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TRANSIT ALLIANCES
TOWARDS FULLY INTEGRATED PUBLIC TRANSPORT

(Background Paper for Plenary Session 3 of the Provisional Programme)

Final Draft

This background paper has been prepared by Mr. Manfred Breithaupt and his Group, German International Cooperation (GIZ) for the Seventh Regional EST Forum in Asia. The views expressed herein are those of the authors only and do not necessarily reflect the views of the United Nations.

BMZ Federal Ministry for Economic Cooperation and Development

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Transit Alliances

Towards Fully Integrated Public Transport

CONFERENCE EDITION

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Introduction

In many developing cities, availability of public transport is not keeping pace with population growth. The shortage of reliable and affordable mobility is an obstacle to growth for the cities, because advancing economic development is often going along with job creation being far away from residential areas. Workplace accessibility is a prerequisite for economic growth, and for many people it is an opportunity to earn an income. In several developing cities, mobility is largely based on mopeds, motorcycles, cars and minibuses. These forms of mobility are very expensive (both the investment and operation), and they cause air and noise pollution. An increasingly motorised population leads to traffic jams on the roads, as long as no stringent counter measures are taken. Building more and wider roads does not prevent the fall of average speeds and the increase in travel time, not least because every infrastructure expansion induces new traffic which quickly eats up the gains in travel time. To change this trend while allowing for existing and growing needs for mobility, public transport must be improved to the point where it offers an attractive alternative to private motorised means of transport. This requires overcoming a number of barriers to the use of public transport, including, for example:

- Capacity problems, overcrowded means of transport, inadequate services;
- Uncertain routes and lack of punctuality;
- Long travel times, as a result of uncoordinated routes;
- Geographically limited availability;
- Difficult-to-reach stops, long distances between transfer stops, safety problems in the area around stops;
- Uncoordinated timetables, lack of connections at transfer stops;
- Contradictory or complete lack of information for passengers;
- Every change of mode means buying a new ticket;
- Resulting in expensive fares and pricing which is perceived as unfair;
- Dirty vehicles, poor safety standards of vehicles, high risk of accident;
- Emissions caused by the extremely large number of technically obsolete buses that pollute the air, particularly in the inner cities;
- No general and state control of transport operators;
- Predatory competition between transport operators at the expense of passengers;
- Poor image of public transport (only for the poor);
- Cultural or religious obstacles.

In developing countries, public transport is often provided by private sector transport companies. The (commercial) interests of the transport operators are naturally focused on adequately profitable routes. In our view, however, public transport is a public responsibility. In the sense of a public service it should guarantee everyone a basic network with the most important connections, even if these are not commercially profitable.

Obstacles to, and restrictions on, the use of public transport by population groups unable to afford cars or motor scooters hamper economic growth. Public transport is essential to create access to earning opportunities for many people. Without transport from city peripheries to the economically strong city centres, many are left without convenient and affordable access to markets and jobs.

A key step towards effective public transport is the creation of a transit alliance. There are many approaches to this, which can differ widely. Here, there are factors which depend on the country's political and cultural history, on existing administrative structures, on prevailing legislation and the available financial resources and distributive structures, etc. Even in Germany, where the idea of transit alliances emerged back in the 1960s, there are many variants to be found today. While it is inappropriate to '*export*' a specific model to developing countries, certain milestones or modules, which always play a role wherever integrated transport services are a goal, are necessary. These modules are described and explained in the following chapters.

1 Introduction to integrated public transport systems

1.1 Demand assessment

The first step in any transport planning is to establish the demand for transport based on a calculation of the existing traffic flows. The challenge is to forecast the changes in traffic flows caused by new services. Particularly in fast-growing cities, we see how new businesses are set up near high capacity transport systems, while housing which offers residents a convenient access to work also gains in attractiveness and value.

Particularly when planning major, capital-intensive transport projects, it is crucial to centralise planning. There are many negative examples of several organisations that have implemented projects at the same time have ended up investing heavily, but ultimately have had little impact on transportation. There is the danger that several projects will be built to serve similar potential traffic, and so compete with each other.

When constructing rail-based routes (light rail, Metro), planning bus networks is particularly important. Rail-based systems (and BRTs) are fast and environmentally friendly. To justify the heavy investment (at least when rail based), continuing bus transport in parallel with the routes should be avoided as far as possible. Instead, regular buses should act as feeders for stations with greater capacity in the transit systems (BRT, Metro, LRT or heavy rail systems).

1.2 Transfer stations

The appeal of public transport systems depends largely on perception of their comfort. Stations should be easily accessible and provide adequate protection at any climatic condition.

Transfer stations where passengers change from one means of transport to another (*e.g.* bus-Metro or Metro-Metro) are particularly important. To optimise travel time and for the comfort of passengers, it is crucial to keep transfer times as short as possible. This generally means that the stations should be planned accordingly. Ideally, passengers should only have to walk a few steps or take an escalator from one vehicle to another.

Figure 1: *Tram station in Karlsruhe.*
Photo: Breithaupt, 2010

Figure 2: *Intermodal station in Freiburg (train, tram and bus).*
Photo: Belka, 2010

There are recurring examples of an uncoordinated approach to the building of stations that serve different routes, so that the transfer between lines is lengthy. This applies even more to transfers between different modes. The result is that transfers take a lot of time, cutting into passenger convenience. Mistakes in this area are virtually impossible to correct after construction has been completed, and MRT systems are therefore often underutilised.

1.3 Integrated ticketing

Due to the different responsibilities, it is normal for a number of different transport companies to be active in an urban region, with all of them setting and collecting their own fares. Particularly in continental Europe, structures have been created in recent decades which have helped simplifying and harmonising fares. *Tariff alliances* have been created for this purpose whereby a ticket can be used for all forms of transport within a defined segment. For passengers who previously had to buy several tickets, this can mean significant savings on fares. The decrease in fare revenue was more than offset in most cases by the increase in the number of passengers.

Integrated ticketing means that it is no longer necessary to buy a ticket for each form of transport used, as one ticket now covers the entire journey. Besides making it more convenient for passengers, it also enables the transport companies involved to optimise their processes. Conversely, this system requires the creation of administrative structures (*transit alliances*) which develop and monitor the rules for distributing revenue.

There are numerous options for developing a ticketing system. In continental Europe, companies have been trying for decades to get customers to buy weekly, monthly or annual season tickets. This reduces processing time and efforts, customers get a discount compared with single tickets and have an incentive to make as many trips as possible with public transport.

Another approach is to move from tickets to smart cards (*e.g.* in London and Hong Kong). A system like this is not necessarily tied to a tariff alliance. Smart cards can handle very variable pricing systems (*e.g.* bulk discount, time card function, peak/off-peak distinction) and can also be used for cashless payments outside the transport sector. However, such systems require considerable start-up investment (particularly in large networks) and the related passenger *education*. They also leave untouched the problem of having to buy multiple tickets if they only cover a single system (*e.g.* metro) and if they do not permit transfers from one mode to another.

1.4 Marketing and communication

Use of an integrated transport system depends to a large extent on how the potential passengers are informed about the service. This includes information like timetables, route maps and maps of the surrounding area at stations and stops.

Figure 3: *Metro and Light Rail map in Lyon.*

Digital information is becoming increasingly important. Most transit alliances in Germany offer timetable information on the internet, covering not only stops but also individual addresses. This service is now also available as an app for smart phones[1]. Acceptance of information in

[1] See for example the timetable service of RMV (Frankfurt) at http://www.rmv.de/en/Fahrplanauskunft

Figure 4: *Bus station with digital display in Berlin.*
Photo: Breithaupt, 2009

the transport sector depends on its completeness, and on standardisation and ability to recognise the information. One important function of a transit alliance is to provide exhaustive information on all transport companies operating in a given area. Obtaining this information, assembling it in a joint database and providing user-friendly informational websites and apps accordingly is an important function of the transit alliance.

1.5 Timetables

Timetables are particularly important if services are infrequent, which is more likely in off-peak periods and less-populated areas. In such cases, timetables (*e.g.* bus connection with Metro) must be coordinated. Here, too, transit alliances are responsible for coordination.

Figure 5: *Electronic schedule board in a train station, Helsinki.*
Photo: Schmid, 2011

2 Technical options for public transport systems

2.1 Bus

The bus is the most flexible and most economic form of public transport. It uses the existing public roads, has low investment cost and is very flexible. In many countries, buses (often unregulated) are the backbone of the public transport system. Capacity and speed depend upon the availability and quality of the roads. In practice, capacity in urban areas rarely exceeds 3 000 passengers per hour and direction, with speeds of 10–20 km/h. Especially in congested areas, schedules are not very reliable as they depend on traffic conditions.

Figure 6: *BRT-Stop in Quito, Ecuador.*
Photo: GIZ, BRT Standard 2013

2.2 Bus with dedicated lanes

The capacity and speed of buses can be significantly increased if the bus operates on dedicated lanes, if necessary only in segments with heavy traffic. The lane must be protected against entry by other road users. Maximum capacity is below 10 000 passengers per hour and direction, with speeds of 20–30 km/h. Further speed increases are conceivable by giving priority at traffic lights. Today, there are bus systems with dedicated bus lanes in many European cities.

2.3 BRT systems

Bus Rapid Transit (BRT) is *a bus-based mass transit system that delivers fast, comfortable, and cost-effective urban mobility.* Through the provision of exclusive right-of-way lanes and excellence in customer service, BRT essentially emulates the performance and amenity characteristics of a modern rail-based transit system but at a fraction of the cost.

While BRT utilises rubber-tyred vehicles, it has little else in common with conventional urban bus systems. The following is a list of features found on some of the most successful BRT systems implemented to date:

- Exclusive right-of-way lanes;
- Rapid boarding and alighting;
- Free transfers between lines;
- Pre-board fare collection and fare verification;
- Enclosed stations that are safe and comfortable;

- Clear route maps, signage, and real-time information displays;
- Automatic vehicle location technology to manage vehicle movements;
- Modal integration at stations and terminals;
- Competitively-bid concessions for operations;
- Effective reform of the existing institutional structures for public transit;
- Clean vehicle technologies;
- Excellence in marketing and customer service.

The capacity of BRT systems can be raised to up to 20 000 passengers per hour and direction, if all those features are applied and high capacity vehicles (*e.g.* double-articulated buses) are used. However, this requires building high-quality infrastructure, including elevated platforms. Such systems are currently operational in about 120 cities worldwide (*e.g.* Santiago de Chile, Bogotá, Istanbul, Guangzhou). Investment costs for such systems are in the range of EUR 5–25m/km.

Figure 7: *BRT systematically combines infrastructure, equipment and operation to improve service quality.*
Source: GIZ/ITDP BRT Planning Guide

2.4 Light rail, tram systems

Tram systems can be constructed on either on a dedicated rail corridor or they can share existing roads. Due to the limits imposed by rails and overhead conductors, they are less flexible if there are outages or fluctuations in demand. With their electric drive systems they cause little emission in cities, they are quiet, and in developed countries passengers clearly prefer trams over buses. Due to the specific technology, tram systems are not profitable until they reach a certain network size (around 25–40 km) and density. Capacity of a tram system is about 10–15 000 passengers per hour and direction, and speeds of 20–30 km/h are normal in urban areas, although 80 km/h would not be a problem technically. Investment costs are approximately EUR 15–40m/km. There are around 300 tram systems worldwide, primarily in Europe and North America. In the past ten years, about 30 new systems have been opened.

2.5 Monorail

This term is used to cover a number of different technologies. A number of monorail systems have recently been built in cities such as Manila, Singapore and Kuala Lumpur, and a number of new systems in India and Brazil are under construction. Those systems are intended to serve as an alternative to metro rail systems, but only achieve a much lower capacity. According to provisional information, investment costs and capacity are roughly equivalent to a light metro system, but so far there has been no breakthrough with this technology.

