kingdom (UK).
- X, .. Telford and Wrekin first to ga. [.]. Local Transport Today. Landor Publishing Ltd. 1998. United Kingdom (UK).
- X, .. The Scottish Rural Transport I. [.]. Community Transport. Community Transport Association. 1999. United Kingdom (UK).
- X, .. The Wiltshire Wigglybus Technical Progress Report:. [.]. Pewsey Vale Transport Appriasal Group. Pewsey. 1998. United Kingdom (UK).

ANNEXES

ANNEX 1: CONTENT OF THE QUESTIONNAIRE SURVEY

Section 1 Information about your company/organisation/agency

1. Name of Organisation. (If you are a local branch of a national organisation, please give your branch title; if you are a Department or a Section in a large organisation, please give both the Department/Section name as well as that of the organisation)

   _____

2. Address (Give the address you use for correspondence or contact purposes)

   _____

   _____

3. Daytime telephone numbers(s) _____
4. Fax number or E-Mail address _____
5. Name of contact person _____
6. Which of the following best describes your organisation? (Please ✓ ONE ❒only)

Rural development agency	❒	Post office	❒
Transport operator (passenger)	❒	Transport operator (freight)	❒
Police	❒	Military	❒
Regional/Local Government	❒	Farmers' organisation	❒
Hospital / Medical Centre/Doctor	❒	Employees' organisation	❒
School/College	❒	Business association	❒
Chamber of Commerce	❒	Tourism provider	❒
Religious organisation	❒	Community organisation	❒
Shop, factory, farm, mine	❒	Financial institution	❒
Association of transport operators	❒	Social/day care centre	❒
Freight forwarding agent	❒	Social insurance institution	❒
Recreation group	❒	Sports centre	❒
Library	❒	Leisure facility	❒

7. Is your organisation one of the following? (Please ✓ the relevant ❒)

Public	❒	Non profit	❒
Private (for profit)	❒	Charity	❒

Section 2 Information about your services

1. Please answer this question if you are **operating** transport services. If you do NOT operate transport, go to Question 9.

   (a) How many vehicles do you operate on services in [insert name of study area]

   _____

   (b) Please ✓ the relevant ❒ to indicate whether you are operating any of the following services now or intend to operate them in the future.

	Now	Future
Regular scheduled services	❒	❒
On-demand or demand-responsive services	❒	❒
Combined goods and passenger transport services	❒	❒
Single services with multiple functions (e.g. general public transport/health/education)	❒	❒
Cross-agency procurement or operation of services	❒	❒

   (c) Please indicate (✓) if information & communication technologies are used for:

   booking & scheduling of services ❒ real time routing of services ❒

   information to users/passengers ❒ data collection ❒

   (d) If you operate passenger services, please indicate (✓) the proportion of your services in the [insert name of study area] on which wheelchair users are able to travel with ease:

   None ❒ 1-25% ❒ 26-50% ❒ 51-75% ❒

   76-99% ❒ 100% ❒

Section 3 Information about problems and needs

2. We want to get a picture of how you feel about aspects of the current transport arrangements in your area, and which issues are particularly important to you or your organisation. Below we set out a number of features of the transport system. For each of them, we would like you to tell us how satisfied you are with the current position, by ✓ the relevant . In addition, if you feel that the feature is particularly important to you or your organisation, please ✓ the ❒ next to each item.

Is it important? ▼

How satisfied are you? ▶ ☹ ☹ 😐 🙂 🙂

(a) Questions for Operators

❒ Current transport licensing system (provides for a good balance of regulation and operator flexibility)

○ ○ ○ ○ ○

❒ Management/employee relations (enable flexibility and innovation)

○ ○ ○ ○ ○

❒ Financing of services (subsidies) (current levels / access to funds)

○ ○ ○ ○ ○

❒ Roads in the area (condition, network, accessibility)

○ ○ ○ ○ ○

❒ Use of information technology for Automatic Vehicle Positioning / Location

○ ○ ○ ○ ○

❒ Use of information technology to provide real time information displays

○ ○ ○ ○ ○

❒ Use of information technology to provide information via the Internet / WWW

b) Questions for Service Users

❒ Integration with other transport services (links, through ticketing, etc.)

○ ○ ○ ○ ○

❒ Vehicle capacity (number of seats/storage space)

○ ○ ○ ○ ○

❒ Service frequencies (at different times of day / week)

○ ○ ○ ○ ○

❒ Service reliability (do they run when they are supposed to?)

○ ○ ○ ○ ○

❒ Areas served (available to all settlements?)

○ ○ ○ ○ ○

❒ Destinations served (available to all key locations?)

○ ○ ○ ○ ○

❒ Flexibility (routing, deviation on demand)

○ ○ ○ ○ ○

Is it important? ▼	How satisfied are you? ► ☹	😟	😐	🙂	☺
❒ Accessibility (step heights, passenger lift/ramp)	○	○	○	○	○
❒ Fare levels/price	○	○	○	○	○
❒ Ease of access to / success in booking (if required)	○	○	○	○	○
❒ Information about the service (ease of access, clarity)	○	○	○	○	○
❒ Facilities at stops (shelters, lighting, understandable timetables)	○	○	○	○	○
❒ Comfort on the vehicle	○	○	○	○	○
❒ Driving standards	○	○	○	○	○
❒ Safety standards	○	○	○	○	○
❒ Customer care	○	○	○	○	○

3. Finally, please can you set out below up to three other issues that you consider particularly important for the future development of rural transport services that are viable, efficient and meet customers' needs.

   a)

   b) _____

   c) _____

   _____

THANK YOU FOR YOUR ASSISTANCE IN COMPLETING THIS SURVEY
PLEASE RETURN THE COMPLETED FORM TO

ANNEX 2: CONTENT OF THE STRUCTURED INTERVIEW INSTRUMENT

At least 3 stakeholders with a regional overview will be interviewed in each region using this structured interview survey. At least one organisation or expert per partner country will also be approached for an in-depth structured interview and as such gather expert opinion on a face to face basis. In selecting the organisations for in-depth interview it is important to bear in mind that transport in rural areas is likely to be more an aspect of rural development than of transport *per se*. It is also important to ensure that information is obtained on what developments can not be implemented effectively or what activities can not happen as a result of the lack of appropriate transport services.

1 Organisational information

- Contact details
- Type of services/activities engaged in

2 Current policies on rural development and transport

- provide details of the policies
- levels at which policies are in place, e.g. geographical or departmental
- when policies were developed
- how policies were developed
- nature of consultation process and who was involved

3 Current strategies and programmes to implement policies

- provide details of the strategies and programmes?
- levels at which strategies and programmes are in place
- when were they implemented
- how have they been implemented
- which organisations have implemented them
- how much they have cost and how they have been financed

4 Proposals for new policies currently under consideration

- provide details of the new policies
- levels at which policies are being considered
- timescale for policies to be developed
- how policies are being developed
- nature of consultation process and who is involved

5 Proposed strategies and programmes to implement new policies

- provide details of the new strategies and programmes
- levels at which strategies and programmes will be put in place
- when are they to be implemented
- how are they to be implemented
- which organisations will implement them
- how much they are likely to cost and how they will be financed

6 Topics for transport research (include details of current research programmes) needed to improve rural transport as a result of, or in connection with:

- current policies, strategies and programmes
- policies, strategies and programmes under consideration
- specific issues of social exclusion
- regular scheduled transport services
- demand-responsive transport services
- the potential for combining passenger and goods in the same service
- the potential for operations serving multiple functions (e.g. general public/ health/education)
- the potential for cross-agency procurement or operation of services
- the potential for the deployment of telematics

ANNEX 3: GOOD PRACTICES HANDBOOK

Rural Transport in Europe: Good Practice Guide

A Report from the VIRGIL Consortium

April 2000

EUROPEAN COMMISSION

CONTENTS

About VIRGIL.....3

Introduction 4

The Projects:

Allarbus, Galicia, Spain.....6
Belbus Meetjesland, Belgium.....7
The Transport Co-ordination Centre, Devon, UK 8
KTEL Combined Passenger / Freight Service, Magnesia, Greece.....9
Kuxabussarna, Ockelbo, Sweden.....10
The Lisdoonvarna Mail Feeder Service Postbus, Co. Clare, Ireland.....11
Metro Rural Parcel Bus, West Yorkshire, UK 12
MobiMax, Achterhoek, Netherlands.....13
Siilinjärvi Service Line, Finland 14
TaxiBus Lüdinghausen, Germany.....15
TaxiTub, Douai, France 16
Videobus, Borgo Panigale, Italy.....17

Contacts and Other Information

Partner Contacts.....18
Website Addresses.....18
Further Information 18

About VIRGIL

VIRGIL is a research project funded by the European Commission DG TREN & DG Information Society as part of the Transport Programme within the 4th RTD Framework Programme. VIRGIL stands for 'Verifying and strengthening rural access to transport services'.

