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Rail Oriented Development on Urban and Regional Levels

Potentials and Impacts, Policy Measures and Processes

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Abstract

The present trend of spatially diffused and functionally segregated settlement structures is to cause significant long-term growth in traffic volumes. One measure to attain more sustainability is to develop land use along the existing passenger rail infrastructure. The federal state of North Rhine-Westphalia (NRW) has adopted this as a clear strategy, providing grants to cities to develop housing close to rail stations.

Both the potential and the effects of a rail-oriented development have been analysed by ILS for the NRW Ministry of Urban Development. A survey done in over one hundred cities in three regions has revealed a considerable amount of land available for new housing around rail stations, but also a substantial variation between regions and among cities. As far as the effects are concerned, another survey was performed among 2100 persons from six comparable suburban areas with high motorization rates. It showed up a significant difference in their modal choice, depending on the rail accessibility, although the difference is lower than might be expected.

Furthermore, this paper presents successful experiences of rail oriented development on different levels. At the regional level, the Haller Willem project in NRW demonstrates the successful revitalisation of a railway line and settlement development close to rail stations. Strategies aiming at the integration of land use and public transport at the urban level are illustrated here by the cities of Orléans and Vienna.

1. Background situation

Suburbanisation of housing and working places

Not only continuous suburbanisation of housing but also growing decentralisation of working places cause long term growth in traffic volumes. While large cities within agglomerations lose population, as for example in the Ruhr area, population growth takes place particularly in the conurbation fringe or, even to a greater extent, in the more rural areas. The biggest rise of population is found in rural settlements not too far from agglomerations (see fig. 1).

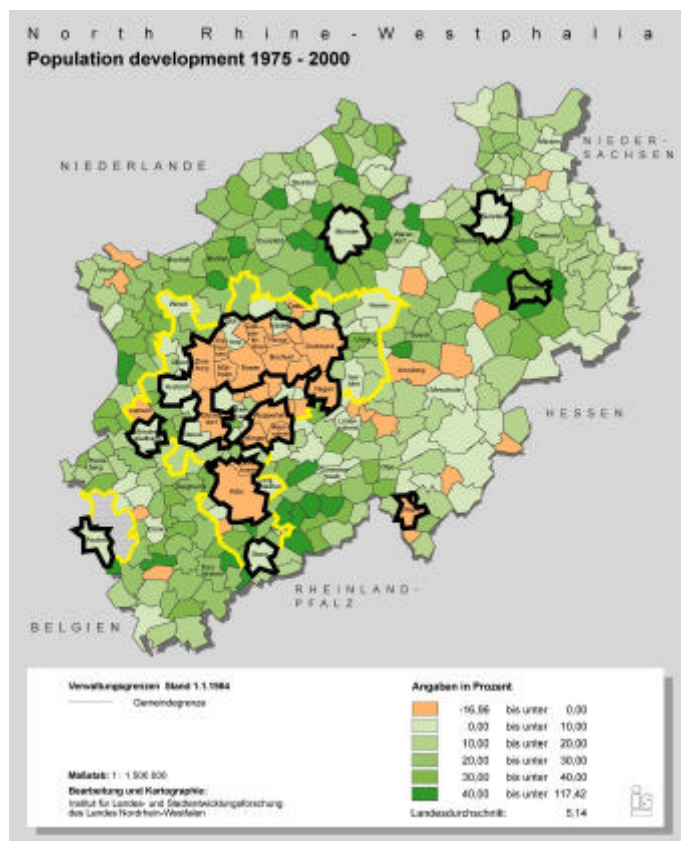


Figure 1: Population development in the Federal State of North Rhine Westphalia

In the agglomeration centres the loss of population is reinforced by negative natural population tendencies, while nevertheless an increase of population takes place in the suburbs and more rural areas.

Reasons for suburbanisation

Since the eighties many different surveys concerning the motivation behind intra-national migratory movement have been carried out. Their results show a heterogeneity of causes. Mainly families, but also childless couples move to the suburbs or even the rural periphery of agglomerations. People primarily move in order to acquire a home of their own; a small but increasing share move into rented residences. A main criteria for many people to move to rural areas is that they expect their new neighbourhood to have both a higher quality of the environment as well as more social homogeneity. According to some surveys, a high percentage of these migrated people would have stayed in the cities if an affordable supply of suitable accommodations had been available there (cf. ILS 2002).

