

## Freiburg's way to sustainability: the role of integrated urban and transport planning

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### 1 ABSTRACT

Since the mid-1950's Freiburg im Breisgau has experienced big growth in both population (ca. 62%) and in the number of workplaces. This trend has been still present in the last two decades (ca. 17%) what is not common among German cities. The city must balance between rising number of cars caused by rising population and the quality of life which attracts new inhabitants and new investors mostly in high-tech.

In attempt to alleviate growing demand on transport, the city extended the tram network and new lines have been constructed to serve areas of new settlement. It is a tool for making transport behaviours more sustainable and to keep low share of cars in the modal split and the tram lines are the backbone of the urban development, especially for new housing areas. The chance for the region is seen in using existing rail tracks for a development of a regional train network. The most important key to success is coordination of urban development and transport policies.

This paper presents the experiences of the city of Freiburg and the region. It focuses on three most important aspects: transport solutions for new settlements within the city limits (Rieselfeld and Vauban), development of regional train connections (inter alia Breisgau-S-Bahn) serving the growing towns and villages in the surrounding region and quality of non-motorized traffic in city centre. The authors evaluate the applied solutions and they show that urban growth can go hand in hand with sustainability and can be used for modal split improvements.

### 2 INTRODUCTION

Freiburg (full name: Freiburg im Breisgau) is a middle-size (about 220 000 inhabitants at all) university city (hosting almost 30,000 students) in south-west Germany. Surrounded by the Black Forest Mountains and located in the foothills of the Schlossberg, city straddles the river Dreisam. The location causes the specific shape of the city but city is relatively flat. There are not any natural barriers for cycling and for relevant tram network construction.

The city plays an important role for the surrounding region. Around 95,000 people are employed in the city. In 2003 around 68,000 commuters travelled daily into the city to work, and some 16,000 residents commuted to jobs outside the city. Most of commuters (65%) go to or from Freiburg by car. The city has witnessed systematic growth of commuters from region and to region. In 1970 there were only 34,000 commuters to the city and 3,000 from the city, in 1987 adequately: 53,000 and 8,000 and in 1997 – 64,000 and 14,000. Additionally, the city attracts about 3 million tourists a year.

The city is located on the Mannheim-Basle railway also known as the Rheintalbahn which is one of the heaviest used railways in Germany. The city is also served by the A5 Frankfurt am Main - Basel motorway (located on western suburbs) and three federal roads.

According to the last traffic survey in 1999 (Verkehrsentwicklungsplan, 2002) the modal split was: walk – 23%, bicycle – 27%, public transport – 18%, car drivers – 26%, car passengers – 6%. Freiburg has been witnessing a significant improvement of transport sustainability. In 1982 it had been respectively: 35%, 15%, 11%, 30% and 9%. The huge reduction of car use was possible thanks to a lot of different measures. The best known of all these was the introduction of cheap monthly ticket called “Umweltkarte” (“environmental card”) in 1984, present named “Regio-Karte” (“region card”).

According to FritzRoy and Smith (1998) the success of public transport in Freiburg can be chiefly accounted for by the introduction of a cheap travel pass in 1984 with the essential characteristics of unlimited use at zero marginal financial cost, interpersonal transferability and wide regional validity. Although the rules of ticket have been changed partly – e.g. there was introduced a not transferable monthly ticket a little bit cheaper, the popularity of “Regio-Karte” is still high. About 86% of all trips using public transport in the city

are done by owners of monthly or yearly tickets (Statistisches Jahrbuch, 2009). But this well known ticket is only one pillar of the sustainable transport policy in Freiburg.

The strategic Transport Development Plan (Verkehrsentwicklungsplan, 2020) sets goals to reach until 2020 even more sustainable modal split: walk – 24%, bicycle – 27%, public transport – 20%, car drivers – 24%, car passengers – 5%. Therefore a lot of different measures shall be implemented in the next years, to promote urban friendly modes of transport. On the one hand there are traffic management activities like extension of the tram, development of cycle infrastructure, or the pedestrian traffic quality improvement; on the other hands are urban planning tools like limitation of spatial development, better utilisation of inner-city areas (braunfield investments), mixed use (traditional neighbourhood design). It is worth to underline that the goal can be reached by the synergy of these different activities.