VIRGIL had two main aims:

- identifying and analysing good practice in rural transport, and disseminating the results widely
- identifying further research needs by consulting widely with key stakeholders

VIRGIL has had several components:

- a broad examination of the conditions under which transport in rural areas operates in 11 different European countries
- creation of a database containing over 100 examples of interesting rural transport operations, together with a review of relevant literature
- in-depth analysis of 28 selected cases
- extensive consultation with rural stakeholders across Europe
- specification of topics for future transport research
- dissemination of information through:
  - an international conference - Rural Transport 2000 - held in Lancaster
  - a website: **www.bealtaine.ie/virgil**
  - this guide to selected practice
  - reports - available from VIRGIL partners

INTRODUCTION

Purpose of this Guide

This guide features 12 different transport schemes providing innovative rural services across Europe. They vary enormously from each other in the vehicles used, the passengers carried, the geographical territory served, the way they are operated and the nature of the operator. However, they share a common feature - they have developed in unconventional forms that reflect the realities of operation in their locality.

There are examples of schemes that maximise flexibility by offering demand responsive services. Others seek to improve viability by making use of smaller vehicles, or combining passenger and freight carriage. Often, demand from different agencies is co-ordinated, so that vehicles and services are multi-purpose, avoiding duplication.

Rural transport innovation can transfer across national borders, as shown by the links between the UK Community Bus, the Dutch Buurtbus and the German Bürgerbus. We have attempted to identify and describe key features of each of these operations, so that readers can identify what may be appropriate to develop in their own area to meet local needs.

Background

Changes in the structure of the rural economy, particularly agriculture, fishing and extractive industries, have led to many rural areas experiencing a worsening in access to facilities and services.

Inherent in the nature of rurality is a relatively low density of population and geographical isolation. This can make the provision of effective services, including transport, difficult unless there is specific intervention by the authorities.

Conventional approaches to passenger transport, based on significant numbers of passengers travelling together, slowly lose their viability. The average trip is longer in distance and time than in an urban area, whilst vehicle and staff utilisation rates are lower. Trip costs are therefore higher and without a well-developed social subsidy system for fares, some or all of this will get passed on to passengers. This in turn can add to the decline as people either reduce their travel, or change to other modes – principally the private car.

Authorities in all countries with significant rural areas have recognised this problem as a major issue for the sustainability of rural community life. Many countries have established rural development agencies to work on the regeneration of rural areas. The contribution of the European Union to this process through its various development funding strategies has been considerable.

The difficult economics for rural passenger and freight transport has meant that there is great pressure to:

- obtain value for money
- make better use of resources
- develop new approaches.

Consequently, a lot of emphasis has been and continues to be put into developing new concepts for public transport. The **VIRGIL** study has examined many of these new concepts.

Demand-Responsive Services

One response to the value for money pressure has been to consider that a service should only be put on when there is an actual demand. This approach can be particularly appropriate to very low-density areas, and also makes use of existing resources - taxis - as an integral part of a public transport network. Unit costs may be high, but low numbers travelling mean that overall costs remain reasonable, and certainly less than conventional alternatives.

Several different models exist, some stand-alone (e.g. Taxitub in France) and some linked to mainline bus services (e.g. Belbus in Belgium). Some follow pre-determined routes but only run when booked (e.g. Taxibus in Germany); some follow scheduled routes but divert on demand; some are completely flexible with regard to times and routes (e.g. Mobimax in the Netherlands).

Use of Telematics (ICT)

Provision of adequate travel information so that potential users can be confident in the service on offer, is vital. This is particularly important for demand-responsive services which need to be understood by locals and visitors alike. Greater use is now made of telematics or ICT (Information & Communications Technologies), for booking purposes (e.g. Videobus in Italy), automated scheduling (e.g. Taxitub) and for ensuring links to other services (e.g. Belbus).

However, the rate of change in this field is considerable. It is clear from the **VIRGIL** research that there is great potential for increased use of ICT to improve attractiveness and performance of rural transport services.

Freight-Passenger Mix

One approach to improving service viability is to combine regular passenger and freight movements into and out of a particular rural area. This commonly involves the main postal delivery operation (e.g. Postbus in Ireland), but other models have been developed. These can be widespread throughout a regional network (e.g. KTEL in Greece) or confined to certain rural routes (e.g. Metro Parcel Bus in UK), but both contribute to local economic viability.

Access to All

Traditionally, transport services for disabled people in rural areas were provided separately, if at all. However, a combination of economies of scale and consideration of the rights of disabled people to be fully integrated into society, means that new service developments are specifically designed to be accessible to people with different disabilities.

These include main line services as well as those that are partly (e.g. Siilinjärvi Service Line in Finland) or fully (e.g. Mobimax) demand responsive.

Co-ordination

A common suggestion for improving rural transport is to co-ordinate existing services. This is clearly easier said than done, as there are many practical and organisational barriers to overcome. However, experience suggests that once the effort is made, there is a noticeable improvement in service standards, and that this is maintained.

Such co-ordination may take place at an operational (e.g. Siilinjärvi Service Line) level, or across a network (e.g. Kuxabussar in Sweden) or at the organisation level concerned with planning and procurement (e.g. Devon TCC in UK).

Summary

There is a continuing challenge for transport systems in rural areas – how to ensure short walk distances, certainty of interchange, minimum journey times and good route links, without creating a system that is too expensive to be viable. This challenge reinforces the need to integrate services, to avoid expensive duplication, and to make best use of technology. The services presented in this **VIRGIL** guide offer examples of successful approaches to this challenge.

ALLARBUS, GALICIA, SPAIN

Allarbus is a private company owned by the municipal authority in partnership with local transport operators. It runs scheduled public transport in the area, as well as providing transport for other municipal institutions such as schools, sports clubs and cultural clubs. Light freight is also carried.

INTRODUCTION

Allariz municipality is located in Galicia, in the north west of Spain, 20 km from the provincial capital, Ourense. It covers 86 km^2 and has a population density of 62 per km^2.

The scheme started in June 1993. The scheme was initiated by the municipality with the aim of providing transport for the villages in its territory. The authority has a 51% stake in the company, the remainder being owned by transport operators from the area.

MAIN FEATURES OF THE SERVICE

There are nine scheduled public services - six different routes with four services per day plus three others with one service three days a week. Additional private services run during term time - scholars and nursery trips (4 services per day), transport to sports centres (2 services per day). Regular daily scheduled operating hours are 08:00 to 20:00. The operation centre also handles bookings for private hire of vehicles for one-off events.

Unaccompanied packages may be carried, charged at the same rate as a passenger.

There are four vehicles, three minibuses (15-17 seats) and a midibus (25 seats). There are five full-time and one part-time drivers, one full time and one part time administrator/manager, and three part-time escorts for nursery journeys.

Timetables are co-ordinated to connect with other public transport services, particularly with an hourly service from Allariz to the main town of Ourense.

Brochures describing the service and giving timetables are available, but there is no specific marketing strategy, as the service is well known locally. Timetables are displayed at bus stops.

LEGAL BASIS

The vehicles have municipal licences for local travel, and licences from the regional Department of Transport for longer distance travel. There were initial problems getting these latter licences because of existing holders. These licences are needed for long distance excursions.

The local concession between the municipality and Allarbus did not involve competitive tendering, but does require the provision of a school service to the remoter settlements.

OPERATIONAL INFORMATION

Scheduled services are used by the general public. The regular dedicated services are used by schools, nurseries, clubs etc. In addition, there are one-off journeys e.g. for sports competitions and cultural activities.

USE OF TECHNOLOGY

Computer software is used for managing service data and for communicating with other companies, via modem links, in respect of ticket sales. The central station in Allariz has a real-time video display of timetable data, including Allarbus.

