Content

Chapter 1
Introduction

The popularity of the bicycle is on the rise. The Mecca of the cyclist can no longer only be found in Amsterdam or Copenhagen. More and more cities have joined the league of cities that can call themselves bicycle friendly. The hot city of Parma is one of the Italian cities that have joined the league, with a bicycle share 19% of all trips. In relatively rainy English city of Cambridge, 27% of all journeys are made by bicycle. In the hilly Swiss town of Basel the bicycle is also a favorite among the local population with a share of 23% of all trips. And in the hot American city of Boulder, Colorado, the bicycle accounts for 14% of all trips.

The combination of the bicycle and public transport – in short bike and ride – has also been discovered in many cities. More and more transportation planners consider bike and ride an attractive alternative for the car and more and more people have become bike and ride users. For instance, in Japan between 15% and 35% of all rapid rail passengers arrives at the station by bicycle. In the Netherlands, in some cases up to 70% of all bus passengers cycle to their bus stop. And at some regional train stations in Sweden, more than 50% of all public transport users prefers the bicycle as the means to reach their station.

The goal of this report is to learn from these international experiences with bike and ride and draw lessons for Israel. The report consists of five chapters. In the chapter following this introduction, the concept of bike and ride will be explained and will be compared to its competitors (Chapter 2). Then the use of bike and ride in various countries will be discussed, as well as factors that influence the levels of bike and ride (Chapter 3). In Chapter 4 policies and measures to promote bike and ride will be discussed. Finally, in Chapter 5, the lessons for Israel will be presented. Taken together, the report aims to provide insight into the ways bike and ride can be promoted in the Israeli circumstances, the possible impacts on the levels of bike and ride, and the advantages for the Israeli society.

Chapter 2
Bike and ride and its competitors

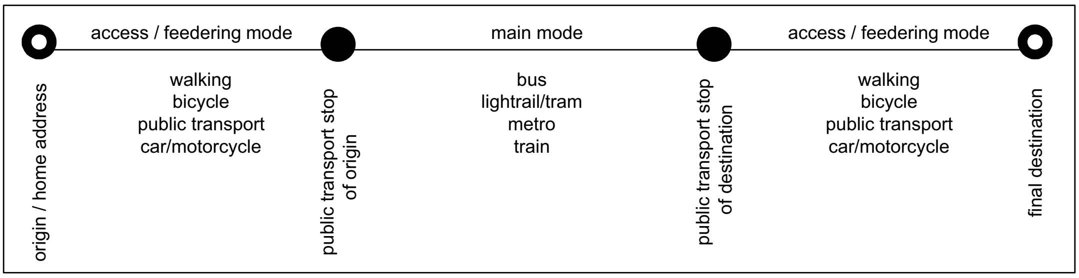
Bike and ride is one of the possible modes of transport that can be used to travel from one place to the other. Bike and ride thus has to compete with other modes in attractiveness. The aim of this chapter is to position bike and ride in relation to these 'competitors'. The chapter starts with a short elaboration of the terms and concepts that are related to the idea of bike and ride (Section 2.1). The five subsequent sections deal with the main 'competitors' of bike and ride: 'walk and ride', 'ride and ride', 'drive and ride', 'cycle only' and 'drive only'. Each section provides a general analysis of the circumstances under which bike and ride may be an attractive alternative to each of these competitors. Section 2.7 discusses briefly the more far-reaching impacts of the introduction of bike and ride facilities. The last section summarizes the main conclusions of this chapter.

2.1 Bike and ride as a transportation concept

Every journey by public transport consists of at least three parts. First, one has to travel from the point of origin to the public transport stop of origin. This part of a public transport journey is called *pre-transport* or *pre-transport trip*. Generally the term pre-transport is reserved for the trip between someone's home address and a public transport stop, irrespective of the direction of the trip. The second part of the journey consists of a trip on board of a public transport vehicle. And finally there is the trip between the public transport stop and the final destination of the journey. This part of the journey is called *post-transport* or *post-transport trip*. This term is generally reserved for the trip between a public transport stop and places other than the home address - such as the workplace, a school, a shop, a conference center etcetera -, again irrespective of the direction of the trip.