2.6 Metro

This term is used to cover rail-based local public transport systems running exclusively on their own track with electric power. In the lower cost segment, metro systems are similar to light rail systems, but there are also high-capacity systems which resemble a railway in their technology and standard. Costs depend to a large extent on whether the system runs at ground level, underground or on elevated tracks. Depending on the design (train length, frequency), capacity of up to 80 000 passengers per hour and direction (Hong Kong) is possible, although in most cities demand leads to capacity of at most 20–30 000. Investment costs for ground level segments are of the order of EUR 20–100m/km, rising

to EUR 70–150m/km for elevated segments and EUR 100–400m/km for underground segments. Depending on the definition, there are 300–600 metro systems worldwide. In inner city areas speeds reach 20–40 km/h, with significantly higher speeds outside agglomerations where vehicles can generally reach 100–120 km/h. Metro systems can carry a large number of passengers quickly and are eco-friendly.

Metro lines generally function as the backbone of urban local public transport systems in very large cities and densely build up agglomerations. Construction involves heavy costs. In most cases, however, the number of potential passengers living within walking distance of metro stations is not enough to fill the metros and make them an economic success. This is why it is usually imperative to develop feeder systems for the metro stations. The primary candidates for this are buses and light rail, but Park & Ride stations or bicycle lock-up racks can also play an important part as feeders.

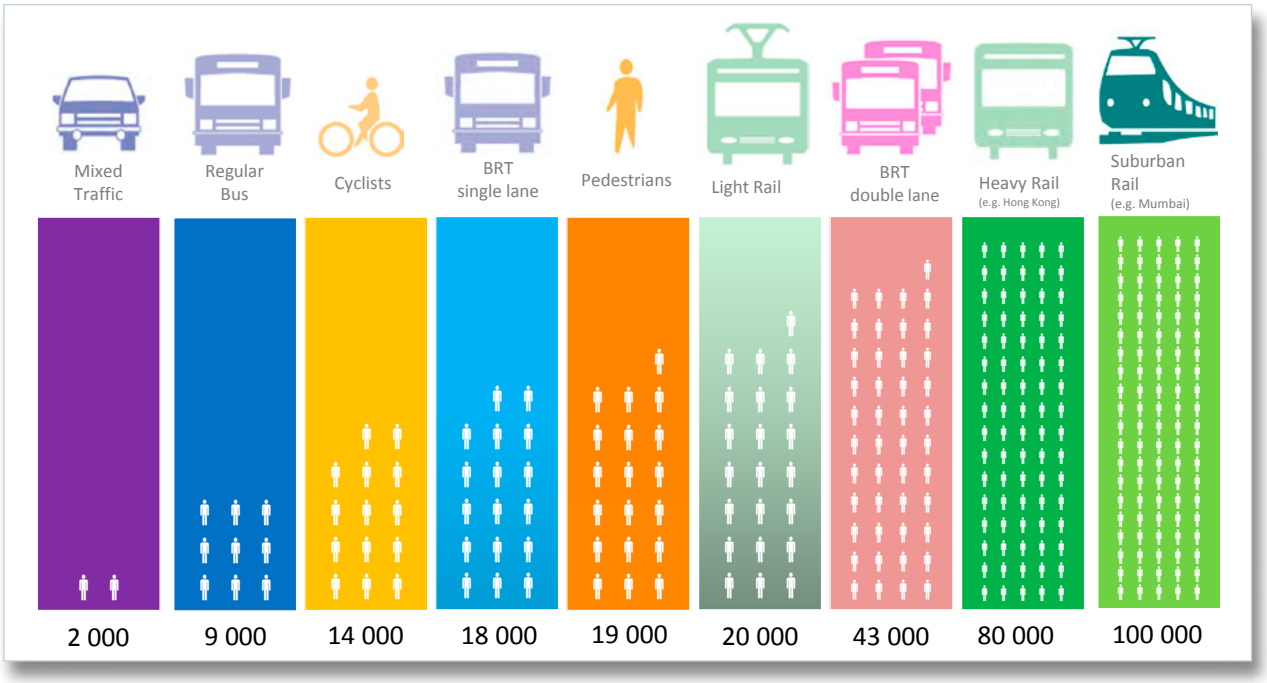


Figure 8: *Capacity of the different transportation modes in comparison (3.5 m wide). (Unit: persons per hour per direction).*
Source: GIZ/Breithaupt, amended and revised from Botma & Papendrecht, TU Delft 1991

3 Transit alliances as organisers of integrated planning

For the above mentioned reasons, it is helpful to create an organisation to plan and organise public transport in a city. There are a number of different ways in which such an organisation could be set up. These are largely influenced by the historical evolution of the transport system, the legislative and administrative environment and political requirements. Depending on the structure, it can be called a transport administration, transit alliance or public transport authority. Transit alliances with integrated planning and tariff alliance function are widespread, including in several European nations (*e.g.* Germany, Austria, Switzerland, the Netherlands, Denmark, Sweden, London, Paris). Due to the multiple benefits other regions of the world are increasingly interested on setting up integrated transit authorities and alliances.

Box 1

Definition of a transit alliance

A transit alliance is a form of alliance within the public transport sector. Such alliances may take various forms depending on the type and scope of the activities included. The form ultimately chosen depends on a number of different factors including the geographical structure of the area, the transport features present and the degree of interconnection between the individual sub-systems. In practice, the historical and political environment also plays a significant role.

In its most basic form – partial co-operation – there is coordination only in certain sub-areas, for example with regard to transport connections, a combined timetable, or tickets which may be used on any form of transport within the given network. Creating a combined fare system, *i.e.* applying a common fare valid across a traffic area served by multiple carriers based on a special agreement entails a higher level of integration and a more closely meshed alliance. Such an agreement will include arrangements governing common fares, common conditions of carriage, and distribution of revenues generated by common fares.

Moving up the scale, a combined transport system is characterised by an alliance which goes further than applying a combined fare system and, in addition to an agreement on the application of a common fare, transport-level cooperation (coordinated organisation of the network and timetable specifically). However, under this model no responsibilities are transferred to a dedicated organisation and the authority for all business decisions remains the prerogative of each partner involved.

Transit alliances are the most comprehensive form of public transport alliance: they are governed by the most extensive contractual agreements and entail the highest degree of cooperation and integration. They are a form of alliance in which key responsibilities (in particular establishing and amending the combined fare system and working together to organise the network and compile a timetable for all public road and rail transport within the alliance area) are devolved to an alliance company, an umbrella legal entity formed by the participants involved. As a rule, the alliance company is independent in legal terms and essentially acts as an independent entity. However, even within such a strong mechanism for cooperation the individual transport operators retain their status as legally independent companies.

Source: VDV/GIZ 2010: Transport Alliances

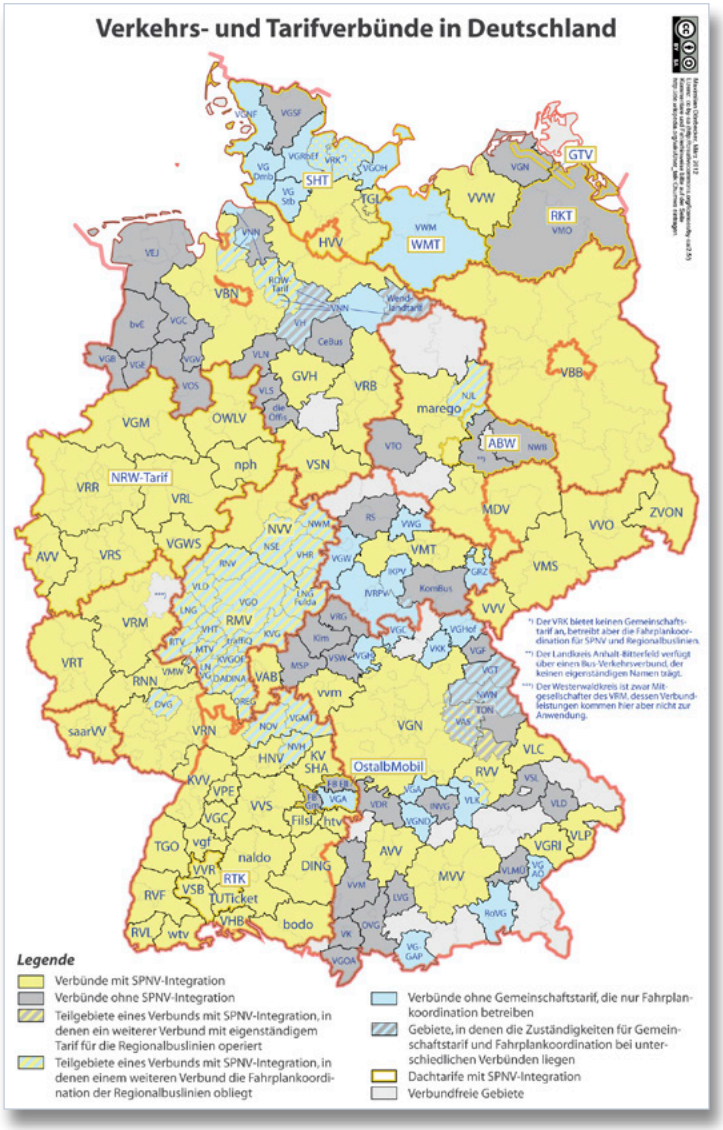


Figure 9: *Transit and fare alliances in Germany: Yellow marked areas are all part of transit alliances*.*
Graphic: Maximilian Dörrbecker, 2009

**) Source: http://de.wikipedia.org/wiki/Datei:Karte_der_Verkehrsverb%C3%BCnde_und_Tarifverb%C3%BCnde_in_Deutschland.png*

3.1 Initiating a transit alliance

Establishing a transit alliance normally requires several years of planning.

Box 2

Hamburger Verkehrsverbund (HVV) – Hamburg transit alliance

The first transit alliance (Verkehrsverbund) was established in Hamburg in 1965 following five years of planning. It was founded as an association of three operators in Hamburg (municipal HHA, operating the light metro, trams and urban bus service, S-Bahn Hamburg, the metropolitan heavy rail division of the German federal railway (DB) and VHH, operator of suburban bus services). The original intention had been to establish a joint ticketing system only, but during the planning it was found that a robust organisation was needed to organise this joint ticketing system and that it would be a good idea to pool other functions like network planning and marketing in a joint organisation. The system was very successful, increased rider-ship and fare-box revenue and has been used as blueprint for all other public transport authorities in Europe. In the beginning, it mainly covered services within the city limits. Over the years, neighbouring communities applied for membership and the territory covered has tripled since[1].

[1] Source: VDV/GIZ 2010: Transport Alliances

Box 3

Benefits of a transit alliance

There are many reasons behind the decision to set up cooperative public transit alliances and such structures will have an impact for passengers, transport companies and local authorities alike. The main priority, though, is generally to make public transport more attractive and more efficient in economic terms.

For passengers, the shift to a transit alliance model was crucial and was born primarily out of a landscape characterised by individual transport companies operating in isolation from each other within a single urban area; there was also a growing interest in coordinating urban and regional transport more efficiently in merging metropolitan areas. The idea was for transport companies within a given area to integrate the range of services on offer and to work together to achieve optimal organisation of the entire public transport system. At the time the first alliances began to emerge, the creation of new suburban railway networks which had to be interconnected with the existing urban transport systems also created a growing need to interlink the transport and fare sub-systems in a particular region.

Cooperative transit alliances linking different carriers and local authorities are intended first and foremost to meet the demands of passengers for a more integrated transport network, as well as to provide easier access to public transport. The primary goal of transit alliances is therefore to make life easier for the passenger: advantages for customers include tickets and passenger information valid for multiple companies, better coordination of transport services and simpler transfers. A combined ticketing system means customers are free to choose both their modes of transport and their routes within the alliance area. They can transfer without having to think about how the different transport systems interlink, thus overcoming the perceived separation between regional rail transportation and public transport in general. Working together in transit alliances makes particular sense where using the individual public transport sub-systems entails frequent transfers.