Consequences for land use and transport

Settlement development took place mainly between the traffic axes, where people are by far the most dependent on cars. Furthermore, accessibility by car is a precondition for land use development in these areas without effective public transport access (cf. Reutter/Unger 1998). In rural areas a significant rise in commuting has been observed (cf. BMV 1998; Reutter/Unger 1998). The aforesaid decentralisation processes as well as spatially diffused settlement structures correspond to this trend. Further consequences are the growth of traffic volume and distances.

Developments in land use and traffic conditions are mutually dependent, and are determined by, for instance, urban sprawl, segregated spatial structures and the steady rise in motorised individual transport (MIT). The reasons for this are multifaceted, since a variety of different elements are in a state of constant and fluid interaction such as political frameworks, income development of private households, the structure of the economy, land prices, demographic features, suburbanisation of housing, trade and business, and different lifestyles, etc. Of great importance is the interplay of settlement development and transport. One indicator for this is the increasing motorization of households, especially on the fringe of conurbations (cf. Reutter/Unger 1998).

The potentials of a reduction of MIT and the development of a harmonised settlement structure are substantial for sustainable development. This paper discusses strategies for an integrated land use and transport development, and concentrates primarily on housing development in its relation to passenger rail infrastructure.

2. Land use and transport integrated development

Building the compact city

Strategies to achieve a more sustainable development base on an integrated land use and transport planning. Sustainable land-use planning adheres to the principles of density, mixed use and the “right location” (cf. e.g. Apel et.al. 1997, Holz-Rau 1997, Reutter/Unger 1998). An implementation of these principles in land use planning would help on the way to the compact city, creating short distances enabling a higher share of non-motorised traffic.

More *densified* settlement structures stand for a higher concentration of housing and workplaces conserving space by keeping a compact urban form. A planning of settlements that gives priority to concentrated coverage types, for instance multi-family housing or semi-detached houses on small lots, contributes to this principle.

Regarding mixed-use settlements, a spatial separation of functions (housing, supply of goods and services, workplaces, leisure) is avoided within a city area, which has long been part of the general orientation of city planners and result in an enormous need for (motorised) transport. The principle of the “*right location*” primarily stands for facilities and settlements excellent accessible by public transport and by non motorised means.

Strengthening city centres and subcentres

The traffic growth can be arrested and reversed only when transport and land-use are effectively integrated. The strategy of a “decentralised concentration” that encourages urban growth and subcentre development around public transport corridors and stations is of the greatest importance in order to guarantee facilities for everyday needs in the direct vicinity. The combination of pedestrian and cycle friendly structures, the mixing of various land-uses (residential, office space, retail shopping, entertainment services, etc.), as well as the principles of the “compact city”, ensure the inner-urban mobility of the inhabitants. Strengthening of city centres and subcentres can effectively be supported by social marketing.

Elements for a rail-oriented development

For an integrated development a co-ordination between new settlement development with existing passenger rail infrastructure¹ as well as between the supply of an effective public transport system with existing settlements is necessary. Only with an attractive public transport supply close to residential areas and working places is it possible to affect long-term mobility behaviour and foster the orientation towards a sustainable land use and transport development.

There are three main elements of a rail-oriented development:

Land use development near stations: New settlement development ought to be located in the neighbourhood of stations. Land use and transport integrated planning is most effective when it is involved in an overall integrated strategy and part of a regional co-operation process. High population density and concentrations of employment in the direct vicinity of stations form the basis for an efficiently used rail transport connection. A functional mix of workplaces, residential areas, services, commerce, leisure-time and cultural facilities near the station enhances attraction of these areas. Further more, the development of social housing in these areas contributes to better mobility for low-income people who are more reliant on public transport.

Improvement of transport supply and services: This involves, for instance, the establishment of new stations and platforms at existing rail lines or the extension of rail lines to existing settlements. In order to make the different modes of public transport more attractive, well-serviced routes, modern vehicles and co-ordinated connections to other means of transport (further rail-bound traffic and buses) as well as facilities for intermodal change (Bike & Ride, Park & Ride) have to be provided. These facilities ought to be accompanied with well-organised ticket sales, transport information (also on complementary transport facilities as Car Sharing) and retail services.

Re-use and upgrading of station buildings and their environment: Restructuring and revitalisation of rail station buildings as well as the integration of the stations' environs into the urban context provide excellent potential to enhance the attractiveness of station surroundings. Besides their usage for transport and mobility service, stations and their hedging quarters are often suited to accommodate cultural and leisure facilities.

