

INTERMODALITY: SUCCESSES BY INTEGRATING PUBLIC TRANSPORT MODES AND CYCLING

J.T.A. van der Loop
Transport Research Centre,
Ministry of Transport and Public Works,
The Netherlands

1. INTRODUCTION

To reduce the increase of car use several policy instruments are planned by the Dutch Government. Increasing the costs of car use is the most effective instrument. Another policy instrument in the transport policy plans of the Dutch government is the reduction of car use by improving alternative modes of transport such as public transport and the use of bicycles. A major obstacle in this policy is the quality of these alternatives in comparison with the use of a private car. For short distances the bicycle in many cases can serve as a good substitute for the car. For larger distances public transport is the only alternative for the use of a car. But public transport is evaluated as far more time-consuming and more expensive than the use of the car (by users of car as well as public transport). Besides, travelling with the car is experienced as more comfortable, feeling more independent and having more status. So, the question arises how to improve the quality of travelling with public transport so that it can compete with the car.

To do this, the whole transport chain from origin to destination should be considered. The alternatives can better compete if the journey by car is expected to be relative time-consuming or inconvenient, e.g. in urban areas or at longer distances. On the other hand transport chains with public transport could be optimised to make competition with the car possible. One way to do this is to make use of a bicycle before and/or after the use of public transport in one trip. Herewith the journey-time from origin to destination can be shorter and more reliable than with local public transport. Also, the "main" part of the trip (train, metro, expressbus, etc) probably can be improved, when the network would have a larger scale (less stops, directer connections, higher speeds, higher frequencies, more reliability). Apart from walking all other modes could profit from this 'high quality' network: local public transport, trein-taxi, shared taxi, transport for elderly and handicapped, the private car, etc. Also the provisions for these modes could be brought to a higher standard.

The transport chain integrating public transport and cycling is an example of approaching the whole journey as a transport chain with different modes. Other examples of intermodality in the Netherlands are: interchange stations (socalled transferia to transfer from car to public transport), multimodal travel information, trip service providers.

In this paper we will first describe the actual and potential role of the bicycle in public transport trips. Next we will summarise the factors influencing the use of bicycle and public transport (both in one trip). Finally, we will give some recommendations for research and policy for the future.

2. ACTUAL AND POTENTIAL CONTRIBUTIONS OF THE PUBLIC TRANSPORT AND CYCLING CHAIN.

Trips with public transport are always **chains** with other modes of transport. Most frequent is a combination of train, bus, metro or tram with walking (about 55%, see Figure 1). The other 45% involves a chain with at least two means of transport. A combination of at least two modes of public transport (train, metro, tram and bus) occurs in 10%, a combination with the bicycle occurs in about 25% and a combination with the car in about 10% (3% as driver, 7% as passenger)(CBS, 1997).

Figure 1. Chains of public transport (CBS, 1997).

<i>Possible chains of public transport</i>	<i>% of trips</i>
Walking and bus, train, metro or tram	55%
Walking and 2 or more modes of public transport (bus, train, metro or tram)	10%
Bicycle and public transport	25%
Car and public transport	10%
Total	100%

In the Netherlands, a large part of the train **passengers** (about 35%) uses the bicycle to go from home to the station and vica versa (see Figure 2). On the other (activities) side of the transport chain the percentage of cyclists is much lower (about 13%). The role of the bicycle in journeys with an express bus is less, but still 14% from home to bus and 2% from bus to destination (Traffic Test, 1995). So, the role of the bicycle in chains of public transport at the moment is already substantial. At the same time these figures suggest that some segments of the market aren't fully profited: especially after transport and in trips with bus, tram and metro.

Figure 2. Use of bicycle before or after public transport

<i>Main mode of transport</i>	<i>from home</i>	<i>to destination</i>
Train	about 35%	about 13%
Express bus	about 14%	about 2%

In 1993 the Technical University in Delft finished a study for the policy of the Ministry to identify the **effects of optimal availability of a bicycle** for before and after transport of the main network of public transport (consisting of train, metro, lightrail and expressbus). It appeared that optimal availability of a bicycle and storage accommodation at both sides of the trips with public transport, should lead to a substantially increased use of the main network of public transport (kilometers + 14% because of substitution from car use and generation of new trips) and a decline of car use of 1,2% (kilometers). These effects should be raised substantially when the main

network of public transport should provide better travel times and/or car use should be discouraged (e.g. parking measures).