Source: VDV/GIZ 2010: Transport Alliances

In the first stage the initiators should assemble the available information and try to supplement it with any basic information that is missing. This involves the following:

- Existing mechanisms for transport and urban planning;
- Existing traffic flows;
- Forecasts of population and traffic growth;
- Overview of the agencies and institutions involved in planning, licensing and financing public transport;
- Overview of the legal framework for public transport (drivers licence, licensing, vehicle safety, financing);
- Understanding of existing actual processes for licensing and financing public transport;
- Structure of formal and informal operators (operating companies, individual entrepreneurs, associations and syndicates).

To obtain a better understanding of the actors, their goals and interests and the processes, this information should be systematically organised. There are tools for carrying out such analyses and visualising the results (process mapping, stakeholder analysis).

Once the basic information is available, the initiators can discuss which goals to pursue. Decisive in all this is the extent of support for the project from politicians and the media, and the funding available for establishing and operating an integrated transport system.

A start can then be made on planning a transport system. It is helpful to describe a target situation, and possibly to consider the individual or intermediary steps for achieving this goal. It is crucial to be clear about opposition from individual participants, and to identify measures to overcome this opposition. Communication with the participants and the media should be included in the planning at an early stage. It is advisable to define the target structures through equally clear descriptions of structures and processes. At the same time, it is helpful to monitor on an on-going basis whether the resulting costs are covered or can be covered. Budgeting must distinguish between three components. First, there are non-recurring costs to be covered which arise in the planning and implementation phase. Depending on the details of the ticketing system, permanent subsidies

may be needed, and it should be clear from the start how these are to be covered. At the same time, it should be established how the current costs of the transit alliance itself will be met.

Each individual stage in implementation must be carefully monitored, and the initiators should be in a position to respond quickly in the event of emerging problems or conflicts. This is why it is advisable to assign a project team to cover the entire planning and implementation phase.

Specific events often give the opportunity to acknowledge the need to establish a public authority or transit alliance and to implement it. Examples are major international (sporting) events or impending investment in a metro, light rail or BRT system, where it becomes clear in the course of planning that roles and responsibilities must be reallocated if such a project is to be implemented. Such events can be utilised to justify the need for a new transit alliance (*e.g.* for the Olympic Games in London 2012 the policy has been that spectators to the multiple vents were only be able to access the venues by public transport or NMT).

3.2 Development and structure

3.2.1 Organisational options for a transit alliance

Transport administration

In the 20th century, transport management in many major Western cities was handled by municipal administrative departments. These administrations handled planning and coordination tasks and also provided transport services. The legal form is largely defined by the regulations for public sector organisations. This structure can still be found today, *e.g.* in Paris and New York. The advantage of such a structure is that politicians can directly influence administration and transport services. The disadvantage is that in large public sector organisations cost effectiveness often takes a back seat, and the organisation often develops a life of its own which puts it beyond effective political control. Also, public transport services are mainly provided by public transport agencies with private transport companies being less frequently involved.

Transit alliances

Many early transit alliances were formed as consortia of the individual transport companies operating in a region. Depending on national legislation, a consortium can be structured as a legal association or a joint venture. These consortia agree to cooperate on common fares, the coordination of transport services, and marketing. These measures made it possible to expand the market share of public transport in many cities, despite the increasing spread of cars. Forming consortia with joint ticketing and marketing was in the direct interest of the companies involved. For example, RMV (Frankfurt am Main region) has increased the number of passengers by over 30 % in the 16 years since its formation, and MVV (Munich region) has tripled the number of passengers over the 40 years since it was established.

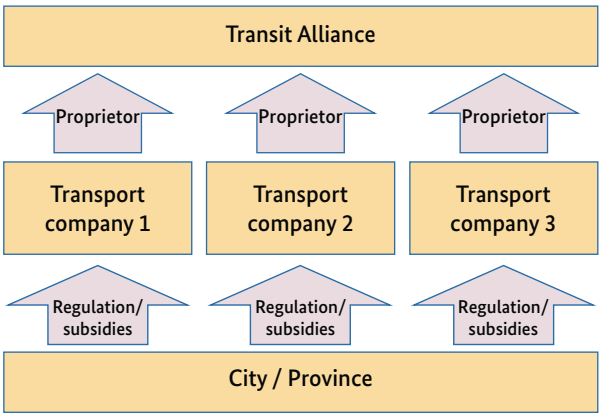


Figure 10: *Transit Alliance.*

The companies involved in a consortium or association retain their own individual interests, which can also lead to conflicts, most frequently over the division of jointly earned revenue between the individual companies. There are also competitive situations in deciding which company operates which lines. The problems in resolving such conflicts are one reason for the trend apparent in most cities today towards replacing other structures with public transport regulatory authorities (*Aufgabenträgerverbund*).

Public transport regulatory authorities

The main alternative to a transit alliance is a public transport regulatory authority. An organisation like this is headed by local or regional governments (cities,

local authorities, provinces, etc.). There are a number of advantages to establishing a transit alliance as a public service administrative consortium.

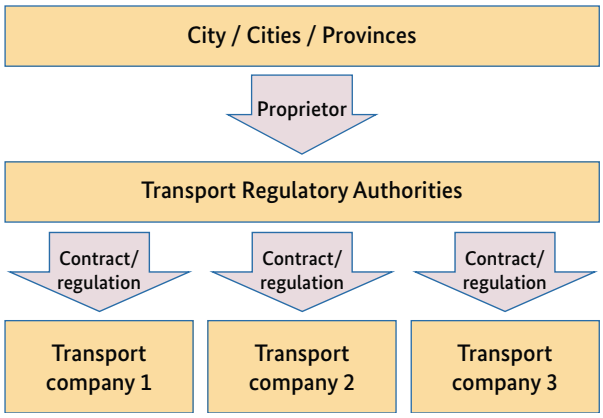


Figure 11: *Transport regulatory authorities.*

First, the functions of land use, urban and regional planning can be more closely integrated with transport planning. Second, this model can be used to implement the *principal – provider* principle, under which the transit alliance as the managing level plans transport services and contracts with the transport companies to provide them (Example: traffiQ in Frankfurt, Germany).

Box 4

'*Principal – provider*' principle

The *principal – provider* principle has become widespread in recent years, particularly in OECD member states. This makes a clear organisational separation between the principal and providers. The principal plans transport services, taking into account urban plan and transport policy goals, and contracts with transport companies (*providers*) to provide these transport services. The principle requires that the transit alliance has the legal and financial capacity to contract with transport companies. Generally, the providers are under contract and receive a share of the fare revenue (possibly topped up by state subsidies). In most cases they receive a payment per contracted vkm, so that the risk remains with the principal. Ideally, such contracts also include quality criteria and penalties for poor performance.

Since the mid-1980s the European Union has issued a number of directives on deregulating the public sector which also deal with tenders for services by public service administrative consortia[2]. However, depending on the legislative and financial conditions, mixed forms or different structures are also possible.

Frankfurt was one of the first cities in Germany to tender all the bus services in the city. Tendering has taken place over a few years in five packages. As a result of tendering bus services, the annual cost of providing the services has been reduced by up to 20–25 %. The performance standard is excellent and customer satisfaction is high.

3.2.2 Financing and need for subsidies

The biggest problem in establishing a transit alliance is financing. There are hardly any examples worldwide of urban transport systems which cover their own costs and at the same time provide a decent quality standard and comfort. In developed nations it is normal for the state to provide funds to cover the deficits of public transport systems. There is a social consensus in European nations that such subsidies are useful. It has become clear that cities with a population of over one million cannot provide adequate mobility without effective public transport. Subsidies for public transport are also justified by environmental benefits, and, in most nations, road traffic does not cover its own costs — road construction and maintenance are generally financed with public funds.

Several major cities (*e.g.* Hong Kong, Singapore, Taipei, Tokyo, Osaka) report that their metro companies are profitable. However, in many of these cities capital investment is financed by the public sector. There are also sources of revenue from real estate development (construction and commercialisation of buildings directly by metro stations) which wholly or partly benefit the metro companies in these cities. China has recently

[2] For details, see:
Council Directive 92/50/EEC of 18 June 1992 on public service contracts;
Council Directive 93/38/EEC of 14 June 1993 on — the procurement procedures of entities operating in the water, energy, transport and telecommunications sectors;
Regulation (EC) No 1370/2007 of the European Parliament and of the Council of 23 October 2007 on public passenger transport services by rail and by road.

established that operation of metros involves heavy losses, even if investment costs are excluded[3].

In major cities in developed countries, the ratio of fare revenue to costs is generally 40–80 %. This depends mainly on the population density and quality of service, and also on how operators are compensated for the reduced fares or free travel offered to specific groups (*e.g.* students, pensioners, handicapped persons).

In developing cities, subsidisation of public transport has been relatively rare so far. The fact that metro operators can get by without subsidies is frequently presented as the result of good management. However, having a closer look at the situation shows that in several systems, deficits are covered by neglecting maintenance and replacement investment and low or irregular payment. As a result, systems deteriorate, passenger comfort declines, and safe operation can perhaps no longer be assured.

For this reason, when constructing new transport systems it is necessary to estimate what deficits will emerge in the operating phase, and how these are to be covered. When establishing a tariff alliance, the question of cost assumption therefore arises. Finally, the on-going administrative expenses of the transit alliance must also be included in the planning.

The basic assumption is that the on-going administrative expenses of the transit alliance should be covered by public funds. However, there is a conflict with other public responsibilities over these scarce budget funds. To ensure financing for public transport, a number of cities have created separate financial structures. In these, a specific source of revenue is earmarked by law for financing public transport, without a need for an annual resolution in the budget. This may be toll revenue (*e.g.* in London, Oslo) or oil royalties (Denmark).

Another option for financing public transport is to use the profits from real estate development along the transport corridors (land value capturing). In many developing cities with underdeveloped transport infrastructure, the value of real estate rises significantly if a metro, light rail or effective BRT system is built. Ways of using these gains vary, depending on the legislative environment. The simplest solution is contracts under private law in which real estate owners commit to co-finance

Figure 12: *The tram Velez-Malaga has been taken out of service due to a complete lack of profitability soon after its construction.* Photo: Wikicommons, 2007

the transport infrastructure. In several cities the transport operators themselves buy land and construct and develop real estate in parallel with construction of the transport infrastructure. Another conceivable option is a mandatory levy or tax. French cities impose a transport tax that all medium and large size companies in the urban area must pay (see GIZ Module 2a: *Land Use Planning and Urban Transport*).

3.2.3 Decision to expand the transit alliance geographically

Before taking any decision on expansion, it is necessary to analyse existing transport networks and routes. Particularly in developing cities, the size of the suburbs and trips between the districts change very quickly. Therefore the trips to be expected, or those which are desirable in terms of urban and land use planning, should be included in the analysis.

One obstacle to this is that transport networks in major cities often do not coincide with the administrative boundaries of cities and local authorities. This creates potential for conflicts, as the interests and priorities of individual cities and local authorities in the development of transport networks can diverge.

It always makes sense to include the entire suburban area around a city in a transit alliance. However, if it is foreseeable that conflicts between cities and local

[3] http://www.theatlanticcities.com/commute/2012/09/why-chinas-subway-boom-went-bust/3207
http://www.chinadaily.com.cn/cndy/2013-01/10/content_16100631.htm

authorities will endanger the success of a transit alliance, the establishment of a spatially limited alliance should be considered, at least as a first stage.

3.2.4 Problems with integration of existing transport companies

There are basic structures for public transport in virtually all major cities. These often consist of buses or minibuses, or similar vehicles. In some cities buses operate under public licences or concessions, in others bus transport is entirely unregulated or even illegal[4]. Such systems are often supplemented by taxis and motorcycle taxis.