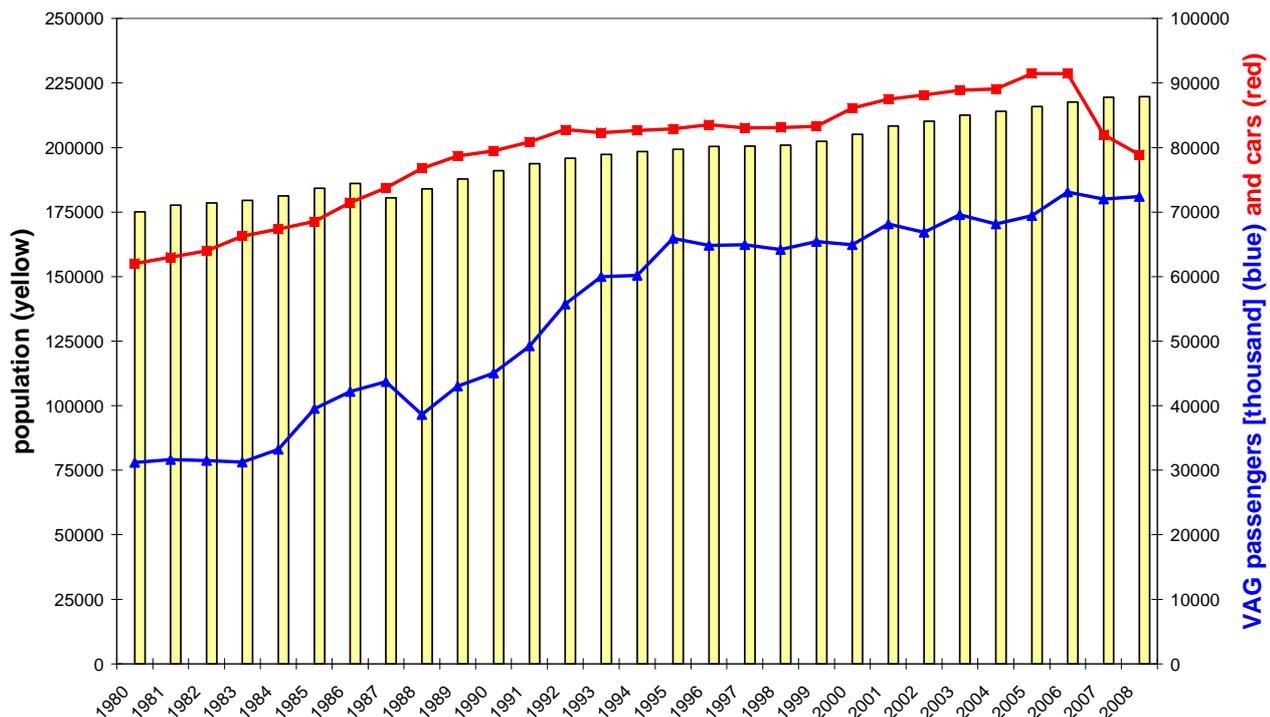


Fig. 1. Population, passengers of Freiburger Verkehrs AG [in thousands] and passenger cars (1980-2008) (source: own compilation based on Amt für Bürgerservice und Informationsverarbeitung, Stadtamt Freiburg im Breisgau)

### 3 HISTORY OF TRANSPORT MANAGEMENT

Freiburg has many advantages for sustainable development. The city has never destroyed the historical centre to improve the car accessibility and the phase of the modernism in urban planning did not leave its strong stamp on urban structure. It was huge difference to some other German cities which had car-oriented transport policies. In those cities the changes have come slowly after the 1973 oil crisis.