¹ Rail in this case includes tram, light rail and heavy rail.

3. Rail-oriented development at the state, regional and urban levels

3.1 Rail oriented development at the state level: the case of North Rhine-Westphalia (NRW)

Policies for rail-oriented development

In North Rhine Westphalia (pop. 18 mil.) conditions for a rail-oriented development policy are favourable with a tight rail network with more than 800 stops and stations for heavy rail alone. In the last decade emphasis has been put on promoting the right location for new housing by various policies for different levels:

Regional planning requires that new settlements should primarily and intensively be developed along rail lines. New residential areas on a regionally significant scale should likewise be planned near stations - best possible by voluntary municipal co-operation.

The state aid programme for settlement development has included some arrangements specifically geared toward the goals set out above. In addition to funds for mobilising brownfields, specific instruments for large new developments have been created. Since 1998, grants for building rental flats are concentrated to the vicinity of rail stops and stations.

Also, promotion of rail use is a cornerstone of transport policy. A high level of infrastructure funding and work towards a state-wide fare system and integrated timetable with regular intervals are among the priorities.

The whole approach is not without criticism, though. Especially in the more rural regions of the state, a substantial argument states, the rail network is not that dense, so that whole areas are locked out from state funding. Besides, even in agglomerations with more rail lines, there might not be enough land around stations to accommodate the needed housing. Furthermore, it is taken for granted that persons living near a rail stop will use it more often. New data both on the potential of building land around stations and on travel behaviour and therefore the potential for a decrease of car use had been lacking. On both questions a recent research project has been carried out by the ILS (cf. MASSKS 1999)².

² "Land use development around rail stops": Research project for the Ministry of Employment, Social Affairs and Urban Development, Culture and Sport of the Federal State of North Rhine-Westphalia (1997-1999).

Potentials

In a first step, for three regions data has been gathered in all cities and towns along the rail network³ for potential building sites for 100 and more units within a 1000 m radius around rail stops. The sites were selected by the local planning authorities, which ensured that there is a “real” potential and not only some land near a station. Besides data on area, number of units planned and the status of planning, the quality of the rail service at the respective stop has been described by a quality index, as the quality of service is obviously of influence on the travel behaviour.

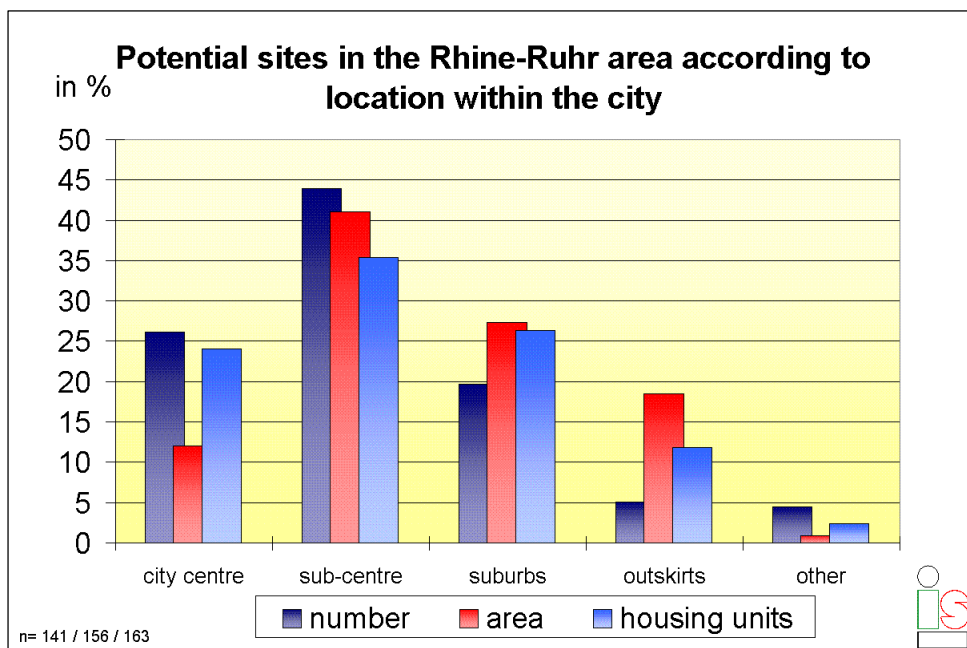


Figure 2: Potential building areas in the Rhine-Ruhr area according to the location within the city

