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Multi Modal Transport Policy - The example of the Dutch 'bicycle and train' system

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Introduction

In the search for a sustainable solution to urban transport problems there is often a strong emphasis on the need for good public transport. Many politicians and experts consider (the promotion of) public transport to be *the* instrument to counter the unsustainable growth of private motorised transport. The question is: can public transport fulfil these large expectations, and if so, under what conditions.

There are obvious reasons to be sceptical, as public transport has some inherent weaknesses. Very few people have a bus stop right in front of their home, and very few buses, trams or trains will bring you right to your destination. As people are travelling "from door to door", public transport users have to get to and from the public transport stop at the beginning and end of their trip.

In this article, we will present a theoretical framework for optimising the combined use of bicycle and public transport, illustrated by the Dutch integration of 'bicycle and train' provision.

Looking at strengths and weaknesses of the various modes of transport

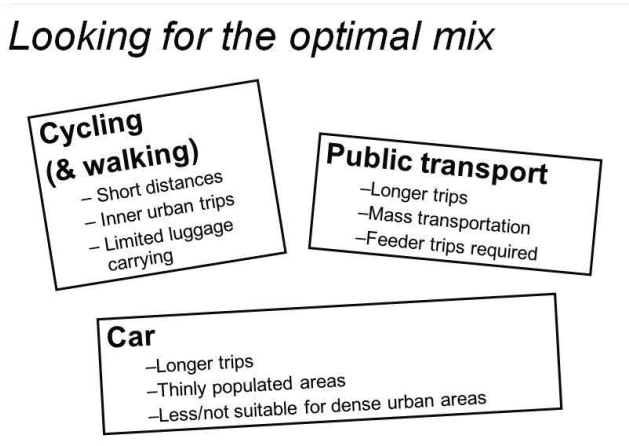
Looking more fundamentally at the various modes of transport, we can see two polarities: 'private' versus 'public' on the one hand, and 'individual' versus 'collective' on the other hand. This results in four categories of modes: 'public collective' mode, 'public

	Public	**Private**
	Strength - More efficient use of a transport system (less unused hours); - Available for everyone, without need to own vehicle *Weakness* - Attuned to average needs, not to individual needs - Only available in case of sufficient demand	*Strength* - Independent from collective (i.e. political) decision making *Weakness* - Summing up of individual choices does not necessarily result in the best total result for society
Collective *Strength* - Advantages of scale in case of large flows *Weakness* - No access to individual addresses, i.e. no door-to-door connectivity	Train Bus Tram Metro Airplane …	Charter transport - Company bus - Touring car - Charter airplane - … Carpool Shared car ownership
Individual *Strength* - Accommodating travel from door to door - Meets individual travel needs *Weakness* - Wasteful use of transport capacity	Taxi Rickshaw Bodaboda (Kenyan bicycle taxi) Rental bicycle Public bicycle/bike sharing ….	Walking Bicycle Moped Motorcycle Car

Table 1: overview of modes according to their public, private, collective and individual character

individual' mode, 'private collective' mode and 'private individual' mode. Table 1 offers an overview of how specific modes can be characterised, and what the general strengths and weaknesses are. Important properties characterising each category of modes are 'penetration ability' (i.e. the ability to penetrate deep into the capillaries of the urban fabric and to provide access to individual addresses), 'flexibility' and 'radius of action'. This more subtle categorisation of modes can help optimise the transport system further.

Each mode of transport has its own 'domain of application' or context where its use is most useful. A sustainable and integrated transport system should utilise the strengths of each mode of transport and avoid the weaknesses, resulting is an 'optimal mix' of transport modes.



Cycling and public transport are very complementary in their characteristics and compensate for each other's weaknesses.

The *bicycle* is a perfect mode of transport for the urban environment: fast over short distances, flexible and providing access to each and every individual address. Moreover, the bicycle can be used at any suitable time. On the other hand its radius of action is limited.