LOCAL IMPACT

There was no previous public transport in the villages served. The scheme has led to an increased interest in public transport which in turn has led to improvements to services run by other companies in the area. Taxis in Allariz have lost some business, although most Allarbus trips are genuinely new demand, stimulated by the improved service and low fares. Taxis have also made an effort to improve the quality of the service they offer, by ensuring greater availability at taxi ranks.

SUMMARY

- A public/private collaboration to improve local transport
- Company owned by municipality and private operators
- Municipality retains controlling interest
- Scheduled public transport services
- Regular runs for other agencies, e.g. clubs, schools, nurseries
- Additional one-off jobs

KEY STATISTICS
Passenger Trips: 72,000 p.a. (scheduled and regular services)
Average Fares: €0.72 (Discount travel available for regular travellers)
Costs: €0.54/passenger trip, €0.45/km
Revenues: €40,000 from scheduled services €50,000 from other services
Seat Occupancy: 62.5%

BELBUS MEETJESLAND, BELGIUM

Belbus is a flexible rural midibus service which operates on request between a network of identified bus stops. This provides a more frequent coverage than the previous fixed route services.

INTRODUCTION

The scheme serves the municipalities of St-Laureins, Kaprijke, Assenede, and Eeklo in the west of the country near the Dutch border – an area of 225 km^2 with a population of 45,140 (200 persons per km^2).

The scheme started in June 1997 as a result of a mobility covenant concluded between the participating municipalities, the regional government and the regional public transport operator. This provided funds for the transport operator to deliver the Belbus service. The municipalities agreed to increase public transport service promotion.

The regional government makes available additional public transport funding for municipalities initiating mobility covenants. This policy has been quite successful in initiating service improvements.

Part of the catchment area (about 30% of the stops served by the Belbus) was previously covered by a regular bus service running roughly every two hours. This service has been maintained following the Belbus introduction.

About 60% of the stops now covered by the Belbus was previously served by a relatively poor bus service, which only gave a peak hour, Mondays to Fridays, coverage. Most of these services have been maintained as well.

About 10% of the stops served by the Belbus was not previously served at all by public transport.

MAIN FEATURES OF THE SERVICE

The service runs hourly, seven days a week, from approximately 06:30 to 21:00. It operates between recognised stops (there is no door-to-door service), but routes are flexible, and are adjusted as appropriate.

Bookings are made by telephone (open 12 hours per day on weekdays, 8 hours on Saturdays, closed on Sunday).

The vehicle used is a wheelchair-accessible midibus. There are 3 full-time drivers and 1.5 full time equivalent operators taking telephone bookings.

The service provides excellent connections to the hourly rail service at the local railhead, Eeklo, as well as with local bus services from Eeklo. There are no systematic connections to bus services at other locations.

The fare system is fully integrated with other local bus services, as well as with rail services in respect of weekly, monthly or annual passes.

Timetables are displayed at bus stops. Belbus leaflets were distributed to every local household when the service was launched and are now available on request from the public transport company.

LEGAL BASIS

The publicly-owned public transport company, De Lijn, has a monopoly of urban and local public transport within the region. In Meetjesland, the operation of the Belbus is sub-contracted to a private bus operator. The contract was granted for an unlimited period with a 5 year term of notice. However the process is to be opened to competitive bidding. Recently, five years advance notice was given of the termination of the contract and De Lijn will issue a call for tenders requiring competitive bids. The new contracts will be valid for a fixed period of 5 years.

Compulsory vehicle safety checks are made on the bus every three months.

OPERATIONAL INFORMATION

Most passengers (80%) travel to and from Eeklo, the main local town and transport hub for train and bus services.

There are 13 journeys scheduled every day in each direction, but in reality only about 70% of these services run (Sundays 40%), since the bus only makes a journey when a booking has been made. Use of the service is still rising, with an average 55 passengers using the service each weekday.

Costs per year are €217,000, whilst revenues are €9,344. To cover this area using conventional bus services would require three separate lines at an estimated cost of €0.61/km excluding labour. The existing scheme, utilising one vehicle, including the cost of reservation staff but excluding all other labour, costs €0.38/km.

USE OF TECHNOLOGY

Telephone calls to make reservations are answered manually, but once details of the requested journey have been entered, routing and other functions are handled automatically by software known as Ring, developed for the purpose by De Lijn. Vehicle position is monitored using GPS, and mobile telephone contact with drivers allows routes to be diverted if last minute reservations are received. There is no real-time information system for customers.

Ticket issue uses the Prodata system, in common with all bus services in the area. Fares are calculated on a zonal basis.

LOCAL IMPACT

Use of local services: the share of public transport remains too small to see any significant increase of local services. Mobility of elderly people, young people and other people without cars has increased significantly, now allowing nearly every trip at any time of the day. According to a survey, the necessity for reservation is not considered to be a major disadvantage.

SUMMARY

- No fixed stops – an on-demand service only
- Flexible routing enables one vehicle to cover a large area
- Fully wheelchair accessible

KEY STATISTICS
Journeys Made: average 18 p.d. *Passenger trips:* ca. 55 p.d. (weekdays) *Fares:* Standard bus fares *Costs:* €217,000 p.a. €1.30 / km *Revenues:* €9,344 p.a.

TRANSPORT CO-ORDINATION CENTRE, DEVON, U.K.

Devon County Council organises all its passenger transport through its Transport Co-ordination Centre (TCC). The TCC uses its central position to develop innovative rural services using both commercial and community-based operations.

INTRODUCTION

The TCC was established in 1986 as the County Council's focal point for the transport of passengers, meals, small and large goods, vehicle hire, subsidised local bus services, development of rural and community transport initiatives and the rail network. In 1988, it took on the Fleet Management function when vehicle repair and maintenance was subject to Compulsory Competitive Tendering.

MAIN FEATURES OF THE SERVICE

The TCC is organised as a free-standing cost centre, with its operating costs being recharged to users - mainly from elsewhere within the County Council. It is not mandatory to utilise the TCC - this was a deliberate strategy to ensure continuous pressure on the TCC to offer its customers better value than they can obtain elsewhere.

The TCC has four teams:

- Client Services
- Public Transport
- Fleet Management
- Support Services (for the other three)

Client Services organises transport for home to school, to social services centres, one-off trips out for schools, day centres and colleges, meals on wheels deliveries, as well as transport for some external agencies in the health and voluntary sectors.

Public Transport manages some 180 bus services supported by the County, a 'Countywide' concessionary fares scheme (on behalf of the Districts), transport information and publicity, some specialist accessible services, support for community transport projects and rail initiatives and some capital projects.

Fleet Management covers some 1,500 vehicles and plant, vehicle specification, design and procurement services, repair and maintenance, driver tests, fuel management, vehicle taxation, etc..

LEGAL BASIS

Although it operates as a cost centre, the TCC is part of the County Council which is a passenger transport, education and social services authority. The Council has no powers to run its own public bus services and has a duty to put most of its service support out to open competitive tender. The TCC can issue Permits allowing not-for-profit, non-public minibus operation, and can run its own school and social services buses.

OPERATIONAL INFORMATION

Most transport is provided by external operators on contract to the TCC. Use is made of 'operation only' contracts (i.e. the TCC provides the vehicles), especially where accessible minibuses are involved. A single vehicle will work for different departments or even external clients, during the day. This might include providing a day centre service at peak times, a demand-responsive door to door service (Ring & Ride) in between, with scheduling provided by a local voluntary organisation, with group hire, with or without a driver, in the evenings.

In planning services, the TCC attempts to develop an approach that meets the client department's specification whilst providing the greatest 'corporate' benefit, for the County Council and for the community.

The arrangements for recharge are important. Direct costs are separated out from TCC overheads and charged to clients. This means that if clients want a whole vehicle and driver themselves, they will pay more, but if they are willing to share (for example, by adjusting their requirements) they will pay less. Overheads are allocated on the basis of staff time records. Guide prices are agreed at the beginning of the year and staff effort is managed to stay within this budget. This is more appropriate than a % on-cost as it better reflects staff effort, gives more incentive to the TCC to manage staff well, and gives clients less incentive to do the work themselves to save a standard mark-up.