Furthermore, in 1969 the city introduced first Integral Traffic Plan. The Plan respected interests of non motorized inhabitants although the main planned form of transport were private cars. Two years later the Cycle Path Network Plan was carried out and passed the city council. Cycling became an important part of transport policy. In 1972 the city decided to retain and expand the tram network. The development of tram network based on modern concepts: separated tracks, priorities on intersection with traffic lights, higher average speed. The name for this new tram system is “Stadtbahn” (“urban rail”) instead of “Straßenbahn” (“tramway”). In 1973 the entire city centre was converted into a pedestrian zone. It created good conditions for pedestrian traffic and started new urban culture with significant role in shopping of Old Town and rising importance of walking, cycling in transport behaviours.

After a decade in 1979 the new Integral Traffic Plan passed the city council. It gave equal priority to pedestrians, cyclists, public transport and individual motorized vehicle traffic.

The next transport document was approved a decade later – in 1989. The Comprehensive Traffic Plan has already different objectives to reduce of car traffic volume. Two main tools were the promotion of environmentally friendly modes of transport and the distinct restrictions for car traffic. Over the last decades Freiburg has become well known for its model measures in environmental protection. In this context conclusive Integral Traffic Plan has made a key contribution. Freiburg's Integral Traffic Plan thus compromises a clearly differentiated integral system with the sectors: local public transport, cycle traffic, pedestrian traffic and motorized vehicle traffic. The main goal of the traffic plan is to reduce the negative effects of car traffic in order to an improvement for living and environmental conditions in our city.

The newest Transport Development Plan (2002) brings continuity. The same objectives are still on the agenda: better quality of life, better public transport, better conditions for pedestrians and cyclists. The plan adjusts the goals to new conditions: the growth of population and the spatial development.

#### 4 LOCAL PUBLIC TRANSPORT INFRASTRUCTURE DEVELOPMENT

Simultaneously to more and more environmental friendly transport policies there has been progress in development of local public transport infrastructure. Trams should be the core of the system and the extension of the tram network has become a central factor in our urban transport policy. The first modern track based on concept “Stadtbahn” (“urban rail”) was opened in 1983. It connected the high density residential areas located on western part of city with the city centre. Two years later the track was extended to a new neighbouring settlement. In the 1980's there was one more investment – optimization of tram network in the city centre (one track was moved to other street).

According to the natural conditions – limitation by Black Forest – the spatial development is in principally in western direction. The main investments in tram networks have been done and are planned in western districts.

Next investments, also in western districts, were done in the 1990's: tram track to industrial area (1994) and to Rieselfeld – model district (1997). It worth to underline that the line to Rieselfeld had been opened before the contraction of new district was finished.

In the late 1990's there was a broad discussion about the next steps to extend the “Stadtbahn” system. It also was a discussion about transport policy and its implications on urban development. The city government planed in the late 1990's to construct a new line connecting the city centre with the new urban areas in the south west of Freiburg. All lines come together at one intersection, the Bertoldsbrunnen, the historic heart of Freiburg, the spot the city was founded 880 Years ago. The Freiburger Verkehrs AG argued that this intersection is not longer able to cope with all the old and new tram lines and will become a bottleneck for further extensions. The company suggested to build a new bypass beside the historic town centre. The discussion was very complex but the key question was: where is the heart of the city? All the people, including the retailers argued that it is the key that the new trams line have to bring the people to the heart of the city. The government and members of the city council argued that the city centre can no longer be the historic town alone but has to be extended to the west. As already mentioned the urban development did go west. But most members of the council voted that the new tram line has to go directly into the historic town, like all the others do. There were broad and controversial discussions over years, in 1999 there was a public referendum with no clear result and at the end the majority of council members decided to connect the new tram line to the historic Bertoldsbrunnen, and it was build this way.

This dispute delayed the development. So the new line to Haslach was constructed in 2002/2004 and was basis for the long awaited tram line to by Vauban inhabitants a connection to city centre (opened in 2006).

Now, ten years later, the inner city bypass is part of the new extensions plans and in the future the planned network will allow both, to serve the historic part of the city and to bypass the city on new line.

At the current time, further line extensions are planned, extending the tram network by more than 50% to 33 km. The plans have three important investments: the already mentioned inner city bypass (allowing to avoid tram, pedestrian and cyclists overcrowded Bertoldsbrunnen – see fig. 6), north-western extension to new university campus and Freiburg fairs area, and eastern extension to train station Littenweiler and district behind the station. This extensions will mean 83% of Freiburg's inhabitants and 88% of places of work will be directly accessible by tram within a 600 m radius from stops.