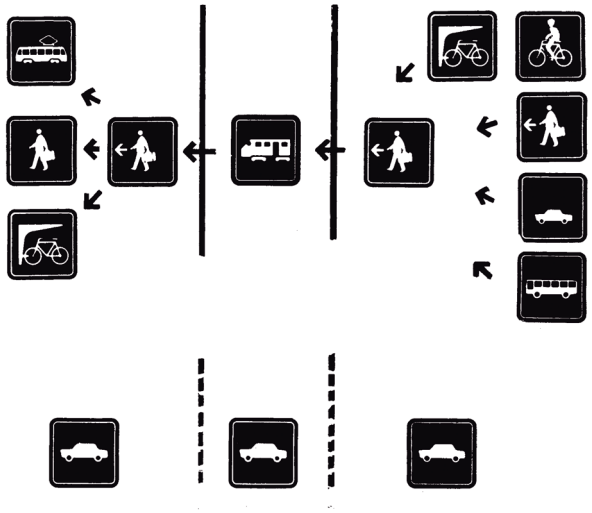
Public transport has quite the reverse qualities: its strength is mass transport over longer distances but its flexibility and penetration ability are very limited. Only over longer distances and under certain conditions can it offer acceptable (i.e. competitive) travel times from door to door. Over short distances, public transport does very poorly.

These strengths and weaknesses of both modes are reflected in the Dutch modal choice patterns: for trips up to 15 km, the bicycle is used more often than public transport; only over distances longer than 15 km is the use of public transport more frequent than bicycle use. This underlines the large potential of cycling as an important element in the urban transport system.

If we can properly combine the strengths of cycling and public transport into one, well-integrated transport system we would have available a system that can provide mobility for almost all trips with origins and destinations in urban areas.

Trip chains

For discussing intermodal transport systems the concept of 'trip chain' is very helpful. Virtually all vehicular trips can be analysed as a chain of 'trip segments' or 'links'. The simplest trip chain has three links: a walking trip to the vehicle, a vehicle ride, and a final walk to one's destination. (The walking trips here can be as short as just a few meters.) In general, trip chains with one or more public transport links are more complex and include access and egress (or feeder) trips. The diagram below shows some rather simple examples with only one public transport link in the chain:



As any chain is as strong as its weakest link, the trip chain concept allows us to analyse which improvements of the integrated 'bicycle and public transport system' are most urgent. And every link in the chain can be optimised so as to offer the best possible door-to-door quality of the trip. The trip chain concept also makes it perfectly clear that good quality of access and egress trips are as important for an attractive public transport system as the quality of the public transport service itself.

In the next paragraph, we will look at the basics of the Dutch 'bicycle and train system' and describe the essential links for a smooth integration.

Optimizing the links in the trip chain: the Dutch bicycle and train example

The Netherlands has a well-used railway system resulting in the most frequently used railway network in Europe. 40% of all train passengers make their access trip by bicycle, and 15% use the bicycle for their egress trip: these percentages are still growing. The success of Dutch rail is, to a large extent, based on the strong position of cycling in the urban transport system, but also because of a deliberate policy to fully utilise the potential of cycling as a feeder mode. Let's have a look why.

Enlargement of catchment area as a consequence of cycling as feeder mode

The closer people live to a railway station, the larger their inclination to use the train. The area around a railway station where train passengers have their origin or destination is called the 'catchment area'. The more people living in the catchment area and the more relevant destinations there are, the more potential clients the railway system will have. About 75% of users of the Netherlands railway system spend no more than about 15 minutes for their access and egress trips. A shift from walking to cycling will immediately increase the catchment area of a railway station drastically as one can cover a 4 to 5 times larger distance in the same time!

Enlargement of catchment area

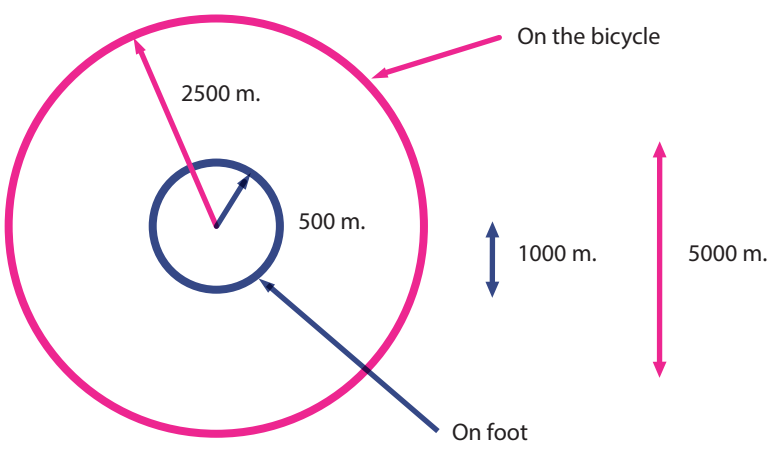


Photo 1: Entrance of guarded bicycle parking at the station square 's-Hertogenbosch

Without the availability of cycling as feeder mode, public transport would depend on walking clients; and as a consequence one would need a much more fine meshed public transport network. This could be achieved by providing e.g. a (rather inefficient) feeder bus system to open up the entire urban area. The combination of bicycle and train is so strong because both sub-systems components are utilised for their strengths: the train for covering long distances, and the bicycle for opening up the urban area.