USE OF TECHNOLOGY

The operation depends upon conventional, non-specialist databases to hold and exchange information about routes, vehicles, staff, operators, etc.. Some local, small-scale scheduling systems exist. A pilot rural Smartcard project targeted at college pupils is starting in North Devon.

LOCAL IMPACT

The role of the TCC expanded following deregulation of bus services, particularly in developing unconventional services and attracting external finance. Activities supported include:

- 6 community buses (local bus services driven by volunteers)
- 14 voluntary car (lift-giving) schemes
- 11 Ring & Ride schemes (door to door transport for elderly and disabled people)
- over 100 local transport representatives
- the Devon Accessibility Guide (directory of accessible services and facilities)
- a Community Transport Action Pack (advice on different schemes)
- a network of Rural Transport Forums, supported by a Development Officer, to identify local needs and encourage local co-ordination
- the Devon and Cornwall Rail Partnership, to promote branch rail services

SUMMARY

The TCC develops cross-agency transport co-ordination to provide a wide range of innovative rural transport services.

KEY STATISTICS
Staff: 39
Own Fleet: ca. 400 passenger vehicles (cars, MPVs, minibuses and buses)
Passenger trips: 20,000 p.d. (education) 2,000 p.d. (social services) + 180 bus services
Concessionary Passes Sold: ca. 25,000
Contracts Managed: ca. 1,500 daily
Turnover: €32.3m (1999/2000) - school transport (55%), social services (3.5%), public transport (11%), fleet (28%)
Costs: €1.8m

KTEL COMBINED PASSENGER / FREIGHT SERVICE, MAGNESIA, GREECE

A scheme which provides transport for passengers, and for small parcels, on all rural and inter-urban bus services in the prefecture of Magnesia.

INTRODUCTION

Magnesia, with an area of 2,636 km^2, has around 200,000 inhabitants spread across mountains and plains. A third of the people live in rural areas, half of which are on the slopes of Mount Pelion connected by narrow, winding roads. The capital, Volos, is a major port connected to Skiathos, Skopelos and Alonissos. Two of these islands have local bus services. KTEL has been operating its small parcel service since 1952.

MAIN FEATURES OF THE SERVICE

KTELs (Koinon Tameion Eispraxeon Leoforion, in effect, Bus Owners' Co-operative) are the only operators in Greece allowed to provide inter-urban (which includes rural) bus transport. In exchange for exclusive rights to inter-urban routes, KTELs are required to maintain a basic rural service. The Magnesia KTEL operates its small parcel service on all passenger operations throughout the prefecture.

Regular bus services operate between the hours of 05:00 and 24:00. A typical village in the rural area would receive a service twice a day. Timetables and routes are fixed, although in practice drivers stop on request in rural areas to pick up either a passenger or a parcel. Services operate individually and are not co-ordinated.

Although in urban areas, parcels must be despatched at bus stations, in rural areas they may be handed directly to the driver or picked up at the kerbside. Typical parcels carried include auto parts, documents, and films for development. This is also the cheapest way to distribute newspapers and magazines, and almost constitutes a social service. Where populations are small, distribution agencies will not expand their delivery network. Residents of villages, especially elderly people, depend on the parcel service for their daily newspaper.

There is no seat reservation in rural areas - if all seats are taken, passengers stand. But it is rare for buses to fill up.

There is no reservation system for parcels. Those handed to the central office usually travel on the next available bus. It is very rare for the cargo bays of a bus on a rural route to fill up with baggage and/or parcels. At the other end, the recipient will have to fetch the parcel from their local Bus Station.

Vehicles used are regular 50 seat buses, typically Mercedes, Volvos or Renaults, locally coachbuilt. None are adapted for wheelchairs. A specific section is reserved in the cargo bay for parcels.

There is one driver per bus, and, the KTEL being a drivers' co-operative, the driver is in most cases also the owner of the vehicle. A limited number of staff drivers are used to supplement the owner drivers. Inter-urban seat reservation is handled by a staff of four at the bus station, working two separate shifts. Four more people there work on parcel despatch.

There is no marketing of the service since it is known to virtually all residents of rural areas.

LEGAL BASIS

The Ministry of Transport oversees KTELs. The prefecture Transportation Office is responsible for evaluating services and ensuring that the level of rural service is maintained. Route and timetable changes must be approved by this office. Whilst these might affect the parcel service, this is not considered a priority by the authorities. Buses pass safety and mechanical inspections every year. Public buses are not required to have seat belts.

OPERATIONAL INFORMATION

Service use has been essentially stable for the last five years. If anything, there is a trend to additional services in the summer in response to increasing numbers of tourists.

When a parcel is handed to the driver in a village or by the roadside, the cost is the same as a ticket for a passenger making the same trip. This applies to small packages; bulkier items will be accepted only at central stations, where they can be weighed.

The small parcel service is complementary to the passenger operation and does not entail additional cost. Overall it is profitable for KTEL. Provided the operator continues to provide passenger transport in rural areas, parcel transportation will continue.

USE OF TECHNOLOGY

A computer system keeps track of parcel movements from four of the urban centres outside Magnesia, but is not used where parcel journeys originate in more rural areas. Apart from this there is no innovative use of technology in the scheme.

LOCAL IMPACT

This is a traditional service designed for convenience rather than speed. It cannot compete with couriers for rapid delivery, but provides cheap parcel distribution that enables aspects of village life to continue.

SUMMARY

- A monopoly public operator running partially subsidised rural bus services
- All services carry small parcels as well as passengers
- Carriage of some parcels, e.g. newspapers, is seen as a lifeline by small communities
- Booking is possible, but not essential, for both passengers and parcels

KEY STATISTICS

Rural Services: ca. 30 p.d.
Average Trip Length: ca. 40 km
Fares: €4 for a 40 minute trip
Costs / Revenues: KTEL does not maintain separate statistics for rural areas
Seat Occupancy: 40%

KUXABUSSARNA, OCKELBO, SWEDEN

A completely free, fully scheduled bus service, well integrated with other public transport services. Careful planning and the use of appropriate vehicles have enabled passenger numbers to be increased at no extra cost. Vehicles also carry freight.

INTRODUCTION

Kuxabussarna operates in the municipality of Ockelbo, 360 kilometres north of Stockholm. The population of Ockelbo is 6,400, half living in rural areas. The population density of the region as a whole is 16 per km^2.

The scheme was initiated by the municipality of Ockelbo in 1995 to demonstrate the potential for improving public transport in a rural area, particularly to increase both public transport use by motorists and the area served by buses. The plan was to combine existing mainly public funded services in the area (school services, medical patient services, and services for elderly and disabled people), and to make them accessible to the general public. It was anticipated that using appropriately-sized vehicles would deliver savings.

MAIN FEATURES OF THE SERVICE

Buses run between 06:00 to 17:00 Monday to Friday, on eight different routes designed so that 70% of local inhabitants live within 300m of a bus stop. Frequencies vary across the day, with a maximum hourly service.

The routes are designed to connect with regional services to larger towns, so that they can be used by commuters. Passengers typically travel between 10 and 40 km.

Kuxabussarna is a regular, scheduled service, so there is no booking system. Since the vehicles are not wheelchair accessible, an accessible taxi service is retained for more disabled travellers. One exception to the scheduled services' fixed route is that buses will extend their run beyond the end of the normal route to collect or deliver disabled people living nearby. This does not affect the timetable, or the other passengers.

The buses also carry freight. Bookings are made through the contractors, and the system is integrated into a nation-wide system called Bussgods.

The service is contracted out to three separate companies. Six vehicles are used, mostly medium sized, although the largest seats 60. Eleven staff provide an average 34 hours daily between them.

A pamphlet about the “Kuxa” system was delivered to all households when the scheme was introduced. In addition timetables are distributed twice a year to the households in the municipality to keep the inhabitants informed. Changes to published routes and timetables are displayed on the Ockelbo website. There are frequent references to the scheme in the local media.

LEGAL BASIS

The service uses standard bus service licences. Four year contracts are awarded to contractors after competitive bidding.

OPERATIONAL INFORMATION

Commuters use the service to get to work in some of the larger villages. 40% of services go to schools, so use among school pupils is high (some schools have adjusted their timetables to fit in with Kuxabussarna). Despite the fact that it is not wheelchair accessible the service is used by significant numbers of disabled and elderly people. Since the introduction of Kuxabussarna, use of special accessible taxis has decreased.