The tram must be fast and comfortable to be successful. Speed is achieved when the tram has its own track independent of private car traffic on the roads. All new lines will have their own track, partly running together with the cars but having priority by traffic signals and traffic management and existing lines will be converted wherever possible. At the same time, a swift tram journey is achieved by priority traffic control.

The buses, partly running on separate lanes, have a shuttle and supplementary role to the tram network.

It is worth to mention that there is wide public participation at development of tram network. The northern extension of tram network (planned to be constructed until 2012) was consulted with inhabitants in frame of an international project – “GenderAlp”, as a task “Implementing Gender Mainstreaming in spatial planning”. The idea of this project was to find new ideas for participation. Public participation was seen as toll for quality-management in the planning process. The gender approach was used to plan the participation of a new tram line and it should be a requirement oriented. The second idea was the implementation of gender mainstreaming in the technical and planning departments of the administration and to develop new guidelines for participation. The result of this broad participation was an unanimous vote for the tram extension in the city council and a easy and fast legal procedure with no caveat.

## 5 NEW SETTLEMENTS

One important sign of Freiburg's sustainability policy are two new quarters: Rieselfeld and Vauban. The well-known solution is Vauban, although the beginning, due to delays caused by problems with construction new tram line. The planned measure of efficiency of integrated urban and transport planning was before of all the reduction of car trips number and motorization level (Cerfontaine, 2007; Nobis 2003, Ryan, Throgmorton, 2007).

The motorization level of all Vauban in 2008 was 167 cars/1000 inhabitants. Higher level was observed in Rieselfeld, the second model district of Freiburg – 290 cars/1000 inhabitants, while the average level for whole city is about 392 cars/1000 inhabitants. Since the 1990's the level of motorisation had been stable (oscillating about 450 cars/1000 inhabitants) but since 2007 Freiburg has been witnessing rapid decreases of motorisation level (see fig. 1).

The goal of the traffic concept was not to create a small, car-free district for environmentalist but to establish a whole district where car is not needed for life. The stress was to reduce the use of cars, not to ban the car in the district. The most important tool to create these behaviours was the idea to have no parking direct beneath or under the homes nor in the residential streets. So most of small streets close to homes are excluded from parking. There is allowed only short term parking for deliveries of goods (e.g. shopping) or to pick-up someone. So there is only a very few motorized traffic and that improves the quality of living, because there is less noise and more safety especially for children. The car can be parked on the main street of district but there is at weekdays between 9:00 and 19:00 a paid parking zone mandatory also for inhabitants. Inhabitants having cars have possibility to buy a place in one of three multi-store car parks. They are located on the district edges. This makes public transport easier to reach – tram stops are usually closer to homes than the car parks. Additionally, short distance to walk to the next shop or to the next cafe is a barrier to frequent use of car. No parking at door steps is called as “parking-free living”, not a quite new idea but seldom transferred to reality in the way Freiburg did.

German local or regional law forces the developers to have an appropriate number of parking places (for cars and also for bicycles) depending of the usage of buildings. The cost of this rules are usually paid by all inhabitants, having car or not having car. In Vauban is different: families without cars are exempted from participating in the costs of community car park. Car-free inhabitants thus save the substantial money of a parking place. The restriction for parking on streets make impossible to park for free a car in Vauban. If someone decides to have a car, he needs to buy a park place in multi-storage garage.. And the concept provides also an idea if there is a strong shift in travel behaviour in the future and all people in Vauban will have own car. Although there is no trend in this direction at all, the concept would allow to build one more multi-story car park in the Western Edge of the area, but this parcel is still a green area where children are playing.

The whole transport policy for Vauban district is based on “push and pull strategy”. Only restrictions for cars could not be successful. In exchange for limitations for car inhabitants receive good public transport: high

frequency (at work days every 7,5 minutes, and at Sundays every 15 minutes) tram line to the city centre and the bus connection to some suburbs.