By optimizing the bicycle route network (more direct routes e.g. by offering short cuts) and by minimizing delay on station bound cycle routes one can further enlarge the catchment area of a railway station for both access and egress trips. Interventions closer to the railway station will have a larger impact, as more cyclists will profit from those interventions.

Improving the smooth transfer between feeder modes and public transport

Station square layout

Also, the layout of the station square requires special attention. Here, all cycle routes are involved, as well as other feeder modes. It is the venue for making the transfer from feeder trip to the train system (and vice versa). Provisions like bicycle parking, taxi stands, bus stops, city maps, a drop off area, park and ride facilities and convenience shops, all these functions have to be accommodated.

From a cyclists' point of view it is important to get to the right spot to park the bicycle safely and as close as possible to the train platforms.

Bicycle parking

Ideally, the location of bicycle parking facilities is well connected to the local cycle route network, and close to the train platforms. Dutch railway stations usually offer two options

for bicycle parking: secured bicycle parking (either guarded or in lockers) at a certain cost, and unsecured parking for free.

Guarded (indoor) bicycle parking facilities can be found at larger railway stations, often in the basement of the station building. Bicycles can be parked in two layers so as to make the most efficient use of scarce and expensive space. New types of two tier bicycle parking are being introduced with integrated gas springs which help the cyclist to lift the bicycle to the upper storage level and back. This makes storing one's bicycle on the upper level a lot easier.

On smaller stations secured bicycle parking is offered by means of lockers or by means of automated entrance systems combined with camera supervision.

Everyday experience has taught us that a substantial proportion of cycling train passengers are not prepared to pay for secured bicycle parking. That is why each railway station has also free bicycle parking facilities available.

Investment programme 'Space for the bicycle'

Good bicycle parking around railway stations is at the heart of the combined use of bicycles and trains. From 1999 to 2012, there has been a comprehensive investment programme to expand the number of bicycle parking facilities available, and to improve

Photo 2: Bicycle parking in the basement of the railway station in 's-Hertogenbosch

Photo 3: Two tier bicycle parking facility with integrated gas springs

Photo 4: Typical bicycle parking facilities
at minor railway stations (Eindhoven)

the quality of the existing facilities. The ministry, the railways, municipalities and various other stakeholders are involved in the implementation of this programme. At the end, 400,000 bicycle parking places need to be available.

An important concern is the most efficient use of the limited space available. More and more the two tier bicycle parking facilities are also on offer for free bicycle parking, at some railway stations in multi store constructions, like the 'bicycle flat' at the Amsterdam central station or the facility in Nijmegen as shown on photo 5. Thus the distinction between secured and unsecured parking is getting smaller, also because a number of municipalities have started to offer secured parking for free.

Availability of bicycles for egress trips

Virtually all Dutch people own a bicycle that they can use for the 'home side' feeder trips. But for egress ('destination side') trips the availability of a bicycle is less obvious.

Photo 5: Free bicycle parking in the city of Nijmegen

Therefore the egress link is traditionally the weakest link in the trip chain. Making bicycles available for the egress trips would bring many more potential destinations within the catchment area of the railway stations. There are a few options for making bicycles available for egress trips as well:

- One can take one's bicycle onto the train. Folding bicycles can be taken on for free. Ordinary bicycles are allowed outside peak hours with payment.

- Commuters may have a second bicycle at their destination station to cycle to their job.

- The third option is a rental or a public bicycle. The traditional rental service at railway stations was relatively expensive and procedures to get one were time consuming: filling out forms and paying a deposit. So the use of this rental system was low, and mainly for irregular trips. In 2002 the OV-fiets (i.e. PT-bicycle, or public transport bicycle) was introduced. This is a public bicycle system that requires a subscription, and allows subscribers to get a bicycle very quickly and easily. Subscribers have a pass with a bar code that can be read by a scanner to get a bicycle. The costs for renting are deducted from your account once a month. This system turned out to be an enormous success. By now (2012) it has 100,000 subscribers, and in 2011 over one million rides were made, thus being the largest public bicycle system in the world. The OV-fiets is used both by daily commuters and for irregular trips, and has proven to be a big improvement in the weakest link of the trip chain.

Conclusion

The Dutch experience shows that investments in the integration of cycling and public transport are worthwhile. A systematic approach, addressing all the links of the trip chain door to door is resulting in an increased use of the Dutch railway system.

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