The freight system is used by the municipal administration for their internal post, by pharmacies, the postal service, local bakeries and other companies.

Since the service is free to passengers, all the annual €375,000 costs are met by the local municipality. This represents a minor saving to the authority compared with the cost of pre-existing services. It was calculated that the cost of collecting fares would exceed their value.

USE OF TECHNOLOGY

Use of specialised technology is minimal since no reservation or ticketing is involved. Timetables and information are available on the Internet. Contact with vehicles is by mobile phone.

LOCAL IMPACT

As stated earlier, the service is used by commuters, schoolchildren, and others, including disabled people. A questionnaire survey in 1996 showed that passengers were very satisfied with the service, and that over half thought the service was an important contribution to rural viability. Adult passenger numbers have increased fourfold when compared with the situation before the scheme was introduced.

Future plans include:

- expansion of the system
- use of accessible vehicles
- better integration with other public transport services and regional routes
- improvement to passenger information

SUMMARY

- Scheme combined pre-existing publicly funded services transport, reduced vehicle sizes and opened service to general public
- Free scheduled service
- Fourfold increase in adult passenger numbers
- Increased value for money

KEY STATISTICS
Vehicle kilometres: 270,000 p.a. *Passenger Trips:* 1997 = 700 p.d. (1994 = 300 p.d.) *Seat Occupancy:* 90% *Average Fare:* Free *Costs:* €2.32/passenger trip, €1.39/km, €375,000/year

THE LISDOONVARNA MAIL FEEDER SERVICE POSTBUS, CO. CLARE, IRELAND

A scheduled public transport service operated by An Post, the state-owned Irish postal service, which combines the transport of passengers with the collection and delivery of mail from and to local post offices. The service is used by local adults for travel to work, by pensioners to collect their pensions and to go shopping, by schoolchildren, who are not eligible for school transport, and by tourists visiting the area.

INTRODUCTION

The scheme serves an area of about 400 km^2 to the north and west of the town of Ennis, the county town of Clare, on the western seaboard of Ireland. The population of the area served (excluding Ennis) is approximately 8,000 with most of the population contained in the five small towns in the area.

The service was introduced in 1982 as a pilot scheme and has been operated continuously since then.

MAIN FEATURES OF THE SERVICE

The service operates to a fixed route, calling at 12 sub post offices and 11 wall post boxes, to a set timetable. The route is a circular one, going one way round in the morning as it delivers to the 12 sub post offices (a two-hour round trip). In the afternoon the route is reversed and the bus collects from both the sub post offices and the wall boxes (a three-hour round trip). Passengers can hail the bus between stops, but it does not divert off the fixed route. The service operates five days a week, with additional Saturday services in the period before Christmas. There is no provision for booking seats in advance.

One vehicle is used – a small minibus with eight passenger seats and a 5m^3 secure section for the transport of mail. There is improved access (drop down step) at the front entrance for people with reduced mobility, but there is no access for wheelchairs. Staffing is limited to two drivers, one for each shift, taken from a pool of fifteen.

The service provides access to longer distance bus services which leave from Ennis, and which connect with other parts of the country.

Due to the fact that the Postbus has very limited passenger capacity, the level of marketing is restricted to provision of timetable and route information at the main Post Office in Ennis, at the post offices served by the Postbus, and at tourist information points in the area.

LEGAL BASIS

Ennis Urban District Council (Local level) issues a Small Passenger Vehicle Licence (Annual Taxi Licence). The Irish Department of Public Enterprise (National level) issues an Annual Passenger Licence.

OPERATIONAL INFORMATION

The service operates in an area where there is a limited, or in parts non-existent, public bus service. It enables people to make local journeys between the scattered communities in the area, to travel into the county town for work, shopping and personal business, or to connect with longer distance bus services to other parts of the country. It provides a very useful service for visitors and tourists as it enables them to access some of the most important tourism areas and facilities in Clare.

LOCAL IMPACT

The service is much appreciated and is used by local adults to get to work, pensioners to collect their pensions and to go shopping, by schoolchildren, who are not eligible for school transport, and by tourists visiting the area. For most of the area, it is the only form of regular public transport service.

SUMMARY

This service is a small scale service, which is operated as an integrated part of An Post's existing operation. It is financially viable and provides a vital service to the people of an area with little or no public transport service. It is however worth noting that this service is unique in Ireland and there appear to be no plans to test such a service elsewhere in County Clare or in Ireland. Certain specific conditions are required for such a service to be feasible. These include: suitable operational conditions for An Post; the lack of alternative public transport services in the area; low levels of actual demand.

KEY STATISTICS

Vehicle kilometres: 224 p.d., 53,500 p.a.
Passenger Trips: 10 p.d., 2,620 p.a.
Average Trip Length: 40 km
Costs: €6.84/passenger trip, €0.26/km, €13.21/operating hour, €66.05/day, €332.81/week, €17,306/year
Revenues: €0.30/passenger trip, €0.15/km, €6.10/operating hour, €30.48/day, €154/week, €8,000/year
Seat Occupancy: 62.5%

METRO RURAL PARCEL BUS, WEST YORKSHIRE, U.K.

The Metro Parcel Bus scheme operates on six separate routes in rural West Yorkshire. It provides both passenger and light goods transport in areas with little pre-existing public transport service.

INTRODUCTION

West Yorkshire has a significant rural area, with villages and small towns in the valley bottoms, and smaller settlements on the open moorland above where high numbers of elderly residents live. Most public transport services connect the larger villages and towns. The Parcel Bus services are a response to concerns that residents without access to cars were experiencing real hardship.

The services were designed in consultation with user groups and local councils. The first service was let on 1 March 1999.

MAIN FEATURES OF THE SERVICE

The services are run by a number of different private operators, under contract to Metro (West Yorkshire Passenger Transport Executive, the executive arm of the transport authority). All services use wheelchair accessible minibuses staffed by a single driver.

The most frequent service (Route 934) operates for 19 hours daily, the least frequent (Route 937) for 6½. Most services operate six days a week, although 934 has a limited service on Sundays, and two others only run on three days a week.

Some services run to fixed schedules, some are hail-and-ride, and some are demand responsive. In the country, they stop anywhere that it is safe and convenient to do so. Four routes operate off route (within a mile) to pick up and/or set down pre-booked passengers especially disabled persons. One also operates via Huddersfield Royal Infirmary for pre-booked passengers. Bookings are made directly with the driver via a hands-free mobile phone, thus eliminating scheduling costs. Users also telephone drivers directly to check estimated arrival times, and the availability of space.

At present, only small scale passenger and freight integration takes place, through delivery of parcels, messages (shopping), and prescriptions. Metro is currently investigating the carriage of other community goods such as newspapers. Bookings for the collection and delivery of parcels are made in the same way as those for passengers. All parcels are charged at 50p per delivery, and must be handed to and collected from the driver in person. Published guidelines for parcel carriage cover such issues as wrapping, contents and non-delivery.

Separate timetables produced for each route contain direct phone numbers for the drivers, and for Metro's Rural Transport Team to encourage a "hands on" approach. Where appropriate, information about connecting services, including rail times, is included. Service information is on the Metro website and will be available on the new national Public Transport Information system. Metro distributed a regular newsletter to community outlets such as libraries. Some service launches have had linked promotions, such as reduced admission to tourist venues.

LEGAL BASIS

All routes are registered local bus services, requiring any successful tenderer to have an Operator's licence and drivers to possess a PCV driver's licence. The operation of wheelchair accessible vehicles is subject to national guidance.

OPERATIONAL INFORMATION

The initial contracts were for one year, but all will continue until at least the end of the financial year 2000. The service is still in its early stages but is regularly used by a significant number of people - between 35 and 65 passengers per day on the more established routes. The parcel service is currently under-used, but this is regarded as a marketing, not a demand issue and appropriate measures are being taken.

Fares generally follow local commercial scales. The maximum fare for journeys of 20 kilometres and over, for any route is £1.50. The standard Metro concessionary fares and travel pass schemes are valid on all routes. Suitably zoned Metro travel passes can be used on buses and trains to provide through ticketing. Talks are in hand for through bus-rail ticketing for a number of the services.

The additional cost to Metro of running these six services is €455k per annum; all these costs are met by the UK central government through the Rural Bus Service Grant, and/or the Rural Bus Challenge fund.