In completely unregulated or illegal systems, the entrepreneurs themselves determine routes and fares and the income earned is their own. Hence the operators of these buses have an interest in operating the most attractive routes themselves. There is no public coordination, with at best informal structures for agreeing routes, frequency of service and fares.

In other cities, bus transport is regulated by issuing licences or concessions that entitle entrepreneurs to operate a specific route. The details specified in the licences and concessions can vary and may include the following:

- Setting the route;
- Frequency and quality of service;
- Exclusive service;
- Fares;
- Vehicle safety;
- Provision of information on passenger numbers;
- Penalties for falling short of quality requirements;
- Time limit or termination option.

Such a concession or licensing system can be seen as the first stage in the way towards a transit alliance. Transport planning should therefore introduce a licensing or concession system at the earliest possible stage (for more details see GIZ Module 3c: *Bus Regulation & Planning*).

Box 5

Foshan (China) initiated a fundamental reorganisation of the public transport system in an effort to bring about sustainable improvement. An alliance was created which in the first stage covered the inner districts rather than the entire city (six million inhabitants), in order to collect experience. The licences previously held by unregulated transport operators were bought back, giving the Foshan Transport Company (FTC) the necessary power to enforce reorganisation of the entire bus network (60 bus routes). The services and timetable were established and new contracts were signed with the transport operators. The contractually agreed transport services are monitored by GPS. Currently, there is a single fare for tickets, but graduated fares are to be introduced for the whole city. The number of passengers has grown by almost 50 % to date. The next stages are to expand the FTC to cover the whole city, and to integrate an underground railway line just approaching completion into the system. It took three years in total from the decision to create a transit alliance to the opening of the FTC, a comparatively brief period.

Source: traffiQ

When establishing a transit alliance, those responsible will have to deal with opposition from established operators, who can no longer independently determine routes, frequency of service, deployment and equipment of vehicles, fare revenue, etc. They lose this power and are instead contractors of a transit alliance. Most radical changes occur when integrating a newly constructed metro, light rail or BRT system into the transport system. As long as the bus is the main means of transport, there are normally numerous routes connecting the areas with heaviest demand.

[4] For case studies and information on the subject see GTZ, June 2010 – Informal Public Transport http://www.cdia.asia/wp-content/uploads/Informal-Public-Transportation-Networks.pdf

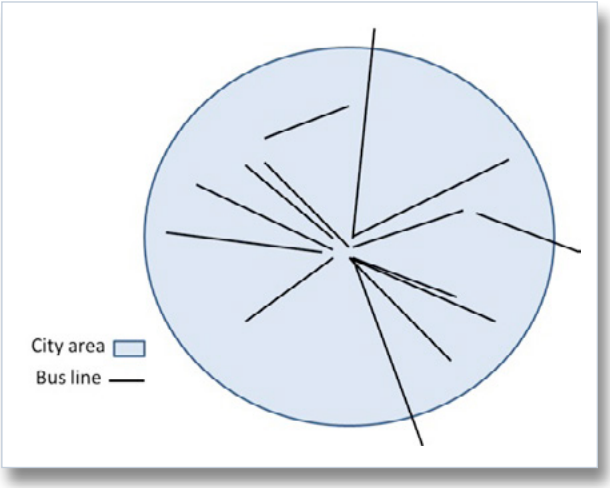


Figure 13: *Example bus network unregulated.*
Source: own figure

When introducing a high-capacity line (metro, light rail, BRT) it makes sense to organise the bus network so that it is a feeder for the main line.

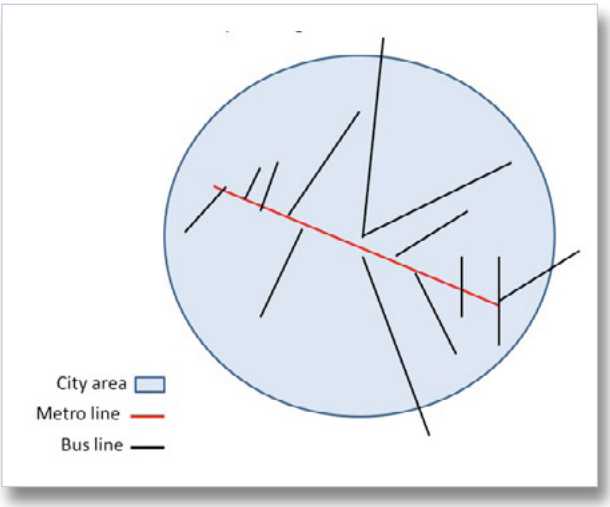


Figure 14: *Example regulated transit with metro line.*
Source: own figure

Incumbent operators often refuse to change the routes they serve. They fear a reduction in profit or even a total loss of business, and there is often also a fundamental refusal to change familiar ways of operating.

There are many ways of dealing with opposition, depending naturally on the legal situation. If the system has licences or concessions which are for a limited period or can be terminated, these can be relatively simply terminated or modified.

Box 6

Transsantiago

In **Santiago** (Chile), the entire bus network was reorganised in 2007. Planning included refocusing bus routes on the characteristics of the metro system and several high-capacity BRT routes. Previously, there was a large number of bus routes offering passengers slow connections but without the need for transfers. A new ticketing system was introduced along with the new network. The reorganisation ended in fiasco which almost brought down the government. It turned out that passengers had not been adequately informed, and that the new bus network had not been sufficiently thought through. At the same time, the city had tried to reduce the number of buses in service by 40 %. Once the problems had been addressed, public satisfaction with the system grew, along with the number of passengers.

Source: traffiQ

In many cities, the predominant share of transport services is provided by informal public transport. This is generally defined by the lack of a licensing procedure, or a regulatory vacuum. According to field studies in cities where informal public transport dominates, it is shown that cities without a transport authority or transit alliance generally have associations or syndicates of bus owners which play a coordinating role[5].

Assessments of the informal transport sector are ambivalent. On one hand these operators provide urgently needed transport services which are not provided by

[5] There are a number of studies on structures in informal public transport, *e.g.* Kumar *et al.*, (2008): Stuck in Traffic: Urban Transport in Africa
http://siteresources.worldbank.org/EXTAFRSUBSAHTRA/Resources/Stuck-in-Traffic.pdf
UITP (2010): Public Transport in Sub-Saharan Africa – Major trends and case studies
http://www.uitp.org/knowledge/pdf/PTinSSAfr-Majortrendsandcasestudies.pdf
CDIA (2011): Informal Public Transportation Networks in Three Indonesian Cities
http://www.cdia.asia/wp-content/uploads/Informal-Public-Transportation-Networks.pdf

the public sector. On the other hand, the lack of supervision in many cities leads to substantial problems with driver reliability and vehicle safety. A further problem is that the city has little power to influence these operators. The basis for a transit alliance is in any case that the transport operators can no longer independently determine routes, frequency of service, deployment and equipment of vehicles, fare revenue, etc. They lose this power, and become instead contractors under a transit alliance, which in turn sees itself as the service provider for the passengers. When establishing a transit alliance, those responsible will have to deal with opposition from established operators. If the transport operators refuse to cooperate, one should consider what action could be taken against them given the fact that they do not have operating licences.

Where opposition from operators is serious, it can be helpful to support the formation of an association of operators as a first step, so that the transport authority can have a party it can deal with (this has been done in Bogotá, Johannesburg and other cities). Subsequently, an effort can be made to introduce voluntary commitments by operators on quality and safety.

Incentives can be created to integrate informal operators, with training measures, investment grants for new vehicles and guarantees for fare revenue if operators are willing to participate in a concession system or operate centrally allocated routes in the future.

Another incentive can be limiting access to bus lanes or bus stations to bus operators who participate in a formalised system.

Finally, depending on the legal situation there is also the possibility of increasing pressure on operators. This can be particularly useful if transport services are not being provided legally, or if safety standards are breached.

Box 7

Johannesburg

In Johannesburg a BRT system (Rea Vaya) was established in the run-up to the 2010 soccer World Cup. The routes planned for the BRT were previously served by minibuses (informal taxi operators with minibuses with 12–16 seats). There were major problems in this system with safety and working conditions, and there were also violent clashes between drivers (*taxi wars*). From the start, policy-makers expected to offer minibus drivers alternative occupation. In the first step, minibus drivers were informed in detail of the plans, the associations of drivers were given administrative assistance to establish them as counterparts able to negotiate. A plan for the transition was then worked out together with the association of drivers. Minibus drivers were given an opportunity to relinquish their vehicle and concession voluntarily. In return they were given shares in the new bus company and offered jobs in the company. The package included training, payments to the drivers during the transitional period, and compensation to drivers who had been harassed by other minibus drivers*. GIZ supported the BRT planning in Johannesburg

*) *For a detailed report, see GIZ (2011), Case Studies in Sustainable Urban Transport #7.*

3.3 Tasks of a transit alliance

3.3.1 Transport service and network planning

Knowledge of traffic relationships is the basis of all transport service and network planning. The starting point for the analysis is generally the residential structure and population density.

Data on mobility must subsequently be collected, and surveys are generally carried out on roads and in public transport, and residents asked about their transport patterns. This yields a data set on demand as a function of need for transport (travel to work, education, shopping, leisure, etc.), by route and by transport mode (on foot, car, bus, etc.). This data is used to evaluate existing transport networks.

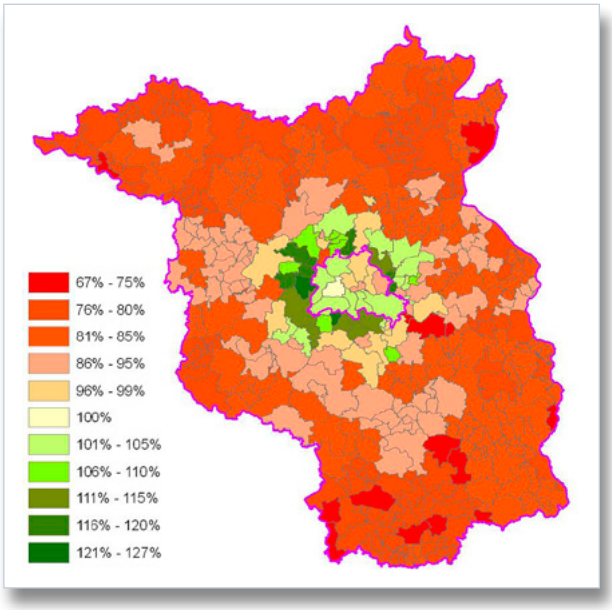


Figure 15: *Demographics in Berlin/Brandenburg until 2025.*

Source: Overall traffic forecast 2025 for Berlin and the state of Brandenburg, p. 11
http://www.stadtentwicklung.berlin.de/verkehr/politik_planung/prognose_2025/download/GVP2025_Ergebnisbericht_2009.pdf

However, for planning purposes it is not sufficient to consider only current data — forecasts of future trends must also be taken into account. The demand for mobility in cities can be influenced by a number of factors:

- Demographics;
- Economic growth (commuters, commercial traffic);
- Age structure (different mobility needs of students, workers, pensioners);
- Growing prosperity — as income rises, so does the demand for convenience, *e.g.* by pedestrians, cyclists, motor scooters, cars or metro users. Growing prosperity is also accompanied by the need for leisure-related mobility (*e.g.* shopping, cinema, vacations).

There are some very complex models that could give shape to these developments, although setting them up and maintaining them involves heavy costs.