Each part of a public transport journey can be made by various types of transport or *transportation modes*. The transportation mode that is used for the second or central part of the journey is called the *main mode*. In case of a public transport trip the main mode is always a type of public transport, e.g. bus, train, metro, lightrail. The transportation mode that is used for the pre-transport and post-transport trip is referred to as the *access mode* or *feedering mode*. Four main types of access modes can be distinguished: walking cycling, driving or feedering modes of public transport. The bicycle is, of course, the access mode in the case of bike and ride (see Figure 2.1).

Figure 2.1 The parts of a journey by public transport and the various transportation modes that can be used for each part of the journey.



The term bike and ride is used for all journeys that combine the use of the bicycle with the use of public transport. Four types can be distinguished (Figure 2.2). First of all, the bicycle can be used in pre-transport. In this case the bicycle is used for the trip between the home address and the public transport stop of origin and the bicycle is parked at public transport stop of origin. The second possibility is the use of the bicycle in the post-transport trip, so between the public transport stop of destination and places other than the home address. The main difference between the use of the bicycle in pre-transport and post-transport is related to the availability of the bicycle. For pre-transport trips, people can use their own bicycle as it is usually parked at the home address. Bicycle availability depends thus to a large extent on bicycle ownership. For post-transport the situation is different, as most people have no bicycle available at the public transport stop of destination. The use of the bicycle is thus depended on the purchase of a second bicycle, the hiring of bicycle at the public transport stop of destination, or - in the case of trips to work - the use of a company bicycle. The third type combines the use of the bicycle in pre-transport and post-transport. In the case of the final type public transport users take their bicycle on the train, bus or other type of public transport. Obviously, this type includes the use of the bicycle in pre-transport and post-transport. The difference with the three other types is mainly related to the required facilities: where the use of the bicycle in pre-transport and/or post-transport mainly requires good accessibility of public transport stops and adequate parking facilities, taking a bicycle on a public transport vehicle requires that platforms, vehicles and the like are accessible for bicycle. The focus in this report will be on the first three types of bike and ride.

Figure 2.2 The four types of bike and ride journeys.

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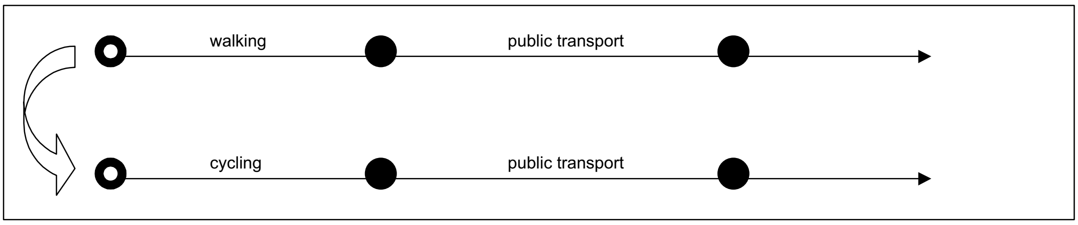
2.2 Bike and ride versus 'walk and ride'

'Walk and ride' refers to a trip that combines a trip by foot with a trip by public transport. The move from walk and ride to bike and ride implies the replacement of the trip by foot with a trip by bicycle (Figure 2.3).

Figure 2.3 Replacement of 'walk and ride' (top) by 'bike and ride' (bottom).