There is planned to build at the closure of the tram terminus the station for regional rail. It is worth to mention that on the one hand this is an element of mobility concept for Vauban on the other hand this is a part of public transport strategy for Freiburg and region – to make intermodal stops on all regional rail tracks. Thus passengers going to targets located in the city but before the city centre (riding from home) are not press to ride by train to main station and come back by tram. It allows not only to short travel time but to balance the passenger density in trams: to reduce in the city centre and to rise on suburbs.

Inhabitants without car can use special offer of car sharing association (Car-Sharing Südbaden - Freiburger-Auto-Gemeinschaft e.V.). These cars are addressed especially to Vauban inhabitants and the cars park on district. Additionally, those residents who joined the car sharing association receive a one-year free pass for all public transportation within Freiburg and “BahnCard 50” a loyalty card offered by Deutsche Bahn, allow passengers to get 50% discount on standard rail fares (Enocha, Taylor, 2006).



Fig. 2. Vauban district in Freiburg (source: own compilation based on Open Street Map)

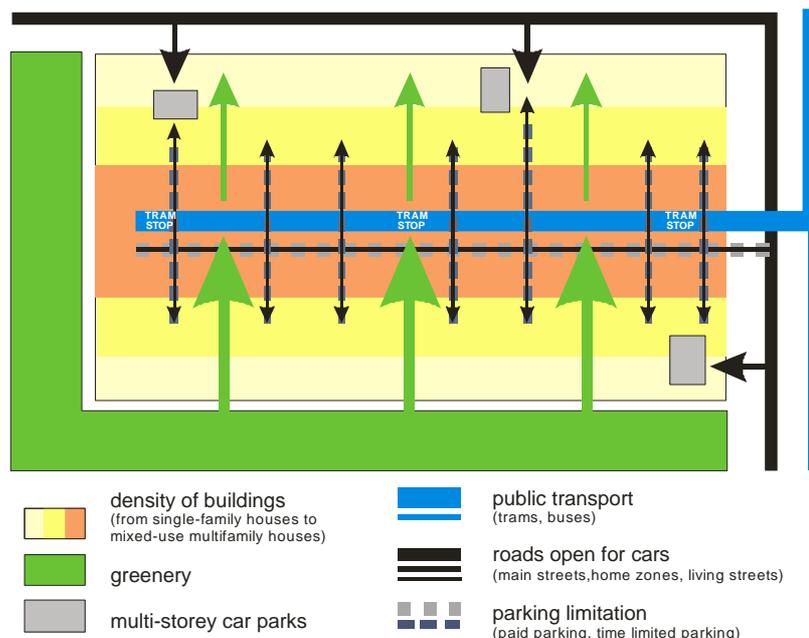


Fig. 3. Idealized schema of modern sustainable settlements in Freiburg (source: own compilation)

The most important factor of car use reduction seems to be mixed land use. The plan of district is based on the traditional neighbourhood design. The population density is fairly high what makes tram connection

relatively profitable (Apel et al., 2001; Loose, 2001). The most important services like school, kindergartens, a farmer's market, a shopping centre, restaurants, cafes, are within walking distance. On the district are about 600 workplaces. Access to recreation is very easy – the district is cut by three axes of greenery (see fig. 2 and fig 3.). This type of urban design can be called as “fractality”. Each part of settlement is a district in miniature: houses, greenery, services.

## 6 REGIONAL TRANSPORT

A successful public transport policy can no longer be limited to a city's own boundaries, but instead it must operate regionally. The neighbouring counties: Breisgau-Hochschwarzwald and Emmendingen have collaborated with Freiburg to form a metropolitan area joint public transport association. The city in co-operation with neighbouring counties has successfully started to expand our integrated rail and bus system. The most important project is the “Breisgau S-Bahn” (Suburban Rail in Breisgau Region) (see fig. 4).

The Land of Baden-Württemberg is supporting the public transport association in this venture. At a cost of 400 million EUR, this plan envisages a regional rail system also integrating Freiburg's tram network and the regional and local busses with closely coordinated timetables interlinking the whole region.