USE OF TECHNOLOGY

All buses / drivers have a hands-free mobile phone. An integrated vehicle tracking, communications and real time information system is planned for service 934. Traffic planning and management systems are to be developed experimentally with services 934 and 935. Ticket machines vary between Almex hand operated and Wayfarer Mk3.

LOCAL IMPACT

The services provide new links along routes that were previously poorly served by conventional public transport, so have had little impact on existing operators, including, surprisingly, local taxi operators. Apart from providing better links, these services allow improved access to local facilities (shops etc.) by communities who were previously forced to travel to the larger urban areas.

SUMMARY

- Six wheelchair-accessible minibuses operating six different routes linking small rural settlements
- Transport of passengers, and of small parcels
- All bookings handled by the vehicles' drivers using hands-free mobile phones
- Pilot project heavily subsidised by central government

KEY STATISTICS
Routes/vehicles: 6
Frequencies: Routes vary: 6 to 33 p.d.
Passenger Trips: 33 to 64 p.d. on more established routes
Maximum Fare: €2.42
Costs: €455,000/year net of revenue

MOBIMAX, ACHTERHOEK, NETHERLANDS

MobiMax is a demand responsive service using easily accessible minibuses. It is open to the general public, and is completely flexible regarding routes, stops and timetables.

INTRODUCTION

MobiMax operates in the region of Achterhoek, a rural area in the eastern part of the province of Gelderland in the Netherlands, located near the border of Germany.

MobiMax became available to the public in March 1998, having operated as a system for disabled people since October 1997. Previously, some places in Achterhoek were served by so-called "line taxis", which had a fixed itinerary and timetable. In contrast to regular bus services, line taxis only travel when actually requested.

In other places, minibuses driven by volunteers provided additional rural bus services and there were some special transport experiments for disabled people.

MAIN FEATURES OF THE SERVICE

Reservations are made by telephoning the Travel Dispatch Centre (in Dutch: Regionaal Vervoers Centrum, RVC), an organisation of regional taxi companies. This uses software that automatically creates clusters of individual bookings and allocates these to vehicles. The system is very flexible, but known regular rides are booked and clustered in advance.

The service is provided using twelve wheelchair accessible eight-seat minibuses. It provides 17½ hours coverage each day.

Connections to other bus and train services are guaranteed when reservations are made at least two hours in advance.

A leaflet providing detailed information about using the service is distributed to all households in the service area. MobiMax is also included in the nationwide "OV Reisadvies", a telephone travel information service covering all public transport modes.

LEGAL BASIS

MobiMax operates under the taxi licence scheme administered by the central government. The contract was awarded to RVC after competitive bidding administered by the local and national authorities. Vehicles must meet standard safety regulations.

OPERATIONAL INFORMATION

Although it is open to all members of the public, the service is used almost exclusively (93%) by people with some degree of physical disability. This is a much higher figure than anticipated. Most people use MobiMax to visit family and friends (48%). Other travel purposes include visiting medical institutions (16%), public facilities (6%), shopping (5%) and sport (5%).

Annual fare revenues of €273,000 cover about 9% of the €3,000,000 costs. Every municipality in the region supports the project with about €11 per inhabitant. For each passenger trip the Dutch government pays an amount to the province of Gelderland for allocation to the project.

USE OF TECHNOLOGY

PlanVision software is used to assist the scheduling process and calculation of fares. Onboard computers communicate with the PlanVision software.

All vehicles are equipped with the navigational system, Carin (a speaking computer), to calculate the shortest or fastest route. Mapping is integrated with Carin in the on board computer.

LOCAL IMPACT

Thanks to MobiMax all inhabitants of Achterhoek have access to public transport (bus and train). Besides that, disabled people can travel throughout the whole region.

The experiment will continue until June 2001. Recently it has been evaluated and the authorities are now deciding whether to take it on as a regular transport service rather than an experiment. It is clear that most passengers welcome the ability to travel independently, without help from neighbours or family.

Some time prior to MobiMax, national legislation was amended so that elderly people identified as having physical disabilities may use facilities created for disabled people. A lot of elderly people have difficulty using regular public transport systems. With MobiMax they can travel independently at times they choose themselves.

This fact may have created an image of MobiMax as a service exclusively for disabled people. Extra effort is now being made to emphasize that MobiMax is available to the public at large. The view is that MobiMax must become more attractive to the general public. Talks between RVC and public transport providers in the region have begun, and a specific enhancement to the service in September 1999, means that 'public' passengers can travel longer distances than before.

SUMMARY

- A very flexible on-demand transport operation
- All vehicles wheelchair accessible
- Open to all, but used almost exclusively by disabled people

KEY STATISTICS
Passenger Trips: 1,000 p.d. *Costs:* €8.20/passenger trip, €3,000,000/year *Revenues:* €0.75/passenger trip, €273,000/year

SIILINJÄRVI SERVICE LINE, FINLAND

A single accessible minibus, reserved for day-centre use for four hours per day, and then used as a dial-a-ride service for public users. The dial-a-ride serves different areas on different days of the week. Three of the areas are served by minibus and two areas with minor demand are served by taxis.

INTRODUCTION

The scheme serves the municipality of Siilinjärvi in the Pohjois-Savo Region in eastern Finland, an area of over 500 km^2, with a population density of 38 per km^2.

The scheme started in February 1999 - the idea was the brainchild of Mr. Juha Elomaa, a local transport engineer. Previously, four of the areas were served by dial-a-ride taxis, three times a week during summer holidays only. One of the areas has never before been covered by this kind of service.

MAIN FEATURES OF THE SERVICE

A key feature is the provision of transport for two day centres: a work centre for disabled people and a day centre for elderly people. The bus is reserved for the use of these centres from 07:00 to 09:00 and from 14:00 to 16:00. Because of the variation in timetable and routes of the trips to day centres, it is difficult to offer the service to the general public during this time.

Between 09:00 and 14:00, and again from 16:00 to 17:00, the vehicle operates a semi-scheduled dial-a-ride service. In the early morning (06:00 to 07:00) and at the end of the day (17:00 to 18:00), the bus operates a scheduled route service in one local area. This also feeds into other public transport services at the bus station. The only fixed stop during the dial-a-ride operation is the bus station which is visited once an hour. Different parts of the municipality are served on different weekdays.

Bookings are made by telephoning the Travel Dispatch Centre (TDC), operated by the city of Kuopio. The TDC amalgamates bookings to produce routes and timetables, and informs the vehicle's driver via a vehicle data terminal, provided by a mobile phone connected to a small computer terminal.

Three reservation staff work in the TDC, but they also take bookings for four other schemes in the region.

The bus is owned by a private bus company which provides the drivers. The vehicle has sixteen seats plus accommodation for two wheelchair users. There is also one extra wheelchair in the bus e.g. for moving elderly or physically disabled people who have difficulty walking, for example on icy ground. The taxis used have four to eight seats.

The scheme has been publicised in local newspapers, and by leaflets distributed to households. Agencies working with disabled people have sent letters to their clients.

LEGAL BASIS

The scheme operates under normal bus and taxi licences issued by the provincial state authority. Any licensed operator may bid for work, with contracts awarded for one year.

OPERATIONAL INFORMATION

The greatest users of the scheme are elderly people and disabled people: 75% are over 70 and 22% use some kind of mobility aid. Research shows the following reasons for using the service:

- shopping: 57%
- banks, pharmacy and offices: 29%
- medical: 7%
- recreation: 4%
- day care centres: 3%.

All normal bus tickets are valid, with some additional concessions (e.g. ½ price for passengers over 65 years, wheelchair users free, assistants free, children under 4 years free and strollers with companion free). The normal national smart card system and regional card systems are valid.

The total gross operating cost is €77,366 p.a.. Siilinjärvi's share of the TDC's costs was about €16,000 in 1999.

Fare revenue covers about 30% of costs. Central government contributes to the TDC's costs. The remaining costs are met in equal share by the municipality and the provincial government.

The scheme's introduction has resulted in a considerable increase in the level of public transport service. In two areas, the service has expanded from a 3 month period to a round-the-year service and one part of the municipality has never been covered by this kind of service before. This has only resulted in a 10% increase in the municipality's transport costs.