The assessment shows a considerable potential for building land around rail stops. In the Rhine-Ruhr metropolitan area (pop.7,3 mil.) 65.000 housing units could be built on sites with more than 100 units. This would contribute to an average of 24 % of the needed housing within the next 15 years. This average is somewhat lower in Rhine-Sieg (16 %) and especially in rural East Westphalia (4 %). The potential can generally be raised by about 40 % if small areas, empty sites or attic extensions are added. 60 % of the potential in Rhine-Ruhr is at integrated locations in the city centre or in sub-centres, usually with good infrastructure and as such a high possibility for a reduction of car use (cf. fig. 2).

³ Cf. footnote 1

There is not only variation from region to region but even more between towns within the same region. On the one hand some cities can cover their need for new housing for the next 15 years entirely around rail stops, whereas others do not have any land reserves at all. A regional approach seems necessary if a policy of rail-oriented development is followed.

Impacts

A survey⁴ (sample size 2100 persons) on travel behaviour and satisfaction with the local public transport generated results on the question of differences in travel behaviour according to location. All trips and parts of trips longer than 100 m were explicitly taken into account. Three sample areas with and three areas without a rail access have been compared⁵. Aim was to look at towns on the edge of metropolitan areas, because in this location housing development is dynamic and car dependency usually high. Spatial structure (distance to the central city, location within the city, housing structure, infrastructure etc.) and social fabric (household size, age, sex, employment structure, etc.) of the areas is comparable so there is the least possible distortion. In the areas with a rail station the sample has been differentiated in two categories, within a 1000 m radius from the station and beyond 1000 m.

In both sample types, with and without rail access, the indicators for access to different modes of transport and general mobility indicators show little difference. Car-free households are found slightly more in the 1000 m radius (15 %) than beyond that or in areas without a rail access (11 %). Ownership of bicycles and of a monthly transferable public transport pass does not differ significantly. The general mobility indicators show no general difference in the pattern of mobility between areas so that all further results are valid. Also, the distribution of trip purposes is equal. A general conclusion, also undermined by the modal split, is that persons living outside the 1000 m radius show a behaviour more similar to those without a rail access. 1000 m thus represent the furthest limit for rail accessibility.

The modal split for all trips (cf. fig. 3) shows only a small variation. Whereas there is no differentiation in foot and bicycle trips, the share of public transport and car trips (including chains) varies. A 4,3 percentage point increase in public transport use in the areas with a near rail station

⁴ The survey was carried out by the EMNID institute using computer assisted telephone interviews (C.A.T.I.) in a revised KONTIV-design.

⁵ All six sample areas are in the vicinity of Düsseldorf and have between 5.000 to 15.000 inhabitants.

might not seem substantial, especially in the light of a more sustainable transport system. From a low level - as usually found in these suburban areas - this represents a 78 % increase in ridership.