Figure 16: *Public transportation demand forecast, Berlin 2025.*

Source: Overall traffic forecast 2025 for Berlin and the state of Brandenburg, p. 78
http://www.stadtentwicklung.berlin.de/verkehr/politik_planung/prognose_2025/download/GVP2025_Ergebnisbericht_2009.pdf

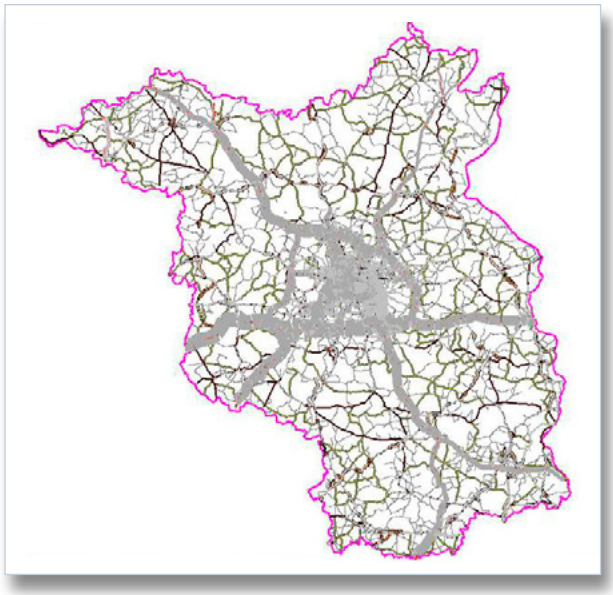


Figure 17: *Car traffic demand forecast Berlin/Brandenburg 2025.*

Source: Idem, p. 74

The goal of modern urban and regional planning is not simply to accept changes in settlement patterns and respond by modifying the transport networks. Instead, an effort is made to promote sensible development of cities through the strategic identification of areas for different uses (housing, offices, industry, retail, transport, leisure, recreation, etc.).

In a coordinated approach to public transport and land use policy, economic considerations also play a role. Public transport needs a considerable number of passengers to be profitable, which means it needs densely populated residential areas, and a concentration of industry and services. Conversely, companies are only ready to invest in housing construction or industrial parks if these districts are well developed (*i.e.* including public transport) or can be quickly developed. The economic benefits of a well coordinated approach to public transport and land use policy measures often emerges only after years (although it can then be relied on), as both public transport and land use planning are intrinsically long-term in nature.

Land use policy must also take into account the options for public transport. For public transport to be able to meet mobility needs, residential areas, schools, businesses, companies, heavily-used public facilities, etc. should not be strung out along roads, but should be tightly consolidated and planned together with stops/stations, etc. Effective public transport can have great influence — for better or worse — on subsequent urban development.

Box 8

Bogotá (Colombia)

In Bogotá *citizenship streets* have been developed where businesses, public facilities and service establishments are concentrated. These streets are reserved for pedestrian use, located at TransMilenio stops, and make it possible to satisfy a large number of needs with a single trip. Bogotá has also deliberately located large new school buildings along the TransMilenio corridor. Bogotá has also been very far-sighted in linking land use policy and TransMilenio, by having the public sector buy up undeveloped land near the planned corridor cheaply in the early days. It was expected that the land would increase significantly in value after TransMilenio's commissioning. When the land appreciated in value as expected, it was sold to investors who committed to building high-density low-rent housing for low-income population groups exclusively in the TransMilenio catchment area.

Source: traffiQ

Box 9

Curitiba (Brazil)

In Curitiba, new construction and urban concentration are almost entirely limited to BRT routes. Urban development and public transport links are so closely connected here that the location of the high-rise buildings can be identified by following the BRT routes.

Source: traffiQ

Integrating public transport under an alliance undoubtedly also involves unprofitable lines. Just as a large number of small streams flow together into a major river, so feeder lines are needed for the main lines of a public transport system. This means that public transport can also affect other areas of policy. Unprofitable lines must be maintained if they fill in gaps in development in a district and provide a good public transport service to all the residents. Coordinating a network of this kind is an important task of a transit alliance.

Box 10

One of the earliest integrated urban and transport planning models is the ***axis model* for Hamburg**, first presented in 1919. This involves concentrating the spread of housing on axes which lead along metro lines (and later arterial roads) from the inner city out into the surrounding area. The spaces between the axes were to be left free from development and to be used for local recreation purposes.

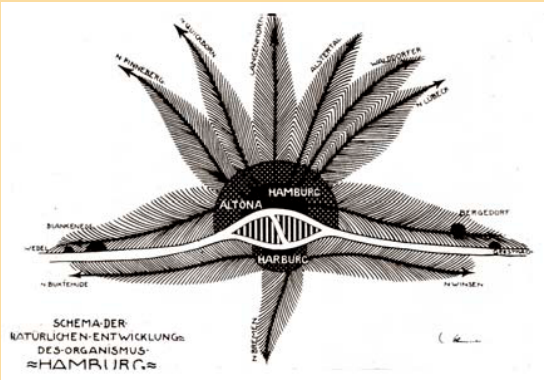


Figure 18: *Graphical representation of the first axis concept in Hamburg 1919.*

The axis model has since been modified — it turned out that the city was not adequately equipped to resist the immense pressure of the real estate market and to ensure that housing continued to be concentrated on the axes and that the spaces in between were free from development.

Source: Kellermann (2003):
Die Entwicklung des Freiraumverbundsystems für Hamburg (The development of the integrated free space system for Hamburg),
http://www.hamburg.de/contentblob/154156/data/stadt-planung-vom-achsenkonzept-zum-gruenen-netz.pdf

Achieving these urban planning goals generally involves conflicts. Specifically, it leads to situations where real estate owners can expect substantial profits if their land is scheduled for high-value uses. Conversely, real estate owners whose areas are not scheduled for high-value uses are likely to protest. Such conflicts are not limited to individual owners, but can also arise between cities and local authorities in a region. The way these conflicts are resolved largely depends on the regulations and political culture in a country, and it is not possible to present universally valid principles for resolving such conflicts. It is clear, however, that early identification of the areas planned or approved for particular uses helps all actors to make appropriate decisions.

Planning urban and regional development is inevitably associated with planning the relevant transport corridors and routes. Development of areas for office, residential or commercial use requires planning the development of transport.

In the 1950s and 1960s the concept of the *car-friendly city* became popular in the West (*e.g.* Los Angeles, Houston, Seattle, and in Germany in Cologne, Kassel, Osnabrück). However, it emerged that the area required for transportation cannot be made available, particularly in heavily urbanized areas, and cities are bogged

Box 11

Master plan

Many cities have succeeded in enhancing the priority accorded to — and the public perception of — public transport by adopting a master plan for local transport. This gives binding force to the following goals:

- ***Commitment by policy-makers***: the master plan documents the commitment to offering and financing specific public transport services of a specified quality.
- ***Communication and transparency***: the master plan provides the stakeholders (specifically transport operators and passengers, but also the private sector, etc.) with the details of the goals and the implied requirements.
- ***Reliability***: active or potentially interested transport companies can derive objectives from the master plan, giving them extra planning security.
- ***Coordination***: the master plan helps initiate coordination processes with all involved — passengers, companies, public authorities and politicians — with regard to the planned goals and requirements.
- ***Integration***: the master plan integrates all aspects of public transport and the various specialist planning activities (land use, urban, economic, social and location policy, environmental protection, etc.) over a precisely defined time horizon.

down in endless traffic jams. As a result, concepts were rethought in the 1980s and many cities started to build public transport systems, trying to force cars back out of the inner cities. This can be supported by a congestion charge system for cars (*e.g.* Stockholm, London, Oslo, Singapore), by increasing charges or regulation for stationary traffic (*e.g.* Tokyo, Sydney, New York), regulating inner city access by decommissioning roads and controlling traffic lights (*e.g.* Cologne), and by preventing through traffic by demarcating pedestrian zones (*e.g.* Munich, Vienna).

In recent years, certain principles have emerged for meshing urban planning and transport planning. It is helpful to route expensive systems like metro, light rail and BRT through heavily used areas. Buses should provide feeder services to these main lines. It is important that the necessary intermodal transfers should be as convenient for passengers as possible. The greater a city's transport problems, the more likely it is that the value of real estate along a route will increase. This increase in value should be used to help finance investment and the current operating deficits. Various procedures can be considered here, depending on the initial situation and the legal system:

- The metro company itself buys and develops the relevant real estate;
- There are contracts under private law with real estate owners in which the owners commit to helping finance public transport in exchange for providing a station or bus stop;
- Land or real estate taxes are imposed for real estate near metro lines.

Care must be taken in this case to ensure that planning of lines is not dominated by outside real estate interests. Several of the early metro projects in developing cities suffered from the fact that routes were determined less by transport needs than by real estate interests, without the beneficiary real estate companies sharing the costs of the metro lines.

3.3.2 Fare system and ticketing

An integrated fare system is a central element in an integrated transit alliance. There are numerous ways to implement this, although the actual scope for action is determined by the funds available and the position of the transit alliance.

Box 12

In ***Bogotá*** (Colombia) the new TransMilenio allows passengers to transfer from (local) feeder buses to the express buses without having to buy a new ticket. Because passengers do not have to buy a new ticket for each individual segment of the journey, they accept the need for more frequent transfers required by the introduction of the TransMilenio.

Source: traffiQ

Where transport is not integrated, passengers have to buy a new ticket every time they transfer. The providers of these transport services demand *their* fares from each passenger. The drawbacks for passengers of non-integrated transport are obvious: travellers without a direct connection to their destination face high fares without fare integration, as they have to pay every time they transfer during their journey (in many cities this means up to 3–4 tickets for a trip). This often impacts poorer population groups living in the peripheral areas of cities. Many jobs, particularly in the formal sector, are located in the inner cities or other high-use areas. For these groups, the fare is a significant cost, and it is often pointless for them to accept employment in these areas. As a result, inadequate public transport creates opportunity costs in the form of lost potential for economic growth. It could be observed that sometimes transport costs eat up to 30 % of the household income of the poorest part of the population.

Box 13

In ***Curitiba*** (Brazil) a deliberate decision was taken to keep the difference in fares small for short and long distances. As a result, fares for longer distances — particularly routes from the city periphery to the centre which poorer population groups need — are relatively cheap. Tickets for shorter routes close to the centre, which wealthier people need, are relatively expensive. The ticket system consequently acts as a subsidy for the poorer groups.

Creating a fare system is one of the most important tasks for the transit alliance. The ideal solution is a complete tariff integration, which means that passengers only have to buy one ticket for all segments of a journey within the transit alliance area. Not only does this mean that passengers may save on fares, but it also means that the transport company saves money, because the number of payment transactions is reduced — this is important if bus drivers perform this function. When transferring between lines or means of transport, there is no further payment under this system, as passengers simply show their existing tickets.

Box 14

Season tickets

In ***Germany*** and several neighbouring states, there has been intensive advertising in recent years for the sale of season (monthly or annual) tickets. For regular users, these tickets offer steep discounts compared with individual tickets (monthly season tickets in Berlin or Vienna, for example, cost around the same as 25 tickets for single journeys). This simplifies the process for passengers, who no longer have to buy tickets every day. As there are no additional costs for additional journeys, passengers are motivated to make trips with public transport even where there are alternatives (*e.g.* evening leisure traffic). The process of selling tickets is also simplified for the transit alliance and transport companies, and revenue is predictable. As the tickets are bought at the beginning of the month, there is also a positive cash effect for the transit alliance. In a further development, companies are offered discounted annual tickets for their employees, and students at many German universities are required to buy discounted tickets for a semester. In many of these cities, a significant majority of passengers now use season tickets.

A central task of a transit alliance is to ensure that the transport companies continue to receive a reasonable income once a tariff alliance has been launched. The major change with a tariff alliance is that the transport companies no longer retain their direct fare revenue, which goes into a common pool. This requires entry into an agreement between the transport companies on distributing funds from the pool. Without an agreement acceptable to all on revenue distribution, a transit alliance cannot continue to exist and offer high quality service.

A means must be found to ensure that all fare income is paid into the pool and correctly recorded. A particular role in this is played by ticket printers and ticket machines, with which income can be electronically monitored.