The conclusion is that substitution from car to a transport chain consisting of public transport and bicycle could be realised by optimal availability of bikes for before and after transport. In subsequent years in the Netherlands many initiatives have been taken and **projects to stimulate the use of “bike and ride”** have been set up in the Netherlands. These projects concern different organisations and different parts of the transport chain. I will give a short description.

The Dutch Railways started a programme to increase the capacity of the storage accommodation because of the expected increase in travellers. Changes in responsibility and funding caused for delay in the realisation of this programme (Ligtermoed, 1997). Bus companies and the transport companies of the larger cities took several initiatives to improve storage facilities for expressbus, tram and metro. Some private and public organisations supplied or funded bicycles for employers to commute. The results of these activities have been described or studied in a number of cases. From these studies we can conclude which factors are influencing success and failure. Other countries also have taken initiatives to draw attention for “bike and ride” (Bundesministerium für Verkehr, 1997).

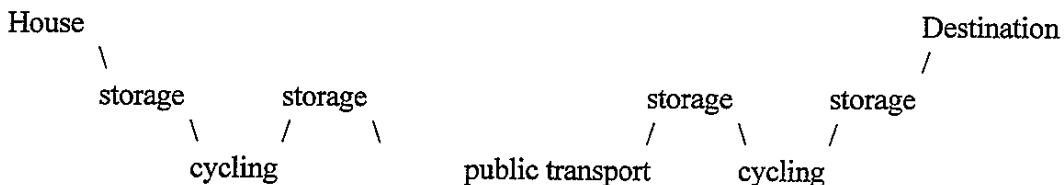
3. FACTORS INFLUENCING THE SUCCESS OF THE PUBLIC TRANSPORT AND CYCLING CHAIN.

It appeared that a number of different factors influenced the success or failure of the initiatives to encourage the use of bike and public transport. These factors are indicated in this paragraph. Three kinds of factors were identified: objective characteristics of the transport system, the way in which this transport system is organised and the perception of relevant authorities and organisations on the policy strategy.

3.1. Objective characteristics of the transport system

The transport chain integrating public transport and cycling consists of many links. In Figure 3 many links are represented schematically for a journey with cycling before and after public transport.

Figure 3. The transport chain integrating public transport and cycling.



The main condition for the use of bicycle and public transport is a high quality of the main link: the **quality of the public transport**. The use of bike and public transport can only be a realistic alternative for the car if the public transport link has very high standards in: travel time, reliability and frequency (4 times an hour appears to be a

minimum). For the use of bicycle and public transport a total travel distance of at least 10 to 15 km. is appropriate. For the use of the bicycle for the first or last link of the chain a distance of .5 to 4 kilometers to and from a busstop or station is most appropriate. By using the bicycle for the first or last link of a transport chain instead of a bus waiting times can be reduced and reliability can be improved.

In principle, a public transport **network** for travel distances of at least 10 km. with these high quality standards could be realised, because this network can serve densely populated urban areas while other modes can have a feeder function (bicycle as well as local public transport, car, taxi, shared taxi and transportsystems for special groups such as elderly and handicapped). By the use of these modes as feeders the main public network in a region could have a larger scale with directer connections, less stops, higher speeds, higher frequencies and more reliability. Provisions for the feeder modes could be improved because of the larger scale of the network. Transformations of the network to a larger scale showed that some of the users of the old, more dense network stopped using it, while others started using the bicycle to reach the busstop. Also, new people were attracted. The question is which structure or scale of the network is best suited as a substitute for car use in a certain region.