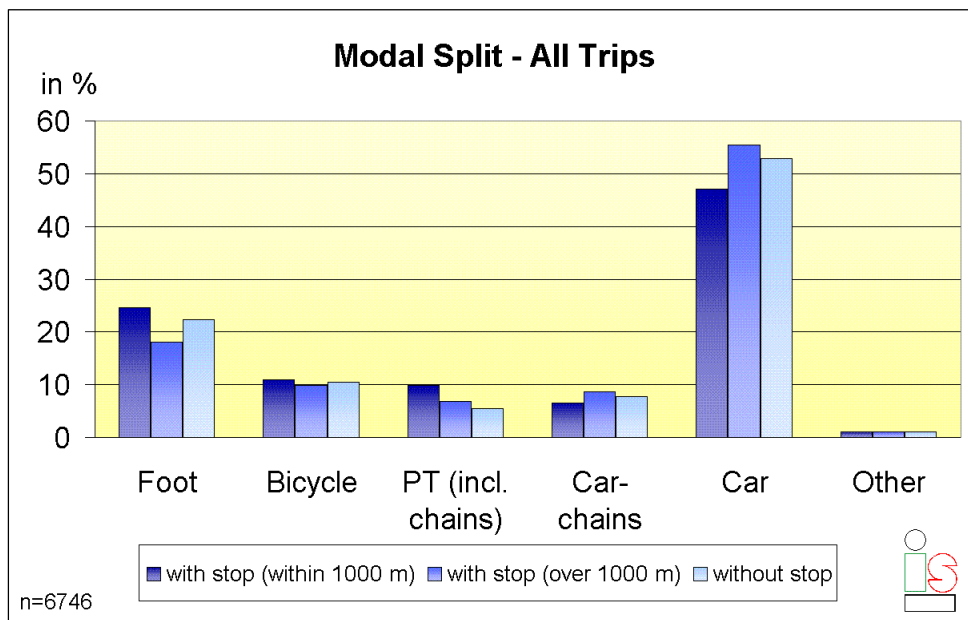


Figure 3: Modal split for all trips

In addition there were some other interesting results: People who live close to stations are more often regular public transport (PT) customers and more content with PT.

These results are clear but should not overestimated. The availability of infrastructure is the backbone, but infrastructure alone is not a sufficient influence on mobility behaviour. So additional instruments are necessary to support the showed basic effect.

Funding new settlement and public housing near stations in North Rhine-Westphalia

According to these results, North Rhine-Westphalia confirmed or updated funding policy. To support cities wanting to use land near stations for new settlement North Rhine-Westphalia funds their extra efforts if the investment is more than 150 housing units within a catchment area of 1000 m near regional trains and of 500 m near trams and subways. They get the highest level of funding for multi-storey housing and land-saving semi-detached and terraced houses (cf. MSKS 1998⁶⁷).

⁶ The complete state programme can also be found at www.massks.nrw.de/wir/st-foerd.htm

⁷ As the decision where to build is a local one, more than 200 meetings with local authorities and public transport associations have been held to encourage a follow-up on these policies.

Of importance for implementation of new settlement development are complementary measures and recommendations: The 1000 m catchment area can be enlarged if there is good bus accessibility. There is a need for basis supply and a mixture of functions. Preferable areas should be larger to ensure a sufficient demand potential, e. g. a supermarket needs 750 to 1000 housing units. Small building lots are helpful for space and cost-saving settlement. Important is a high quality supply of rail services and mobility services.

Basis reflections for updating public housing funding stem from energy saving strategies. Energy saving effects can easily be over-compensated if people have to use a car over longer distances. A second argument is a social one: Living close to PT can help to ensure affordable mobility especially for low income people. Last but not least, the policy had in mind that people living close to PT stations increase the demand for PT.

The public housing subsidies which have been offered since 1998, provide funding for investments within a catchment of 1500 m near stations within inner-city areas. The catchments can be enlarged if there is good bus or bicycle accessibility. Funding of public housing without a station is possible only as an exception.

The described measures are innovative, but also experimental. Cities are not obliged to plan settlements according to these rules if they do not want to use public subsidies. Especially regarding public housing the criteria have been weakened because of the strong resistance of different stakeholders. Nevertheless the discussion and awareness process is of high importance.

3.2 Regional level

Haller Willem: an integrated approach for modernisation of a rail line, revaluation of the stations' surrounding and housing development

The rail line “Haller Willem” connects 13 stations between the city of Bielefeld (pop. 325,000) in the federal state of NRW and the current terminal station Dissen-Bad Rothenfelde in the federal state of Lower Saxony.

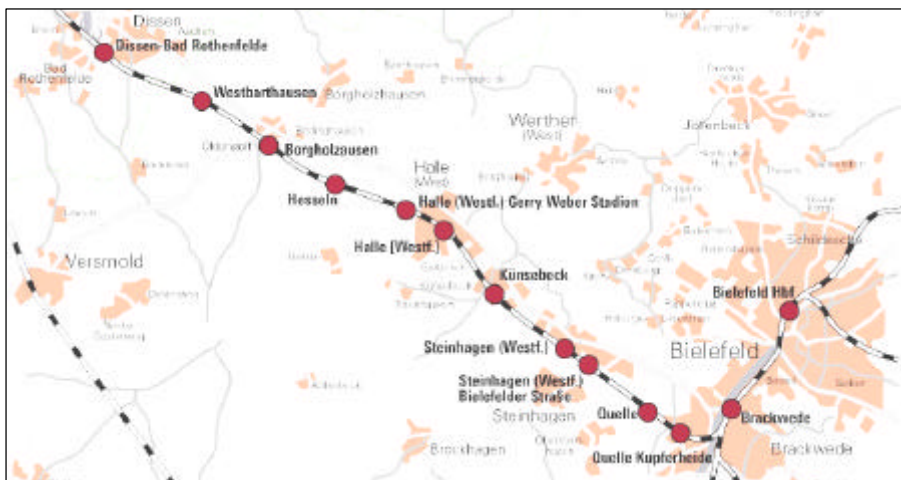


Figure 4: Railway line Haller Willem (Source: VVOWL)

As project of the world exhibition EXPO 2000 in Hannover the project is characterised by an integrated approach for the upgrade of a regional rail line. Three innovative elements define the basis for the intention.