Of course, the different transport companies have diverging interests in the distribution of income. In a first step, it is important to establish principles governing distribution. The first principle is that the costs incurred by an operator are adequately covered, to ensure that the operators have an interest in providing the service. In addition, the distribution of income should, if possible, include an incentive to operators to increase the number of passengers. Options here include bonuses based on the number of passengers.

As already explained, the income from fares will generally not be enough to cover all operator costs. The transit alliance must therefore be subsidised by public funds. Part of the subsidy is justified on the grounds that in many cities legislation requires specific groups of passengers (*e.g.* children, pensioners, veterans, handicapped persons) to get reduced or free tickets. The legislature is then required to compensate the transit alliance for these payments.

In addition, before launching a tariff alliance, it is necessary to determine the losses in revenue that will arise. If the public sector does not cover the expected reduction in income, the fare system must be modified, *i.e.* fares must be increased (for options for financing subsidies, see Section 3.2.2). Lower fares generally lead to increased demand, which means that some of the income lost from the introduction of the tariff alliance can be offset by attracting new customers. However, passenger demand in response to a change in fares varies significantly from country to country, which is why estimates are very difficult to make.

In a tariff system, the fare level as well as fare structure must be established. There is often a trade-off between simplicity and appropriateness. It is logical that fares should increase along with increasing distance. This principle can be reflected through zones within a tariff alliance. Here, the area covered by the tariff alliance is split into geographical zones. The fare depends on the number of zones in the trip. However, such systems

quickly become very complex. This may not seem a problem for regular customers, but the complexity and incomprehensibility of fare systems repeatedly emerge as obstacles for users of other means of transport and prevent them from switching to public transport.

The alternative model is a simple fare system with a small number of zones, and, in the extreme case, a fare unrelated to the distance travelled. The implication here is that passengers travelling short distances will be charged disproportionally, compared to passengers travelling long distances. Here again, it is expected that participants in a transit alliance will take different positions. Representatives from local communities in surrounding areas whose residents mostly travel long distances to the inner city will support a system with small differences in fares based on distance, while inner city representatives will support a system which reflects the difference in distance proportionally in fares as closely as possible. In Germany, zone systems are most frequent, but the complexity of the systems varies.

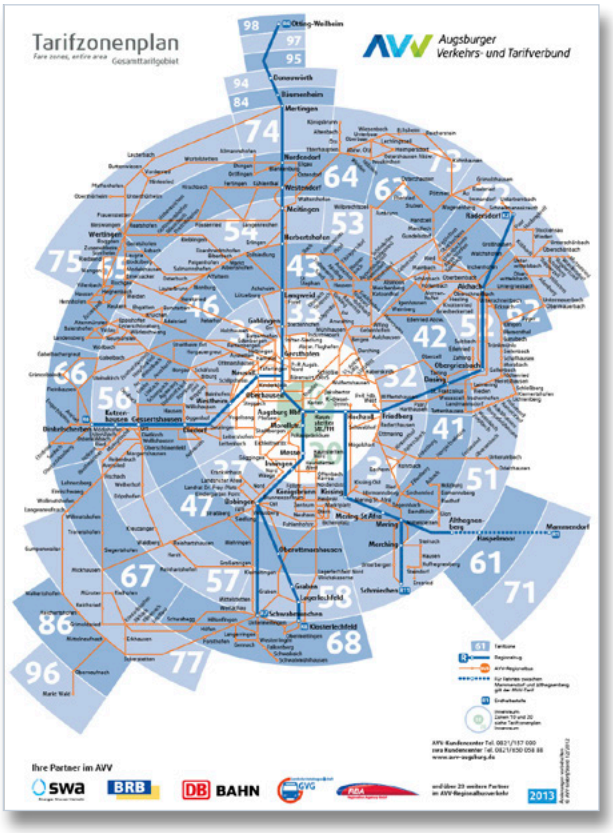


Figure 19: *Fare zone system Augsburg.*

Source: Website AVV
http://www.avv-augsburg.de/tl_files/avv_files/tarifzonen/Tarifzonenplan_Gesamtraum.pdf

Figure 20: *Fare zone system Berlin.*

Source: S-Bahn Berlin:
http://www.s-bahn-berlin.de/aboundtickets/allgemein.htm

A major decision for a transit alliance is to determine the physical characteristic of tickets. In an integrated system, it is crucial for all employees checking tickets to be able to easily establish whether these are valid. Tickets must also be safeguarded against forgery.

Establishing a system of this kind depends to a large extent on how the checking system is designed. In the case of bus systems only, the driver can check tickets as passengers get on the bus. However, when a large number of passengers want to get on, it can slow down the boarding process and lengthen travel time. In the case of metros, access can be controlled manually or with the help of automatic barriers. Light rail and BRT systems pose a special problem. These are often integrated into the roadways, and structural barriers are difficult to implement.

In many cities in developed nations, access to metros, light rail and buses is without any access control, and there is no regular inspection. This minimises access and stopping times. Instead, employees randomly check passengers to ensure that they have valid tickets. Passengers travelling without valid tickets are required to pay substantial fines. Cities with a system like this report a fare dodger ratio of between 3–15 %, with the ratio being largely influenced by the intensity of the inspections. Mixed systems are also common, with random checks where there are large numbers of passengers and a requirement to show tickets to the bus driver for each trip where bus lines have few passengers or during off-peak hours.

Tickets are either centrally printed and distributed or issued by ticket machines at stations or on buses. The arrival of electronic tickets creates new possibilities for issuing and using tickets. For around 20 years there have been systems with magnetic stripes applied to paper tickets, which are used as one-way tickets. In recent years, electronic tickets are predominantly based on RFID chips which can be integrated into chip cards or tokens.

Box 15

Smart card in Hong Kong

Besides the Oyster card in London, the Octopus smart card in Hong Kong (China) is the best-known example of the use of an electronic ticket. In both cases a credit is recorded on the card and card readers debit the fare for public transport travel on the basis of the length of the route. Paying fares with the Octopus card is significantly cheaper than buying a *classic* ticket. There is something else that has helped the Octopus card become popular. More than 3 000 merchants (businesses, restaurants, snack bars, etc.) have signed up with the Octopus card and accept card payments. The card is therefore not only a ticket for travel, but also a parking ticket, purchasing card (partly with bonus programme), access card (schools, hotels, offices) and can even be used as a time card in companies. 95 % of Hong Kong's residents generate over 11 million transactions a day. Octopus Card Ltd. is wholly owned by Octopus Holding Ltd, in which all major transport companies are involved. The alliance concept is most certainly supported by this marketing concept. This identifies local transport in the city with its seven million inhabitants as a uniform service, organised by the Transport and Housing Bureau and operated by the various transport companies: Metro Train (formerly KCRC), Metro (MTR), tram, bus, ferry and rack railway. As such, Hong Kong is a good example of the successful implementation of a transit alliance which — although only in its initial stages, organisationally speaking — is nevertheless established on the basis of its tariff and Octopus card service, and accordingly functions as an integrated service.

Source: traffiQ

These electronic tickets can significantly speed up access control, *e.g.* in metro stations. However, on light rail or bus systems, additional manual controls are unavoidable.

Smart cards can also be used for other small payments. Such cooperation arrangements enhance the acceptance and popularity of such cards and lower the barriers to the use of public transport.

The smart card also has advantages for transit alliances and transport companies, as electronic documentation of travel for which the smart card is used makes it possible to analyse the type of use and to consequently improve the services offered.

Box 16

Smart card in Izmir

A smart card (Kentkart) was introduced in Izmir (Turkey) back in 1999. Initially, it could only be used on buses, but it was soon extended to the metro and to the ferry, which plays a significant role in the city. To help Kentkart make a permanent breakthrough, it was linked to fare reductions, so that the '*old*' paper tickets are now an absolute exception. In the process, the transfer stops between bus and ferry were improved and timetable connections optimised. From the start, the data collected from the Kentkart was used for planning purposes. The bus system was gradually restructured and the lines now act as feeders for the metro.

Source: traffiQ

With the help of the smart card, trips can be billed at different rates. Discounts or season ticket functions can be easily integrated. A particularly interesting element is the distinction in timing between peak and off-peak periods, which is easy to implement with smart cards. With this application, travel can be more expensive during rush hours and relatively cheap during off-peak hours. Basically, an arrangement of this kind can boost the use of public transport outside rush hour.

Such differentiated fare systems do, however, include risks if passengers do not understand the complexity of the system. Where there is a distance-related system, passengers need to check in not only at the start of

the journey but also at the end, otherwise they will be charged for the maximum distance. This is not a problem at metro stations with entrance barriers, but with systems without such barriers or with buses, this is repeatedly forgotten. In London, the TfL earns an additional unjustified EUR 75 million a year (about 1.5 % of total revenue) as a result of passengers forgetting to check out. This is why it is essential to ensure that passengers accept and understand the smart card system, and that the existing or target fare system can be displayed with the smart card.

In existing systems, it is also important to take into account that a smart card system must be introduced across the board. This requires the necessary investment as well as funds for passenger information and employee training.

Figure 21: *Minimum standard bus stop in Bayreuth.*
Photo: Broaddus, 2007

3.3.3 Infrastructure, stops, interchanges

The stop is the passenger's first point of contact with the transport system. Stops should accordingly be designed to be as attractive as possible. Where financially feasible, the following comfort aspects should be considered for bus stops:

- Elevated area around the stop to promote passenger safety;
- Information for passengers (fare information, stop signs, line number information, timetables, map of lines, map of surrounding area);
- Ticket machines;
- Protection against weather;
- Seats.

Metro stations typically have a significantly higher number of passengers. For this reason, metro stations offer an opportunity to generate additional revenue from advertising or leasing sales areas. Again, other elements can be added to the comfort functions listed for

Figure 22: *Bus stop with stop names and line numbers in London.*
Photo: Hickman, 2006

Figure 23: *Bus stop with public transportation map and line maps in Berlin.*
Photo: Breithaupt, 2009

Figure 24: *Sheltered bus stop with seats in Dresden.*
Photo: Belka, 2009

bus stops, depending on the availability of funds. These include both staffed sales points for tickets and WiFi systems helping passengers to be productively engaged while waiting.

Rapid transit stations (particularly in a tunnel) should be easy to use and well lit in order to enhance passengers' subjective sense of safety. In addition, objective safety should be offered through security personnel and CCTV.

Escalators and lifts are important comfort elements from the passenger point of view, and their importance increases with an ageing population. Lifts are also vital for transporting handicapped persons (particularly wheelchair users). However, they involve substantial operating costs for energy and maintenance. Even where lift installation is waived initially for cost reasons in a construction project, a check should be made to see if retrofitting is possible.

In the case of metro stations with heavy traffic, it is particularly important that stations are constructed in such a way as to ensure passenger safety. Where there is overcrowding, there is a risk that passengers waiting directly by the rails will be pushed onto the rails by the passengers behind. Potential danger increases in case of panic. There are a number of structural and technical measures for preventing such accidents. For example, the rails can be separated from the platforms by transparent walls, with entrances through automatic doors opposite train doors (*platform screen doors*). Passages and stairs should be wide enough. For emergencies there must be an option for erecting effective barriers to close off overcrowded areas. In addition, a concept must be drawn up in advance for evacuation routes in case of emergency.

An integrated transport system depends in many cases on connections.

This is particularly the case where a high-capacity rapid transit system (metro, light rail, BRT) is the backbone of the system. In such cases, particular attention should be paid to the design of transfer stops. To shorten travel time and enhance subjective passenger comfort, transfer distances should be minimised. This must generally be taken into account in the construction phase. In the case of transfers between metro and railway lines, this can be done through multilevel stations where the individual lines operate at different levels. Ideally, such stations are located directly above one another, so that only one flight of stairs is needed to get from one line to another.