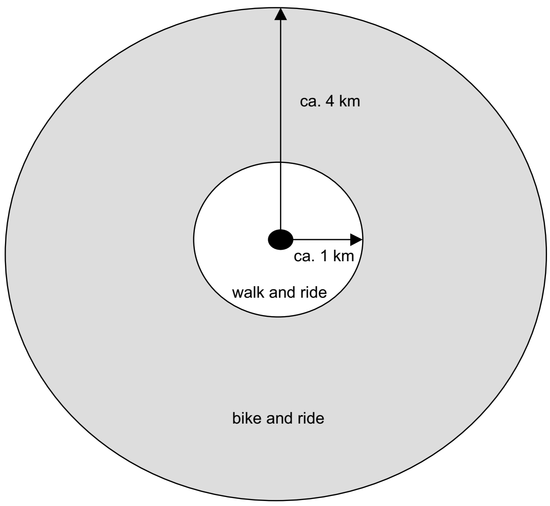
The competitiveness of walk and ride in relation to bike and ride is strongly related to average travel speed of both modes of transportation. The average walking speed is about 4-5 km/h, while the average cycling speed in urban circumstances is 12-15 km/h. Walk and ride is thus relatively attractive for short pre-transport and post-transport distances, but soon looses its attractiveness as the distances increase. The attractiveness of walk and ride over bike and ride on the short distances is related to the fact that the use of the bicycle requires some time for getting the bicycle ready at the beginning of a trip and for parking the bicycle at the end of the trip. A study by Ooms & Smith (1990) shows that the time necessary for these activities is about 4 minutes. Based on this estimation and the average travel speeds of walking and cycling, it is possible to estimate the travel time for various pre-transport and post-transport distances (Figure 2.4). The figure shows that walking is very competitive for distances of less then 500 meter and still reasonably competitive for distances between 500 and 1000 meter. The bicycle is clearly faster for longer distances. These calculations are confirmed by studies on 'walk and ride'. Ege (2001), for instance, shows for the Copenhagen area that the number of passengers that walks to their public transport stop decreases rapidly as the distance increases. From all the bus passengers that walk to their bus stop, less than 50% walks more than 250 meter and only 5% walks more than 800 meter. Passengers of suburban trains are willing to walk a little bit further, but still less than 50% walks further than 450 meter and only 5% walks more than 1250 meter.

Figure 2.4 Travel times by foot and bicycle for various pre-transport and post-transport distances.

Pre-transport distance	Travel time by foot (4-5 km/h)	Travel time by bicycle (12-15 km/h + 4 min)
500 meter	6 - 7.5 min	6 - 6.5 min
1000 meter	12 - 15 min	8 - 9 min
1500 meter	18 - 22.5 min	10 - 11.5 min
2000 meter	24 - 30 min	12 - 14 min

The difference in travel speed between walking and cycling is reflected in the so-called catchment area of public transport stops: the area from which a certain public transport stop manages to attract passengers. Given a certain pre-transport or post-transport travel time, the replacement of walk and ride by bike and ride can increase the catchment area of a public transport stop substantially. Figure 2.5 presents an example based on a maximum pre-transport and post-transport travel time of 15 minutes. Based on the use of walk and ride the catchment area would be about 3 km^2 in size. The introduction of bike and ride would increase the size of the catchment area to about 50 km^2. The actual increase in catchment area will of course vary from case to case. The increase will be relatively large for public transport types with long distances between stops and relatively small for public transport types with short distances between stops, since the catchment areas of stops will overlap in the latter case. The size of the catchment area will also depend on geographical circumstances: mountainous terrain and major barriers like rivers or closed-off areas will limit the size of the catchment area of public transport stop.

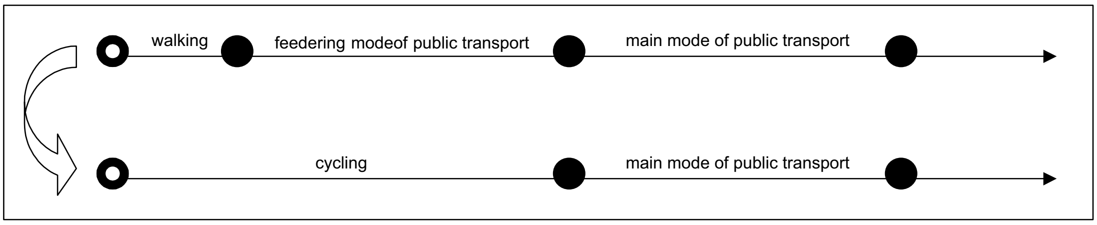
Figure 2.5 Increase in the catchment area of a public transport stop as a result of the replacement of 'walk and ride' by 'bike and ride', based on a pre-transport / post-transport travel time of 15 minutes.