Main elements of upgrading the regional rail line Haller Willem

At first stands the quality *improvement of railway-technique* concerning the connection, the service and crafts. The tracks were primary renewed, the security for level crossing was raised and the departure platforms were redesigned and re-valued. The increase of the maximum speed up to 80km/h and the use of new trains led to a reduction of travel times.

Core of the second element are the *railway-stations*. Short distances, straight linkage with the bus system and Park & Ride as well as Bike & Ride facilities create modern traffic stations. In the quarters themselves an urban development is promoted with focus on housing, recreation and culture.

The third purview merges different *housing* measures. In the vicinity of new or relocated stations, several properties for more than 1500 housing units were made available or developed out of brownfield sites. Settlements with ecological standards are also planned.

In the federal state of NRW the project is supported by the program “Housing support in the catchment area of railway stations”. By now three new settlements in Bielefeld, Steinhagen and Halle are to be developed. After the implementation a high customer potential for the railway is expected. The implementation is set on in different periods and the completion of all housing measures is expected for 2010. So far the improvements lead almost to doubling of the number of passengers from 1328 in September 1998 to 2548 in September 2000.

In addition, the Haller Willem is part of the bicycle route Teuto-Senne. The route is attractive for tourist, since several stations connected to the bicycle path enable so-called “one-way-biking” .

With the discussed measures potential user groups like residents, tourists and commuters are addressed specifically. An identification of the residents with the Haller Willem and a growing interest for railway development can be observed. The comprehensive approach and implementation activities are also of national interest for the image of rail traffic. A steady and targeted marketing is also necessary to retain this image effect as a perpetuation of the high quality standards. (cf. Dresbach/Schulte/Siemer 2001; VVOWL 2000)

3.3 Urban level

In the European Commission supported project TRANSPLUS, the ILS and 13 other European partner organisations investigated 22 case study cities that actualise an innovative policy for the promotion of sustainable land use and transport development. For the task “rail oriented development”, arranged by ILS, six case study cities were analysed in depth (cf. Deliverable 3.1, Public Transport Oriented Development: Significant Practice in Europe). At the second TRANSPLUS workshop in Dortmund in May 2002 the latest results of integrated planning and implementation strategies were presented and discussed. In the workshop session “Rail Oriented Development”, the Orléans’ tramway project was presented by Mrs. Marie-France Archambault, whereas Mr. Johannes Gielge illustrated the rail oriented strategic concepts and development of Vienna.

3.3.1 Orléans' new tram service

In Orléans' public transport development and the redesign of the bus-network are used as a stimulation for the conurbations planning policy and as a structuring tool for an existing settlement.

The city has an average size of about 265.000 inhabitants and a large urban area with about 30.000 ha. The area of Orléans' conurbation is characterised by dispersion and strikes by a very atypical morphology: the main railway station is located in "Les Aubrais" three km north of the conurbation, while a huge new district was built ten km south of the centre in the 60's. The new tram service is meant to connect this parts and to support the spatial development as well as sustain the adjacent sub-centres.

Supporting policies

The goals of the transport policy of Orléans were defined in the **Urban Master Plan** from 1994. With regard to control the urban development the city centre should be revitalised and the conurbation should become more structured with the development of dense sub-centres.

The planned concept was supported by the **Master Transport Plan** that focused on a better balance between the various transport modes. The organisation of the favoured sub centres were defined in the **Master Housing Plan**. Another aim was to create a better balance between the city centre and the sub-centres and was discussed in the **Master Commercial Plan** (Archambault 2002; CETE 2001).

Structuring the agglomeration by the tram project

The building of the new tram became a backbone in the conurbation and accelerated the development process. Remarkable about the project is the connection between the tram development and the parallel focussing on settlement development in adjacent areas. The tramway is about 18 km long and passes through the city centre via the historic quarter. Along the tramway several new neighbourhoods developed and by now about 56.000 inhabitants within a 500 m radius around the tram stations can use the service (which is equivalent to 22% of residents living in the conurbation).