Figure 25: *Multi-level metro-suburban train station (Berlin Ostkreuz).*

Source: http://www.s-bahn-berlin.de/aktuell/2007/images/047_ostkreuz_aufbau_gross.jpg

Figure 26: *Multi level metro-metro station (Berlin Schöneberg).*
Photo: Axel Mauruszat, 2007

Even more convenient, although generally more structurally demanding, are transfer possibilities on the same platform. For this, the lines involved must be on the same level and travel in the same direction.

Rather less structurally demanding are transfer facilities outside densely populated areas, *e.g.* between bus and suburban rail or bus and light rail.

Figure 27: *Bus-Tram station in Bern.*
Photo: Belka, 2010

Figure 28: *Light Rail – Bus station in Strasbourg.*
Photo: Hickman, 2003

There are recurring examples of stations for different lines being built in an unregulated manner, so that changing between lines can involve a long walk, which is time-consuming and inconvenient. It is virtually impossible to correct mistakes in this area once construction has been completed.

Particularly in less heavily populated regions, accessibility of metro stations depends not only on bus lines but also on other forms of transport. Suitable interfaces should be provided for these too. Private cars need parking spaces (*Park & Ride*) and suitable facilities for dropping off passengers at a metro station (sometimes called *Kiss & Ride* zones). In addition, there should be adequate areas for taxis, auto rickshaws, etc. to stop.

Figure 29: *A Park & Ride facility at Kassel, Germany.*
Photo: Schmid, 2010.

Box 17

Taxi traffic

In the case of ***Shanghai*** (China), it was determined that taxis looking for passengers were empty for up to 80 % of travel through the city. These unproductive trips could be significantly reduced by establishing taxi-waiting zones at major metro stations from where passengers could take a taxi. This would increase passenger convenience, reduce emission from cars, and probably reduce taxi costs.

In regions with dense bicycle traffic, it is important to check how parking spaces for bicycles can be provided at metro stations and major bus stations. Use of bicycles varies, depending on history, climate and factors such as the danger of theft and vandalism. Providing a safe and sheltered bicycle parking at a metro station can promote the use of this environmentally friendly means of transport.

Figure 30: *Underground bike parking station at Muenster main railway station..*
Photo: Doehn, 2010

Public bike systems are a relatively new but rapidly growing business in many cities. At present there are over 250 such systems operating, with continuous and rapid growth. The largest system is in Hangzhou with 80 000 bikes, while Velib in Paris has 23 000 bikes. Here again, suitable interfaces at metro and bus stations are useful.

Figure 31: *Self-service bike system in Guangzhou.*
Photo: ITDP China, 2010

Normally, operators only plan their own stations, and consideration of interchanges with other lines, buses, cars or bicycles often takes a back seat. The requirements of planning law and financing mostly means that operators are unable to influence the development of the area outside their own facilities.

This is why a typical task for a transit alliance is to handle the integrated planning of stations that takes into account transport modes and to push through implementation. These tasks include planning and financial coordination. This can be very elaborate and complex with integrated stations, as the facilities for such an interchange often belong to different operators with different interests, planning cycles and financing options. In Germany, the state provides investment funds through interface programmes for the development of facilities where financing from operators' classic funds would be difficult or impossible.

Designing such integrated stations often leads to conflicts over use (*e.g.* the question whether the *best* places outside a metro station should be reserved for buses, or whether these should include access for taxis or private cars). In mediating such disputes, a transit alliance — as an independent tribunal — often plays a decisive role.

3.3.4 Timetable

A transit alliance must also organise the timetable. The primary goal of any timetable is to offer adequate transport capacity for passengers. On the contrary, it is important to avoid offering services for which there is no demand. This is another reason why a transit alliance should regularly collect data on transportation demand.

In developing cities, particularly in high-density centres, the overwhelming problem today is to offer adequate capacity. One of the major tasks of an alliance is to help expand capacity.

The problem is completely different in areas with light demand for transport. Here, the challenge is to provide a reasonable frequency of service that attracts customers. In western countries, waiting times of up to ten minutes are acceptable to customers, but longer waiting times lead to a loss of *non-captives* to other means of transport. In the case of direct connections, waiting times for passengers are easy to plan, but transfers pose a greater problem. Here, the task of the transit alliance is to set departure times for connecting lines so that waiting times for transferring passengers are as short as possible.

Box 18

Fixed-interval schedules

In a number of ***Central European*** nations (led by Switzerland, the Netherlands and Germany), transport systems with fixed-interval schedules have been established in recent years. These are very important, particularly outside the major centres. In suburbs and rural areas, the services run on fixed departure times (*e.g.* every ten or 30 minutes or every hour). These times do not change during the day. Passengers no longer need to worry about departure times, as they know that their bus or train will always depart at a specific time, *e.g.* every ten minutes (06, 16, 26, 36, 46, 56) or at 17 minutes past every hour. Ideally, scheduled nodes are planned, *i.e.* transfer rail stations where suitable connections are scheduled. A system like this involves substantial costs, as connections also have to be offered which, on their own are not economically feasible. Overall, however, several countries and regions have shown that many *non-captive passengers* can be attracted as customers even in developed countries.

Timetables become a challenge for buses and trams that use public roads in mixed operations. In these cases it is difficult to stick to timetables. Separate bus lanes are of course ideal, as this helps considerably in stabilising schedules. Another possibility is to keep bus lines (particularly those which feed metro lines) as short as possible. This prevents knock-on delays over extended periods.

The function of the transit alliance is then to create and implement an appropriate timetable that suits passengers.

3.3.5 Passenger information and marketing

Informing passengers about services has a central importance in public transport. This is especially true for transit alliances where transport services are significantly more extensive, with a simultaneous increase in the complexity of the information. New technologies are causing rapid development in this area. Passenger need for information also depends on the user profile: regular passengers travelling the same route every day, as commuters need little information. Passengers who rarely travel or take different routes need more information. With advancing economic growth, it can be assumed that the share of passengers needing a lot of information will rise. The reason for this is that in developed societies, switching from one workplace to the other assumes significance, and growing prosperity leads to more non-captive passengers who only occasionally use public transport. In addition, there is the growing importance in leisure traffic, together with demand from tourists in many cities.

Socio-cultural aspects also need to be considered in the marketing strategy. These include illiteracy rates, familiarity with — and the ability to use — maps, the spread of the internet, and availability of cell phones and smart phones.

Passengers need information at two typical points: first, in planning their trip, *e.g.* from home; second, directly at the stop. Traditionally, passengers are supplied with timetables in book form for use at home, while current timetables are displayed at stops. In developed countries these forms of providing information are being largely replaced by new technologies.

The technological basis for all new systems is an electronic timetable that is available on the internet and is made accessible for all passengers through user-friendly graphic interfaces. Today, information can be accessed on the internet or from a smart phone. In many transit alliances, the first step is to provide timetable information for all stops in the alliance area. Most information systems in Central Europe now offer information for specific addresses, which includes walking time to and from the stops from the starting and destination points.

Such systems normally include details on the services operated by all alliance carriers and can therefore be used to look up routes from and to any given stop, address or key destination, and to consult maps. The systems also often contain details on the particular alliance's fares and other important information. When entering the relevant search criteria, the results pages outline the key details on the various connections found; more in-depth information (*e.g.* lines used, transfer points and information on delays, disruptions, barrier-free connections, maps, fares) is usually available on specific pages.

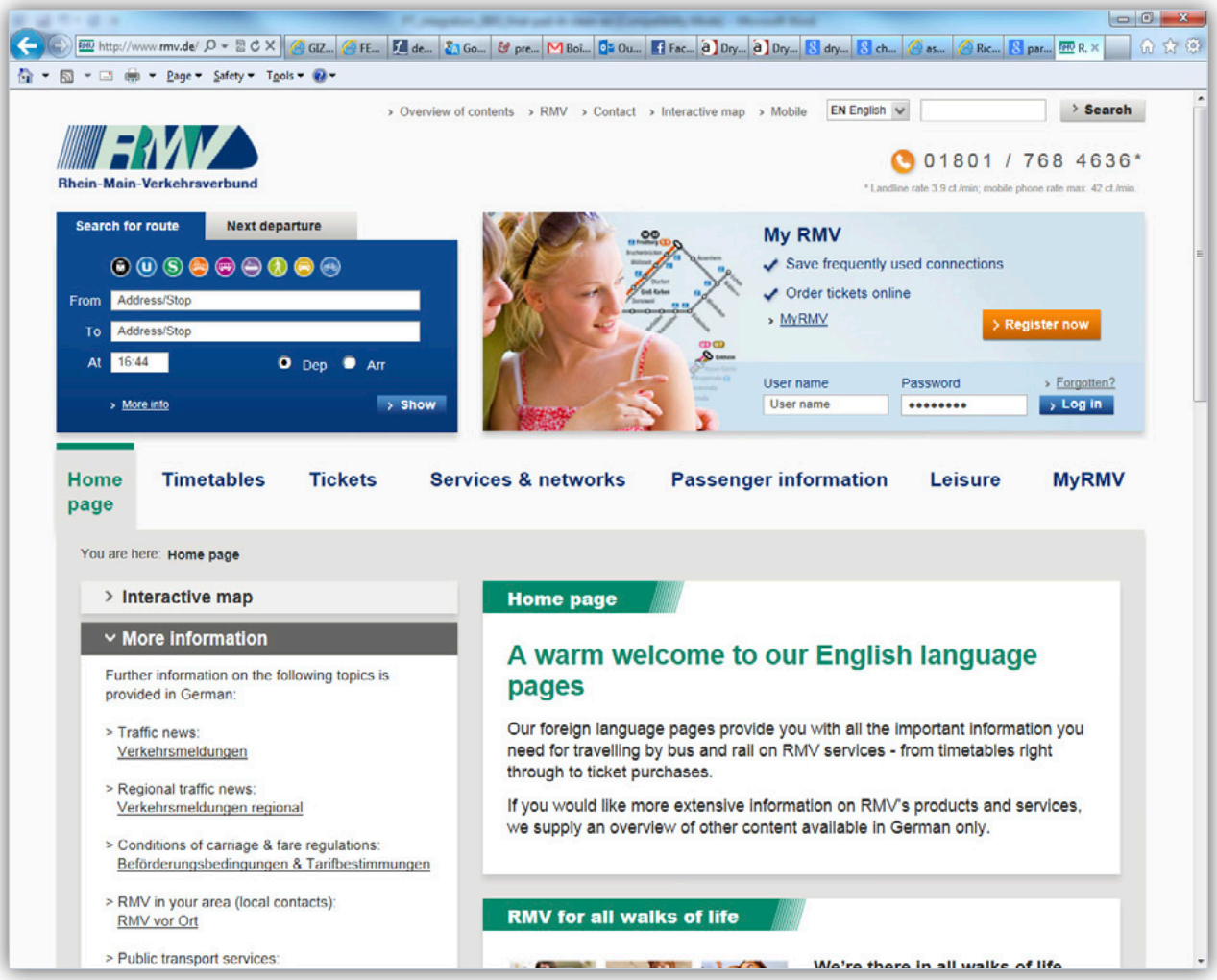


Figure 32: *Welcome page of the RMV, the Rhein Main transit alliance (region of Frankfurt).*

Being able to include real-time information from multiple operators within alliance-wide timetable information systems has been a key advance in recent years and is therefore a crucial aspect of expanding existing systems.