USE OF TECHNOLOGY

Telephone bookings are entered by TDC staff into a special Finnish software program which schedules the trips and organises routes. Details are then passed electronically to a vehicle data terminal device. Requests for taxis are first faxed to the taxi centre, which transmits them to local taxi drivers via taxi data terminals. National smart cards can be used on the bus. There is no real-time information system.

LOCAL IMPACT

About half of the passengers say that their mobility has increased since the scheme's introduction. The bus is often full and this is why there is pressure to increase the number of vehicles deployed. It is highly probable that a second bus will be taken on in forthcoming years. This would enable better integration of school trips into the main scheduled bus service.

SUMMARY

- A single accessible minibus, reserved for day-centre use for four hours per day, and used as a dial-a-ride and a scheduled service for the remainder
- Serves different areas on different days of the week
- The service is supplemented by dial-a-ride taxi in certain areas with lower demand
- Users are predominantly elderly people

KEY STATISTICS
Vehicle kilometres: Bus: 300-330 p.d., Taxis: 70 p.d.
Passenger Trips: 130 p.d. and growing
Average Fare: €1.36
Costs: €2.50/passenger trip, €0.88/km, €77,366/year
Revenues: ca. 30% of costs

TAXIBUS LÜDINGHAUSEN, GERMANY

An on-demand service using taxis, visiting fixed stops to a fixed timetable. Only those stops for which reservations have been made are visited.

INTRODUCTION

TaxiBus covers an area of about 650 km^2 in the district of Coesfeld, north of Dortmund in the federal state of Nordrhein Westfalen in the mid-west of Germany. Average population density is generally around 150 per km^2.

The scheme started in 1996, replacing existing public transport services in the area which were generally uncoordinated, with steadily decreasing patronage. The main objective of TaxiBus is to provide a substantial transport service in low density areas not served by public transport, at relatively low costs. The local authority in Coesfeld is responsible for the scheme, which is run from the public transport centre of WVG (Westfälische Verkehrsgesellschaft) in Lüdinghausen. The service is operated by five different local taxi companies.

MAIN FEATURES OF THE SERVICE

There are five separate routes, all with fixed stops, and an hourly service operating between 06:00 and 19:00 (06:00 and 14:00 on Saturday, no Sunday Service).

Users book the service by telephoning the public transport centre. At present the reservation system is entirely manual – receptionists take down journey details and fax them to the appropriate taxi company. Taxi companies then decide which vehicle to use. There are plans to automate this process using a computer system.

Vehicles have between four and eight seats and differ from company to company. The vehicles are not adapted to be accessible to people with mobility difficulties, so such people may have difficulty using the service. This group may also experience problems because the service is not door-to-door. Many users overcome this problem, however, by hiring the same vehicle (charged at full taxi rates) to take them between the bus stop and their home.

Customers pay normal public transport fares to the taxi driver. Ticket revenues go to WVG and in return WVG pays the normal taximeter tariff (discounted for volume purchase) to the taxi companies, less a €1.30 commission for each booking.

Driving staff are provided by the taxi companies, but the equivalent of four full-time booking staff are required.

TaxiBuses are now scheduled to connect with commuter trains and other regional buses.

Timetables are distributed to residents in the area and are also available at bus stops and stations. Information about the system and the timetable is also provided on the transport authority's website and TaxiBus has been well publicised in the local press.

A new telephone service centre called "ask+go" (frag+fahr) was introduced in October 1998 to provide public transport information, including details of TaxiBus. Bookings can also be made directly through this centre.

LEGAL BASIS

The service uses regular taxi licences because the capacity is limited to 8 passengers.

WVG is responsible for the competitive tendering process. Contracts are valid indefinitely, but may be terminated at three months notice.

OPERATIONAL INFORMATION

The largest user group is school pupils: 43% of the passengers had a school travel card. However commuters are significant users of the service now that connections with other services have improved.

On weekdays, about 80% of the potential scheduled services run, on Saturdays about 40%. The average number of passengers per taxi journey is a little over three.

Before the introduction of TaxiBus the combined cost of the pre-existing services and school services was €800,000 per year. The combined cost of TaxiBus and supplementary school services is now €540,000 per year.

USE OF TECHNOLOGY

At present the system is extremely low-tech. The telephone booking and scheduling system is entirely manual, communication with taxi companies is by fax, and with vehicles is by radio or mobile phone. There is no real-time information system, GPS, or automated ticketing.

LOCAL IMPACT

Patronage has increased from 35,340 in 1996 before the service was introduced, to 81,500 in 1998, and numbers continue to rise.

WVG's research has shown that the Taxibus has no effect on the use of regular taxis. There appear to be two distinct user groups: taxi-users and new Taxibus-users. According to WVG, reaction to the Taxibus is very positive. In the beginning WVG feared that the need to book the bus by phone would be a barrier for potential users of the service. Instead this appears to be a positive aspect: users appreciate the personal contact with the operators at the service centre.

SUMMARY

- A fixed stop, fixed route, scheduled, on-demand service
- Taxi based
- Good links with other public transport
- Greatly increased passenger numbers
- Significant cost savings
- Entirely manual booking system

KEY STATISTICS
Routes: 5 *Passenger Trips:* 81,500 p.a. *Fares:* Normal Public Transport *Costs:* €3.19/passenger trip €260,000/year *Seat Occupancy:* 3 per journey operated

TAXITUB, DOUAI, FRANCE

A public transport service utilising fixed routes, stops and timetables which is operated by regular taxis. This is an on-demand service - vehicles only operate if a booking has been made. The scheme is run by the local public transport authority.

INTRODUCTION

This is a former mining area of 180,000 inhabitants centred around the local town of Douai (45,000 inhabitants). The majority of the population is concentrated along an East - West corridor covering both the city of Douai and the former mineworkers "cités" of 2,000-3,000 inhabitants each. The rest of the area is rural, comprising small settlements. All mines are closed down now, and economic activity is focused on other industries and the tertiary sector.

TaxiTub came into operation in 1992, copying, with some minor changes, the system in the St-Brieuc area (Western France). The motivation was to increase the level of service at a reasonable cost. Before TaxiTub, the area was only served by regular bus services, mostly operating only two or three times a day. Some villages now served by TaxiTub had no public transport at all.

MAIN FEATURES OF THE CURRENT SERVICE

There are twelve services (described as "virtual lines", since, although scheduled, they only operate when required). Most customers travel to and from Douai, the main local town, which is the transport hub for train and regular bus services. TaxiTub services mostly link remote settlements with bus stops used by conventional services, so customers usually have to transfer between TaxiTub and a regular bus service. TaxiTub users get guaranteed bus connections to Douai. Services are hourly or half-hourly, six days a week, from approximately 06:30 to 19:30. Users must book by telephone, at least two hours in advance, and must have paid an annual registration fee of 30 FRF (€4.50).

No vehicles are permanently allocated to the scheme. All vehicles used are regular taxis which are booked only when required for a specific journey. The taxi operator closest to the origin of the booked journey is always approached first. Bookings are handled automatically by a voice computer (see below), so that the authority needs only to employ the equivalent of 0.25 full-time staff in order to run the scheme. Marketing is via timetable leaflets and posters which are distributed locally.

The transport authority (financed itself by the municipalities) pays the regular taxi fare to the driver, minus a small commission. The passenger pays a standard public transport fare. When the taxi driver is not operating under the TaxiTub banner (i.e. when no booking has been made), there is no payment. When the TaxiTub service is operating, the "taxi" sign on the roof is covered up.

LEGAL BASIS

Taxi operators participating in the scheme require the usual taxi permit. They then sign a contract with the local public transport authority committing them to the conditions of the scheme, although they remain free to refuse any individual request for their services. There is no competitive bidding involved in the transport delivery side of the scheme, although the supply of reservation software was subject to competitive bidding.

OPERATIONAL INFORMATION

The cost of the scheme to the authority has been slight – an initial investment of 680,000FRF (€103,000), and an annual staff cost of 50,000FRF (€7,525). Costs per passenger of 57.22FRF (€8.67) are significantly less than they would be for conventional buses operating the same route.

Most lines were served as a regular service 2 to 3 times per day. The number of TaxiTub customers is:

- 1997: 6,759
- 1998: 7,395

USE OF TECHNOLOGY

The scheme's most innovative use of technology is in the automated reservation software supplied by WIN of St-Maur. Reservation calls are free, and may be made 24 hours a day. A computer synthesised voice prompts the user to enter their registration number, line number, stop and time details via the keypad of their telephone. Despite its complexity, no complaints have been received about the system. After a reservation is made, the system automatically contacts the nearest taxi driver to the departure stop. If they are not available it continues down a list of taxis until a driver is found.