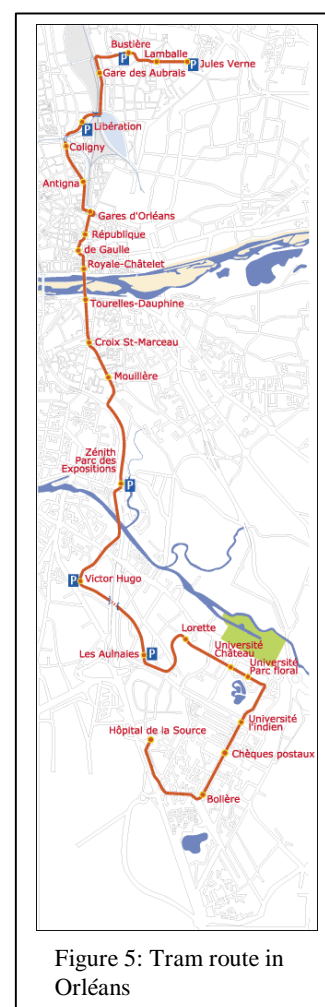


Figure 5: Tram route in Orléans

Furthermore it provides access to about 35.000 jobs (which is equivalent to 29% of jobs in the conurbation) (cf. CETE 2001).

The tram service has intentionally been used to support several new projects integrated in the global conurbation project of Orleans. The tram service, which is now completed and operational, had the advantage of extraordinary site opportunities. Such opportunities made it possible to institute both urban reconstruction projects and urban production projects.

Urban (re-) construction projects connected with the tramline

Several measures were intensely connected with the new tram. Urban reconstruction with the new tram layout was realised with the creation of a new town centre in *Fleury-les-Aubrais*. The new tramway connects various of neighbourhoods and brings together sub-centres with central functions and supports the creation of a true centrality near the town hall, the shopping centre and public amenities. To facilitate a real centre, further social and cultural amenities and dwellings are being put in place. In *Le Larry Olivet* the tramway routing made it possible to organise an area with a few small collective buildings, individual dwellings and amenities. Installations will be organised around the tramline, with a wedge of open space, public areas etc. The first realisation was the construction of a private clinic.

The implementation of the project was very fast. The decision for the tram was made in 1995 and already opened to public in 2000. About 20% were financed by state subsidies, the remainder entirely by the Urban Community (cf. Goût/Heilemann 2002).

The success of the tramway operation is mainly based on the fact that there was a unity of place, time and team. There was only one perimeter for both land use and transport issues and the same team dealt with all transport and urban projects. Another positive aspect was the strong municipal will to realise the project and the existence of land opportunities accelerated the process as well (Archambault, 2002).

3.3.2 Metro extension and sub-centre development in Vienna

Vienna has about 1.6 Million inhabitants and its environs may be identified as a circle around the city with a radius of 40-50 km. Since the 80s the population grows in the environs. Apart from this the settlement activity in the so called "axial zones" (in towns situated along commuter train lines) was

lower than in the “intermediate areas” (other communes). This indicates a further consumption of the countryside around Vienna. Thus the aim of decision-makers in Vienna has to be the prevention of these developments.

Strategic approaches towards a rail oriented development

Urban land-use and transport objectives and measures were defined in the **Urban Development Plan** (STEP 94) and the **Traffic Concept** from 1993. However, these tools have no legally binding character, but they are updated continuously after some years. According to these tools the objective of a reduction of urban sprawl is to be achieved with the help of:

An inner district urban expansion: The historically grown body of the city should remain intact and a new functional mix should reactivate more public space.

Outer district expansion is to meet the demand of housing as a result of growing population. In this context the concentration of all settlement activities along axes and close to these is essential. Therefore the concentration process shall take account of a spatially balanced distribution of urban functions.

An axial development: The intention is to develop these axes by means of a highly efficient public transport network. This results in ribbon-type settlement structures, which may join with regional settlement axes outside the city limits. It is planned to give priority to the expansion of primary and district centres, but also to further development of local centres outside the Gürtel ring road in order to create possibilities to interchange between regional and municipal public transport.