Another condition is the storage accommodation for bicycles at **stations and busstops** before and after transport. Improvements of these accommodations at stops for express buses appeared to lead to a large increase not only in the use of bicycles to that busstop, but also in the amount of other bus passengers (Traffic Test, 1995; DTV Consultants, 1995; Awareness, 1995). The storage provisions seemed to have a positive effect on the average level of quality of the busstop and on the image of the busstop. The design of stations and busstops can have an important influence on travel time and travel comfort for the daily passengers (walking distances, stairs, quality of storage accommodation, etc.)(CROW, 1997).

Road infrastructure is another important link: safe and fast passages and routes to stops and stations for bicycles in urban, suburban and sometimes rural areas. **Priority** in design of infrastructure and traffic management can also enhance the status for this category of traffic (as well as for other alternatives for the car).

Another factor is the **storage accommodation** at home or at the other side where the activities take place: work, school, public places, areas for shopping, recreation, etc. Safe storage of the bicycle appeared to be an important factor influencing the use of the bike in the Netherlands.

Also the **bicycle** itself should be available. At one or both sides of the transport chain. In case the bicycle is used for commuting the employer can supply a bicycle or funding as can be done for other modes of transport (car, public transport). To stimulate the use of the chain public transport and bicycle an employer probably will have to reimburse the **costs** of public transport, storage and disposal of a bicycle. Longterm agreements between organisations of employers and employees favour the use of the car and/or public transport above the combined use of public transport and bicycle. Public transport companies could stimulate the use of public transport by lower fares for taking the bike in the train or bus e.g. during off-peak hours.

Stimulating or discouragement of the use of bicycle and public transport can also be brought about by reservation and payment facilities. Separate payment systems at each link of the chain don't match with a **marketing** approach of the product according to which the whole journey should be presented to the traveller as a service with a certain kind of quality with a corresponding price. The method of presentation of the product to the employees appeared to be a major key in its success. Employers tend to see a lot of disadvantages, but no advantages. Their behaviour is strongly influenced by habits developed in mode choice. It appeared that employees who used public transport and the bicycle instead of their car for some time on a voluntary basis without extra costs as an experiment, reported positive experiences (Traffic Test, 1992).

The quality of the whole chain of public transport and bicycle will always be compared with the **quality of other modes of transport**. E.g. parking facilities for cars at work locations are an important factor underlying the opportunities for alternative modes.

3.2 Organisation of the transport system

A main obstacle in the policy to stimulate the combined use of public transport and bicycle concerns the organisation of the transport system. As appears from the preceding paragraph many of the required provisions are relatively cheap and simple. But they require an integrated approach: **all the succeeding links** should be optimised in relation to each other. E.g. improvement of the public transport without adequate provisions for the bicycle doesn't improve the whole transport chain. Another obstacle is that the direct responsibility for the quality for each link rests with **many, different organisations**: public transport companies, authorities responsible for road maintenance, local, regional and national authorities, employers, etc. In many respects it is not clear **what agency exactly is responsible** for what aspect of the transport chain. E.g. storage accommodation at train stations used to be the responsibility for the Dutch Railways Company (NS). Since some years the NS and the national government have in principle agreed that NS is responsible for provisions meeting the demands of the travellers while the national government is responsible for the funding. But both parties until now didn't agree about the way how to work this out. Also, provisions for storage can conflict with other interests of NS concerning train stations such as the profitableness and image. And, it is a well-known phenomenon that **parties will tend to wait** on an initiative from another agency when the responsibility cannot clearly be ascribed to a certain party.

Employers are in a position to influence the mode choice of their employees. They can be expected to have an interest in a good reachability of their establishments for clients, suppliers and employees. But, in practice employers sometimes see disadvantages in the chain of public transport with the bicycle as a component in transport management: such as higher costs and commotion from the employees. The process of decisionmaking by employers and employees generally appeared to take a lot of time and effort. Also, the advantages of the transport chain of public transport and bicycle strongly depend on the characteristics of the specific firm: the commuter distance should be rather long for public transport and cycle to be an alternative for the car and high quality public transport should be present. It should be kept in mind that a small

reduction in urban areas during peak hours can have a significant effect on road congestion.