Since the service operates to fixed routes, no routing software is needed. All ticketing is manual, although fully integrated with all other types of bus ticketing. A website for the Taxitub is scheduled to come on stream during the year 2000.

LOCAL IMPACT

Improved mobility for all users, with the exception of those with severe mobility difficulties (since none of the vehicles is wheelchair accessible). Home to school transport for schoolchildren is significant.

SUMMARY

- Taxis used to provide a scheduled service which only operates on demand
- Users must pre-book
- A low cost option for routes with very low patronage
- Combines cheap transport for the user with minimum investment and overheads for the provider

KEY STATISTICS
Routes: 12 - operating 305 days p.a.
Vehicle kilometres: 113,000 p.a.
Passenger Trips: 2 per route p.d., 7,000 p.a.
Costs: €8.67/passenger trip, €64,115/year
Fares: Normal public transport fare
Seat Occupancy: 20% of route mileage is occupied

VIDEOBUS, BORGO PANIGALE, ITALY

Videobus is an on-demand bus service linking a small community of users with a main public transport corridor - an operation that would not be economically viable using an orthodox scheduled public transport service. The service is primarily available to residents of the community, and booking is through home computer terminals supplied by the bus operator, ATC.

INTRODUCTION

Borgo Panigale is a small village in Emilia Romagna Region, to the North West of Bologna. The scheme started operating in June 1995 to cover the village and surrounding area, although the area covered has increased slightly since that time.

MAIN FEATURES OF THE SERVICE

The service operates to a fixed route with 30 stops, 17 of which are only utilised when booked. The bus is timetabled to run hourly, but only operates if booked. The service operates fourteen hours a day, six days a week.

The community served is very small – about 60 families and some 10 to 15 companies. All of these are supplied with free terminals, together with magnetic cards that are used to confirm payment once the user is on board the bus. Booking is made through the terminals by following on-screen instructions, using simple keystrokes to choose pre-set information such as card number, day and time of trips, start and final stops, number of passengers (not more than 2 persons per booking). Reservations are accepted until 35 minutes before the bus leaves the terminus. The reservation is processed by a host computer, and automatically forwarded to the bus driver via an on-board LCD display and paper printout. The bus also has a radio link with the dispatch centre which operates the entire bus network in the region.

LEGAL BASIS

ATC operates the service under licence from Emilia Romagna Region, and the Bologna Municipality, the current licence being valid until June 2004. The operation is subject to the same safety regulations as any other bus service. Competitive tendering was not involved.

Videobus was conceived and developed by ATC, ENEA and Emilia Romagna Region under the EU's THERMIE Programme.

OPERATIONAL INFORMATION

The route is serviced by one 33 seat vehicle, owned by ATC, the operator. The 14.5 hours (two shifts) staff time is sub-contracted to a small drivers' co-operative.

The main transport corridor involves bus services to Bologna, and it is assumed that the majority of the trips have the Bologna urban area as the ultimate origin/destination.

Because use of the scheme must be made through a terminal, a lot of effort has been made to tell users about the service, and to train them in the use of the equipment. In addition, marketing has been targeted towards those users starting journeys in Bologna, where terminals are available at staffed ATC outlets.

USE OF TECHNOLOGY

The reservation system is fully automatic. It involves the use of a home terminal, linked via an ITAPAC network to central, Unix-based software, which in turn communicates, via a radio link, with an on-board terminal in the bus. The passenger list is forwarded to the vehicle before it leaves the terminus. At each stop, the driver can identify the number of passengers with a reservation and the number of seats available because each passenger registers on-board by inserting his magnetic card into the reader; the same card links the payment, confirmed on the bus by marking a ticket, to the reservation. The system incorporates routing software.

The entire public transport system in the area is managed by a GPS system. This allows the Videobus's timing to be co-ordinated with the timings of buses on the main Emilia road corridor, so that passengers can make easy connections between the services.

LOCAL IMPACT

Before this scheme was operating, there was no other public transport in the area. The scheme is seen to be very successful locally and there are plans to repeat the approach in other areas. New schemes will have to cover larger areas and it is likely that taxis rather than buses will be used, and that telephone reservation will be used in place of the home terminals.

SUMMARY

- A timetabled bus service which is only run on demand
- Links a very small community with a main public transport route
- GPS enables efficient co-ordination between Videobus and mainstream services
- Passengers must pre-book using specially provided home terminals
- A low cost option for areas with very low population
- Revenue covers 30% of costs

KEY STATISTICS
Vehicle trips: 10-11 p.d. average
Vehicle kilometres: 110 p.d.
Passenger Trips: 110 p.d. average
Average Trip Length: 10 km
Average Fares: €1.15
Seat Occupancy: 30%

VIRGIL PARTNERS AND FURTHER INFORMATION

PROJECT LEADER:
LANGZAAM VERKEER
Minckelersstraat 43A,
3000 Leuven, BELGIUM
Tel: + 32 16 23 94 65
Fax: + 32 16 29 02 10
jan.vanseveren@langzaamverkeer.be
Jan Vanseveren

AVM
Koninginnegracht 52,
2514 AE, Den Haag,
NETHERLANDS
Tel: + 31 70 302 8650
Fax: + 31 70 302 8654
avm@euronet.nl
Rob Jeuring

COGNIVISION RESEARCH
Valencia 93 PRAC.1a
8029 Barcelona, SPAIN
Tel: + 34 93 3236365
Fax: + 34 93 4512282
cognivision@teleline.es
Alberto Sanfeliu

ETT S.A.
Calle Explanada 8-1º A,
28040 Madrid, SPAIN
Tel: + 34 91 534 08 57
Fax: + 34 91 533 56 05
pppc@ett.es
Pedro Puig-Pey Claveria

FORTH
PO Box 1527,
GR-71110 Iraklion, GREECE
Tel: +30 81 39 17 67
Fax: +30 81 39 17 61
baz@ath.forthnet.gr
Christos Vazuras

SK CONSULTING
Kaikukatu 3, 00530 Helsinki,
FINLAND
Tel: + 35 897742 3322
Fax: + 35 89 7742 3211
antti.merilainen@skolmio.fi
Antti Merilainen

SOTECNI
Via Salaria 1317,
00138 Roma, ITALIA
Tel: +39 06 886 941
Fax: +39 06 886 94300
sotecni@rmnet.it
Alessandro Veralli

THE TAS PARTNERSHIP LTD.,
Britannic House, 1a Chapel St.,
PRESTON, PR1 8BU, U.K.
Tel: + 44 1772 204988
Fax: + 44 1772 562070
john@tas-part.co.uk
John Taylor

TAYLOR LIGHTFOOT TRANSPORT
CONSULTANTS, Derg House,
Connaught Road, Scariff, Co. Clare,
IRELAND
Tel: +353 61 921121
Fax: + 353 61 921693
tltc@bealtaine.ie
Graham Lightfoot

TRIVECTOR AB
Åldermansgatan 13,
227 64 Lund, SWEDEN
Tel: + 46 46 38 65 04
Fax: + 46 46 38 65 25
pg@trivector.se
Per-Gunnar Andersson

Further copies of this guide, and electronic copies of the research reports and the database are available from your local partner. More information can be found on the VIRGIL Website: www.bealtaine.ie/virgil

Other useful sites include:

ELTIS - European Local Transport Information Service – covering European transport measures, policies and practices
www.eltis.org

CORDIS - European Community Research and Development Information Service; contains information on Transport Research within the 4th Framework Programme and Key Action Sustainable Mobility and Intermodality within the 5th Framework Programme
www.cordis.lu

TRENTEL - Telematics Applications for Transport and the Environment, giving details of many relevant projects including SAMPLUS, ERANTIS, ICARO, MULTIBUS, SCRIPT
www.trentel.org

VIRGIL is supported by:
EUROPEAN COMMISSION
Directorate-General Energy & Transport
Rue de la Loi 200
B-1049 Bruxelles
BELGIUM
Tel: + 32 22 96 82 50
Fax: + 32 22 96 47 10
maria.alfayate@cec.eu.int
Maria Alfayate