This plan will help to shift the balance considerably in favour of the public transportation network. The extension of the public transportation network in metropolitan area is one of the main factors in the policy of the coming decade, supported by all the relevant political groups.

The first line of these integrated regional local traffic system started operation between Freiburg and Breisach on the Rhine River in 1998. This rail system is being complemented by a dense bus network to cover the communities without own train station.

The accessibility of the suburban rail system and the tram network must be improved with transfer possibilities for cyclists (Bike&Ride) and car drivers (Park&Ride). Up until now, more than 2,600 P+R parking spaces have been established in the city of Freiburg and about 2,400 at the stations throughout the region. Bicycle parking spaces are already available at many stops and train stations, where the bicycles are protected against theft, the wind and the weather. These options will be expanded consistently over the coming years.

The railroad to Breisach two decades before was planned to be closed. The introduction of a suburban rail (Breisgau-S-Bahn) in regular tact and integrated with Freiburg's fare system has changed the inhabitants transport behaviours. At present, trains at weekdays operates every half hour but demand is higher. Thus there are plans to extend to twin track railroad and to electrify. The planned frequency at weekdays is every quarter.

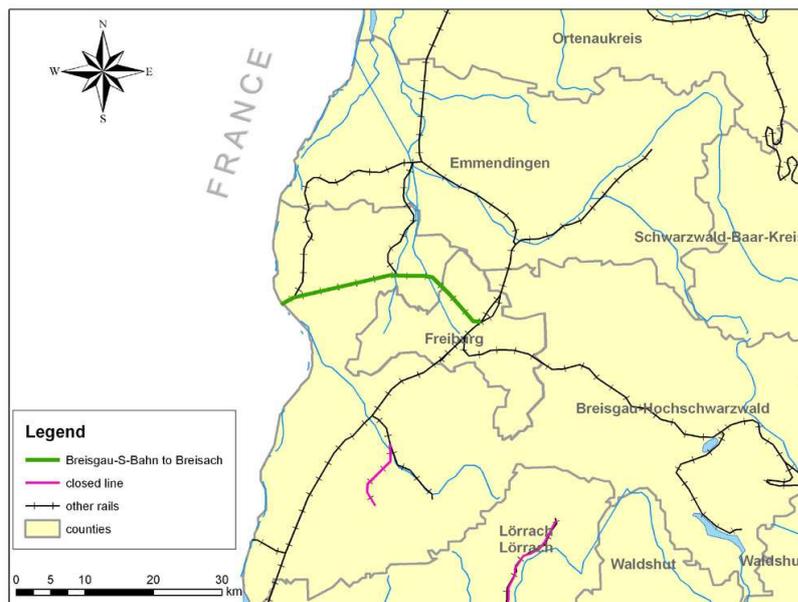


Fig. 4 Breisgau-S-Bahn line to Breisach (Source: own compilation)



Fig. 5. High frequently suburban rail (Breisgau-S-Bahn) was an impulse for housing estates development in the vicinity of the train stations. Ihringen. (Photo: M. Beim)

## 7 PEDESTRIAN AND CYCLING FRIENDLY CITY

The main focus of Freiburg's transport policy is to provide attractive alternatives. This is generally the better and more effective approach than imposing restrictions and bans.

Nevertheless, certain restrictions are naturally unavoidable within the framework of traffic policy. The most far-reaching restriction is the creation of car-free areas and pedestrian zones. As early as 1973, Freiburg converted the entire historic part of the city into a pedestrian zone, incidentally against strong initial protest by the shops affected. It is almost impossible to imagine our main street in the heart of the city, Kaiser-Joseph-Straße, was the Federal highway along which the entire motor vehicle traffic from North to South only a few decades ago was squeezed through the Rhine Valley. Characteristic for the Freiburg pedestrian zone is that the shops and department stores can be reached directly very easily by bus and tram.

The total length of pedestrian areas in 2008 was 8 535 m including 6 938 m pedestrian zones partly opened for deliveries. The network of pedestrian streets has not been extended in last years.