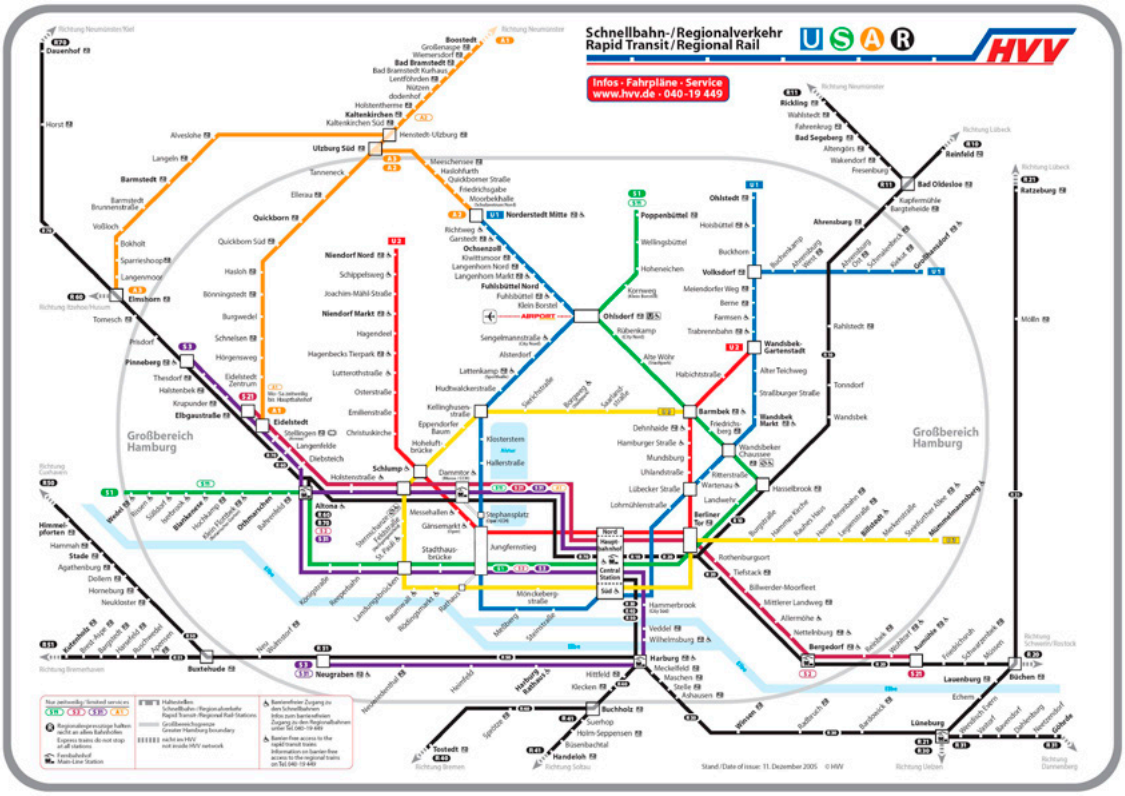
Although the amount of real-time information available will vary, the primary considerations are a) what information (both details of a specific delay and general information on disruptions) is most important for customers and where, and b) how to communicate complex information to passengers as simply and transparently as possible. One of the public transit alliances' key tasks in this respect is to devise solutions which provide passengers with the information they need in a clear and comprehensive manner but can also be introduced and maintained at reasonable cost.

At stops and stations, printed timetables are increasingly supplemented by real-time systems showing the next few services while taking into account current changes. Market research shows that passenger satisfaction is significantly enhanced by updated information on waiting times. Stops are currently being equipped in many countries with QR codes which enable smart phone users to access departure times for a station at any time.

Figure 33: *Tram station with real time information in Karlsruhe.*
Photo: Breithaupt, 2010

Another important source of information are the traditional network and route plans, which visually help passengers plan their trips.

Figure 34: *Public Transportation map, metropolitan area of Hamburg.*



An important task for the transit alliance is to ensure that the data and documents are available in time. This involves taking into account a number of details:

- The corporate identity of the transit alliance (layout of information, signs and drawings) must be uniform;
- The information provided (*e.g.* timetable, map of surrounding area and network map at every metro station) is standardised;
- The station names are standardised (the same designation for all operators and in all documentation, particularly for transfer stations).

It is foreseeable that in the coming years every transit alliance will need electronic timetable information. Initiating and designing this is a typical task for a transit alliance.

Box 19

Examples

- In ***Manchester*** (UK) a separate company was formed to deal specifically with passenger information. This company is the only one allowed to publish passenger information. Information on public transport in Manchester is very comprehensive, and is increasingly provided and used today in a wide range of electronic media.
- The ***London*** transport company TfL (UK) maintains an elaborate customer information system. Some 10 000 customers and potential customers use the service at Call Centre London Transport every day:
  - approx. 80 % of customers act on the recommendations of the information service;
  - approx. 40 % of passengers get a recommendation on how to simplify or shorten their trips with public transport;
  - over 10 % of callers would not have used public transport for their journey without the information;
  - for less than 10 % of callers, the information has encouraged them to start using public transport.
- In ***Sao Paolo*** (Brazil), although the STM is an institution which has (among other tasks) the responsibility of coordinating communication and marketing for the transport operators involved (metro, regional trains, regional and local bus companies), the transport companies all appear under their own name. There is no common brand which creates a public identity. No agreement has been reached on uniform external marketing. It is uncertain whether in these circumstances the improvements in public transport are actually noticed and accordingly appreciated.

4 The transit alliance as a project

Establishing a transit alliance is not a *routine* task. Besides political commitment, technical and professional knowledge, training in project management techniques is also essential. There is comprehensive international literature on project management and there is therefore little need at this point for more than a few comments, although these have particular relevance for the task of establishing an alliance (for a step-by-step checklist, see Annex I).

Every project starts with a description of the project goal(s). Without the most accurate possible description of the overall and subordinate goals, the project will not be able to run smoothly and cannot be successfully completed. At the very start there is the (political) decision regarding the goals of a transit alliance. Is the primary aim to increase the number of passengers, or to mitigate the adverse impact of informal paratransit? Is the intent to initiate a far-reaching fare structure reform, or is the emphasis on environmental aspects? Is the formation of the transit alliance to be accompanied by extensive expansion or conversion of the infrastructure? This process of determining the goals may itself take some time, although this time absolutely ought to be invested before the start of the actual project. A political commitment to *doing something for public transport* is hardly sufficient.

In the next step, the general conditions should be analysed and evaluated. What legal requirements (already) exist, what is the starting point, and who are the stakeholders? Who is affected in some way or another by the formation of a transit alliance? Possibilities range from passengers through transport operators and the community transport organisations to the owners of the infrastructure, political actors, and possibly the banks as potential lenders. All the stakeholders need to be covered. What is known about them? How do they feel about creating a transit alliance? Is anyone influential enough to block the planned transit alliance? Who would actively support a transit alliance, and under what conditions? It is necessary to decide how to deal with the individual stakeholders. Is the aim to involve them, or is the goal to act and subsequently implement the results, if necessary in the face of opposition?

Given the scale of this project, it is essential in a third step to draw up a complete project plan, including a description of all the work packages included in it. This should summarise the individual steps, the estimated time they require, and all the participants needed for the individual packages. The resulting schedule and timetable provides information on the sequence that is necessary and useful for completing the work packages and the overall term of the project, and makes clear when which intermediary results (milestones) can be expected. A realistic estimate should be made of the time that is probably required to set up a transit alliance. Naturally, preparatory planning for the project should include the costs incurred (material, human resources) and the financing aspects should be clarified.

Like any other major project, the transit alliance project involves a number of risks, which can extend from questions of financing unexpected (internal) political changes through to unforeseeable resistance by the transport operators. The better those responsible are prepared in the analysis of possible risks and formulating possible preventive or curative measures, the greater the likelihood of reducing the possibility of risk and/or the potential damage.

Actual project implementation should in any event include feedback at regular intervals on the milestones developed in the planning phase. Was an important goal perhaps not recognised earlier? Has another influential stakeholder appeared, or has an existing stakeholder been inaccurately assessed? Is the timetable still valid, or does it need to be corrected, are the human resources adequate? Has a previously unrecognised risk become apparent?

Project marketing is essential. To some extent, it is a constant companion throughout the entire term. Many of the statements in chapter 1 have made it clear that the population, passengers and potential and future passengers are always the actual supporters of an integrated public transport system and a possible future transit alliance. When creating a transit alliance it is advisable to establish a communication strategy for passengers from the start and to proactively advertise the benefits of the future transit alliance for passengers (*cf.* definition of goals at the start of project planning). Ultimately, it will always be the passengers who help a transit alliance (and with it those responsible for implementing it) to be a success.

ANNEX 1

Checklist for establishing a transit alliance

n.b.: The following steps are not necessarily to be performed in the sequence shown – some overlapping and flexibility is to be expected.

Collect basic data

- Master Plan for urban development or similar documents;
- Transport Master Plan or similar document, including information on:
  - Projections for population growth;
  - Projections for transport sector development (including motorised individual transport and public transportation);
- Status quo of public transport operations including paratransit, including information on:
  - Lines operated;
  - Vehicles;
  - Stops;
  - Traffic/passenger flows (origin & destination, passenger counts, passenger surveys);
  - Fare and payment structures;
- Overview of the agencies and institutions involved in planning, licensing and financing public transport;
- Understanding of existing processes for licensing and financing public transport;
- Structure of formal and informal operators (operator companies, solo operator, associations and syndicates).

Assessment of framework conditions for establishing a transit alliance

- Overview of the legal framework for the public transport system (*e.g.* requirements for drivers licence, operator licensing, vehicle safety, financing);
- Preliminary identification of necessary improvements to the regulatory framework;
- Preliminary calculation of necessary investments (including for planning, building/upgrading infrastructure, purchasing vehicles, driver training, etc.);
- Preliminary calculation of funds necessary for establishing and operating the transit alliance;
- Preliminary calculation of expected fare revenues;
- Identification of relevant stakeholders:
  - Political parties (including public relations and press departments);
  - Current employees of both the formal and informal public transport sector, related associations, etc.
  - Authorities and departments involved with planning, licensing and financing public transport;
  - Passengers and beneficaries such as industrial/commercial establishments, shopping centers, etc.);
- Stakeholder analysis:
  - Expectations and requests of stakeholders;
  - Strategy for stakeholder participation/concept for external communication;
- Identification of risks:
  - Political and regulatory/organisational risks for transforming the old system into a transit alliance;
  - Risks related to planning and technical issues;
  - Risks related to timing and duration of transition period;
- Risk analysis:
  - Probability of a negative event happening;
  - Potential damage.

Setting targets

- Analysis of shortcomings of the current public transport system (including paratransit) and achieving political consensus that such shortcomings shall be eliminated;
- Political decision to establish a transit alliance, including its main goals – *e.g.*:
  - Assuring access to mobility & satisfying the demand for mobility;
  - Fostering the local economy through provision of adequate mobility;
  - Affordable and fair fare system to enable universal access to mobility;
  - Costs covered (to the extent possible) by fare income;
  - Improving road/traffic safety;
  - Transitoriented urban development;
  - Environmental protection;
- Political decision on those targets that can or shall not be achieved by the transit alliance;
- Political decision on target structure of the transit alliance:
  - Define a feasible size of the future transit alliance, depending on local geographic, economic and political structures;
  - Define the decision hierarchy and organisational structure of the transit alliance;
  - Define the network to be covered by the transit alliance (stops and lines);
  - Standards for timetable integration, passenger information and marketing;
  - Outline of a common fare structure and necessary technology.

Implementation

- Establish a project team which shall be responsible for implementing the transit alliance;
- Milestones:
  - Final timeline for implementation;
  - Final organisational chart & business plan of the transit alliance;
  - Necessary contractual arrangements (*e.g.* between alliance and communities and regions involved);
  - Detailed infrastructure planning;
  - Detailed planning for timetable integration, passenger information and marketing;
  - Detailed planning for fare structure and necessary technology;
  - Final budget (calculations for expenditures including infrastructure and operating costs and for income based on fares and public subsidies, if applicable);
  - Final concept for coordination with current operators, including paratransit;
  - Final concept for external communication;
- Final decision of political stakeholders on implementing the transit alliance, agreement on the above mentioned milestones;
- Implementation;
- Monitoring, evaluation, necessary adjustments;
- Regular budget monitoring.

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