Metro extension and urban development

In order to shift the modal split to environmentally friendly modes of transport, the transport policy aims at making the existing tram and bus network more attractive and efficient as well as extending the metro and commuter train network to fulfil the requirement of urban expansion. From 1993 to 2000 four metro lines with a total length of 18 km were extended. (cf. Gielge, 2002; TUW 2001)

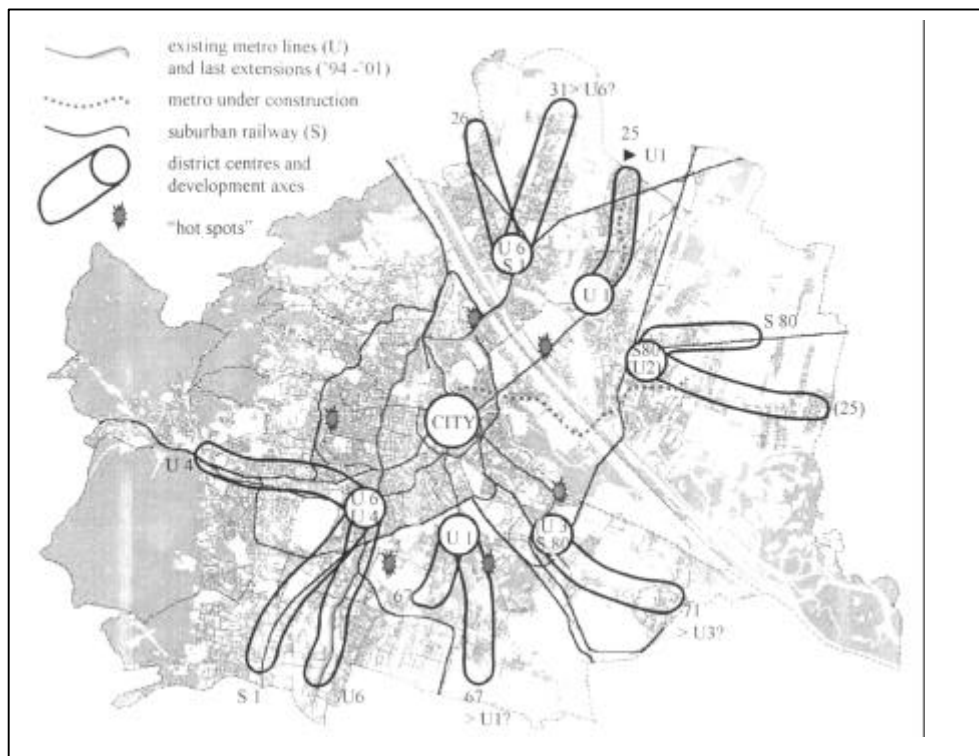


Figure 6: Metro extension and urban development in Vienna (source: Gielge 2002).

Gasometer City: sub-centre development on a former industrial site combined with the extension of a metro line

The Gasometer City is located on a former industrial site in Vienna and is restructured into a sub-centre with exemplary accessibility. The site offers an functional mix of housing, working, shopping and entertainment. The quarter has become one of the most dynamic planning areas over the past few years. In particular the adaption of the Gasometers for residential use connected with shopping and entertainment possibilities and the extension of the U3 have sparked increased planning and construction activity. The Gasometer City can be reached by all means of transport, but provides an excellent car accessibility, too. (cf. Goût/Heilemann 2002)

4. Conclusion

The results of the research illustrate a potential for an even greater integration of land-use and transport. Housing settlement in the vicinity of public transport stations in conjunction with the upgrading of railway lines and stations lead toward an increased use of the modes of public transport. Nevertheless, the presence of a nearby rail station does not by itself lead automatically to a sufficient difference in travel behaviour. This can be realised only through a combination of hard and soft policies. The strategy of developing land near rail stations should be combined with others such as mobility management in co-operation with housing and public transport companies. To be successful in this sector new partnerships have to be formed: Housing providers need to co-operate with mobility providers, local authorities and residents (cf. Müller/Endemann 2000). Mobility management can include a mix of measures ranging from information and consulting, transport organisation and creation of awareness, e.g. a specific campaign just for households in the vicinity of a (new) rail stop.

An example would be a specific information package on transport alternatives geared towards newcomers to a city, including trial tickets for the local public transport system.

Another interesting new field is the possibility for new ticket schemes for public transport that offer a substantial rebate to the households in a certain quarter or estate. The idea is to treat rebated public transport passes as a regular element of the rent or to sell them at a lower price to effect an economy of scale.

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