The importance of cycle-oriented traffic policy, i.e., providing a further alternative apart from the public transportation network is misjudged too often. The special attraction of the cycle policy is that within a short period and with only little investment and follow-up costs, it is possible to achieve tremendous changes. This is especially important in times of tight budgets.

Since the 1970's, the city of Freiburg has enlarged the cycle ways network to 99,5 km. During the first few years, the main emphasis was given to expanding the cycle path network at the city outskirts, which could also serve for cycle trips. In more recent years priority has been given to increasing the extension and structural alteration measures designed to lead cyclists into and across the inner city. In addition to extending the cycleway network, we must carry out other related measures. In this context, over the last few years over all more than 8.000 cycle parking spaces have been provided, some as a result of reallocation of existing car parking spaces.

Cycle traffic causes sometimes conflicts with other users, especially with pedestrians. The cycle facilities in Freiburg are designed to avoid this. The cycle lanes on roadways are preferred in cases where car speed is limited to 50 km/h. In traffic calming zones ("Tempo 30" or living streets) cycle traffic is on roadways without special facilities (one exception are contra-flow lanes in one way streets). Only in case of low pedestrian and cycling traffic are common ways for both groups of users. In the area of the main tram stop "Bertholdsbrunnen" was introduced a strictly bicycle parking prohibition (see fig. 5). This rule caused huge controversy among cyclists but it was needed to ensure good quality for public transport passengers changing trams. And today there are no more discussions and the parking system works sufficiently for everyone. The cyclists find a place (in distance about 100 m from Bertholdsbrunnen) where they can leave and lock their

bicycles and the tram passengers can chance the trams and the pedestrians can walk around without parked bicycles as a barrier.

Remarkable in 2009 is the introduction of special mirrors called “Trixi-Spiegel” which allow truck and car drivers to observe cyclists riding on cycle lanes to the advanced cycle stops (see fig. 7). This small measure has significantly improved the cyclists safety on intersections with traffic lights (Rau, Haag, 2010).



Fig. 6. Bicycle parking prohibition around the main change stop of tram network in Freiburg - Bertoldsbrunnen caused controversies and is usually not respected by cyclists (Photo: M. Beim)



Fig. 7. “Trixi Spiegel” mirror which allows truck drivers to observe cyclist riding parallel (Photo: M. Beim)

## 8 PARKING RESTRICTION

Since 1990, the local council has implemented the concept of parking space management throughout the city centre. All public parking spaces cost money since that time. The principles of parking space management are:

- Downtown residents are entitled to park in public streets within a reasonable distance to their apartments in the form of a “parking permit solution.”
- Regular long-stay parkers, above all employee commuters, are induced to switch over to other forms of transport by “tightening of the parking space screw.”
- At the same time appropriate measures, as for example Park&Ride, are made available in the region to enhance the attraction of coming into the city by bus and tram rather than by car, especially to

bring customers and visitors into the city. This is important for Freiburg as a tourist city and a regional shopping centre.

- This is all designed to force long-stay parkers out of the city centre, which in the interest of Freiburg’s economy and retail trade because the turnover frequency of the parking space is increased.

## 9 CONCLUSIONS

Transport policy must cover all areas of town planning and urban development with a comprehensive strategy. Town planning must ensure that as little avoidable traffic arises as possible. Above all, as it was already mentioned, Freiburg tries to apply these principles when planning new urban districts but also in giving priority to inner development before outer development of new houses and offices.

As a general principle, traffic avoidance strategies are to be taken into greater account in town planning. This means - in contrast to the failure of urban planning segregation concepts of past years - working and living must be integrated. Decentralized town planning of the new residential districts includes cultural and social activities, a multiplicity of shops and services as well as the pub round the corner and helps, of course, to avoid traffic.

General urban development policy, regional policy and traffic policy are interwoven intimately and must be considered as a whole unit. Housing policy and traffic policy must be seen as being interrelated. New housing clusters in the city and in the region should only be developed along the public transportation network axis. Urban development and traffic policy must be implemented unremittingly and with patience. Spectacular results in shifts within the modal split can only emerge after a moderate period of time.