Public transport companies until now only tended to supply enough storage capacity for the expected amount of travellers. They don't use the chain with the bicycle as a separate tool in their planning or marketing activities. As paragraph 2 indicates, some segments of the market are already exploited, but others still have potential.

3.3 Policy strategy and attitude

As indicated in the preceding paragraph the integration of different modes of transport is the key factor determining the strength of the chain. This integration in practice is in conflict with many obstacles as described before. These obstacles can only be overcome by a clear strategy and a firm attitude from the responsible authorities indicating the relevance of this subject and the need to work towards improvement of the chain from all composing links. This requires a shift of mind and courage from policymakers and politicians.

4. RECOMMENDATIONS FOR RESEARCH AND POLICY.

4.1 General

As several studies and experiments in the Netherlands have showed, the use of public transport with the bicycle for the first or last part of the chain has substantial potentials for competition with the car. The same conclusion could be drawn for other chains of transport such as car and public transport (park and ride) and shared taxi and public transport. The main obstacle in practice lies in the will and decisiveness to do something about it.

Marketing, information and pricing are vital links of the chain. Policy measures to discourage car use in many cases can enhance the chances of the public transport chain considerably.

4.2 The bicycle as a marketing instrument for public transport companies.

The use of public transport can be stimulated substantially in some segments of the market: by stimulating the use of the bicycle in the first or last link of the chain in a large-scale network of public transport consisting of train, metro, expresstram and expressbus. By improving storage accommodation not only cyclists, but also others will make more use of public transport. Municipalities will also gain advantages from adequate provisions for parking of bicycles, e.g. to improve the accessibility of city centres.

Public transport companies could start with the existing network that meets the identified criteria. The following step would be the realisation of adequate provisions for storage and availability of bicycles. At the same time adjustments of the road infrastructure could be realised to improve the accessibility of stations. Finally, the

whole chain should be sold as one product. Ergonomic research should be carried out to improve the service for daily and incidental clients.

Public authorities could stimulate activities by making clear who is responsible for the different links in the chain. By funding the development of initiatives and the improvement of provisions could be stimulated. Communication will be necessary to attain a shift of mind about the usefulness of transport chains. In making contracts between local authorities and public transport companies the quality of transport chains could be an important criterium.

4.3 Transport chains in transport demand management

In transport demand management trip chains with public transport and bicycle sometimes appeared to be very successful as an alternative for the car for commuting at longer distances (at least 10 km.). And sometimes not. The success depends on many factors. E.g. on the location of the company in relation to the network of public transport. It is evident that the success of a new trip chain depends on the advantages in comparison with other possible chains such as the car or public transport and walking between public transport and the company. The undertaking of initiatives to stimulate the use of other modes of transport instead of the car requires a lot of time and effort to communicate and organise the required facilities. Nevertheless, the organisation of provisions for car usage such as car parking space can give still more problems and can be more costly.

Therefore, transport chains such as public transport in combination with the bicycle should be an integral component in the total package of transport demand management. Starting-point should be a clear view on the possible transport chains. The package of demand management can imply many possible provisions, reimbursements, etc. and can be based on the advantages and disadvantages of the possible chains. E.g. to make the use of a bicycle attractive, bicycles and storage accommodation should amply sufficiently be provided in balance with the available car parking space.

New developments can be helpful. E.g. multimodal travel information can be helpful in visualising the advantages and disadvantages of modes of transport for commuting. Interchange stations (park and ride or so-called transferia) can be set up as a missing link between car use and public transport or between car use and bicycle use (rent a bike). These developments are other examples of links that can improve trip chains and facilitate intermodality. This makes it possible to profit from the advantages of the different available modes of transport such as car, bicycle and public transport for commuting.

Transport demand management could be improved by making use of all possible kinds of trip chains. Employers, local authorities, transport companies and national authorities can all play an important role to make use of these opportunities. A better insight should be sought in ways how to facilitate these organisations. E.g. by a certain division of roles and responsibilities. National authorities could provide clear information and practical instruments.

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