Having a look at the modal split development between 1982 and 1999 indicates that we cannot only report on future intentions and projects, but in reviewing the years since 1976 we are already in a position to make a provisional appraisal and to record results in Freiburg. Overall this development in the modal split is very remarkable. Naturally, in Freiburg - as in Germany as a whole - the private car density has increased considerably. Consequently, the transport policy aims at having car owners drive a great deal fewer miles on the average. Drivers make much more frequent use of the green modes of rail, bus and bicycle. The city office hopes that this trend can continue.

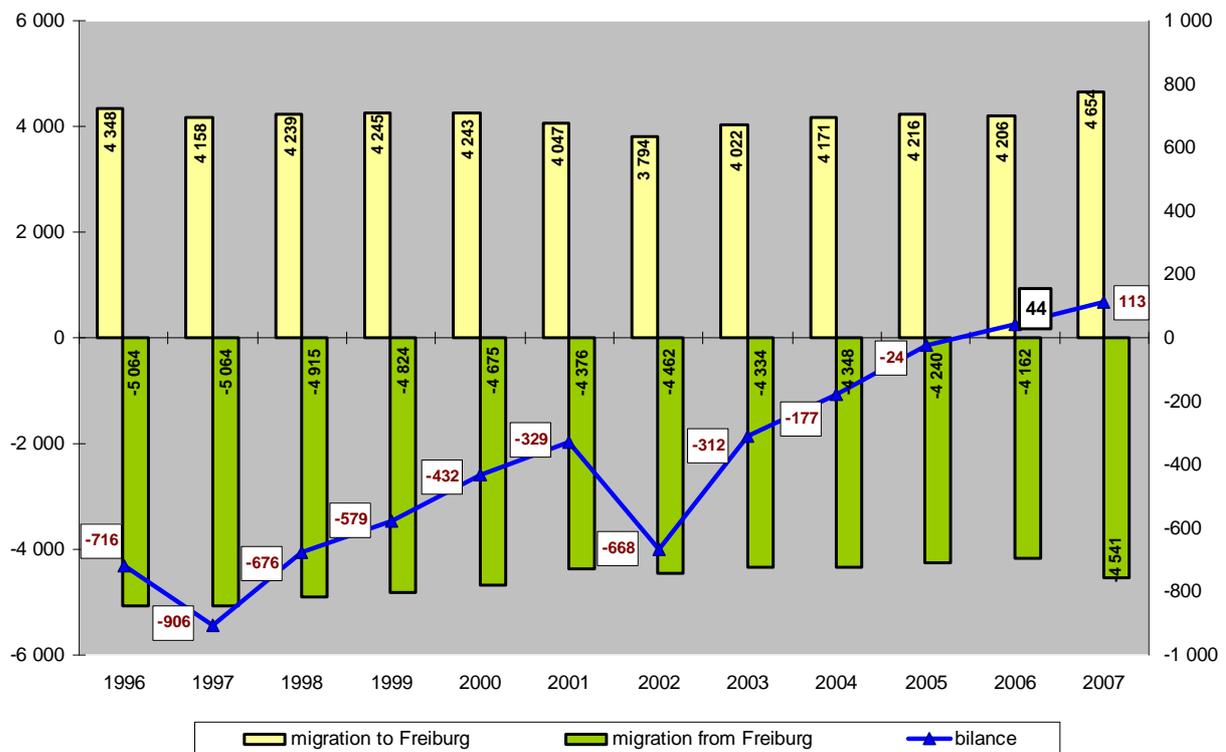


Fig. 8. Migration from Freiburg to neighbouring counties (Landkreis Breisgau-Hochschwarzwald and Landkreis Emmendingen) and from these counties to Freiburg in 1996-2007 (source: own compilation based on Amt für Bürgerservice und Informationsverarbeitung, Stadtamt Freiburg im Breisgau)

Consequent policy of urban renewal (first of all revitalization of old districts), modern concepts of new districts based on traditional neighbourhood design and sustainable transport development has achieved the success. In the last years more people have moved from suburban counties (Landkreis Breisgau-Hochschwarzwald and Landkreis Emmendingen) to the city than have migrated to suburbs. The reurbanisation has started.

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