2.3 Bike and ride versus 'ride and ride'

The term 'ride and ride' refers to a trip that combines two types of public transport. In such cases, one type of public transport is used as a feedering mode for another type of public transport. The most typical example is the combination of a bus and a train trip, where the bus is used to get from home to the railway station and the train is used to travel to the area of destination. Other examples are the combination of a suburban and intercity train trip or the combination of an intercity and city bus trip. The move from 'ride and ride' to 'bike and ride' means the replacement of the walking trip to the first public transport stop and the trip by the feedering mode of public transport by a bicycle trip (Figure 2.6).

Figure 2.6 The replacement of 'ride and ride' (top) by 'bike and ride' (bottom).



The attractiveness of bike and ride compared to ride and ride depends on four factors: the pre-transport and post-transport distances, the public transport frequencies, the reliability of public transport, and the cost of public transport. Each of these issues will be discussed below.

The distance of pre-transport and post-transport is the first factor that determines the attractiveness of bike and ride in relation to ride and ride. In general bike and ride is more attractive on the shorter distances, wile ride and ride becomes more attractive on the longer distances. The travel speeds of public transport are of crucial importance, however. Van Goeverden & Egeter (1993) provide some insights into the competitiveness of bike and ride versus ride and ride in relation to pre-transport and post-transport distance. They have developed a model that compares the travel time by bicycle with the travel time by public transport. The travel time of the bicycle is based on an average cycle speed of 12 km/h, the travel time by public transport on the average speed of various types public transport, various levels of congestion, and an estimated waiting time. The model estimations are based on a situation in which public transport is readily available, that is within 200 meter of the home address. The results of the estimations are presented in Figure 2.7. The figure shows that only high quality public transport is faster than the bicycle. A metro or lightrail service, for instance, can compete easily with the bicycle at pre-transport or post-transport distances of over 0,7 kilometers (by a frequency of 12 vehicles per hour) or 1,5 kilometer (by a frequency of 6 vehicles per hour). The same is true for a bus system that includes free bus lanes, albeit to a lesser extent. However, when the average speed of public transport drops to 15 km/h – like it does in many cities in rush hours – it is always more attractive to take the bicycle to reach a bus or train stop than to take a bus (see bottom two rows of the figure). While these figures are based on model estimations, they do provide a tool to assess the potential for bike and ride in various cases. Data from München, for instance, show that the S-Bahn (57 km/h), the U-Bahn (37 km/h) and the regional bus (45 km/h) have average travel speeds that can compete fairly easily with the bicycle on the longer distances, while the tram (20 km/h) and city bus (20 km/h) perform less well (Commission for Integrated Transport 200#a).

A comparison of these data and the model estimations thus suggest that e.g. intercity train stations that are only served by trams and city buses are in higher need of bike and ride facilities than stations that are connected to a lightrail or metro network.

Figure 2.7 The competitiveness of bike and ride versus ride and ride for several pre-transport and post-transport distances.

Type of public transport	Average speed	Frequency per hour	Distance within which bicycle is faster than public transport
Metro/lightrail	50 km/h	12 6	< 0,7 km <1,5 km
Bus (free bus lanes)	30 km/h	12 4	<1,0 km < 2,5 km
Bus (average traffic)	20 km/h	12 4	< 1,5 km < 4,5 km
Bus (heavy traffic)	15 km/h	12 4	All distances All distances

Source: Van Goeverden & Egeter (1993), processed.

The second factor that determines the competitiveness of bike and ride in relation to ride and ride is the frequency of public transport. Low frequencies of both feedering public transport and public transport as a main mode make the bicycle relatively attractive, because low frequencies tend to increase the waiting time and thus the total travel time by public transport (see e.g. Van Goeverden & Egeter 1993; Rietveld 2000b). This is especially true if the departure and arrival times of public transport are unreliable (see below). Given the lack of data on the relation between frequencies and the attractiviness of ride and ride, the analysis presented here is merely an indication of the relation. A crucial factor that determines the travel time is the frequency of the main mode of public transport. In the case of low frequencies, like once an hour or less, ride and ride is only attractive if there is a frequent or a reliable connecting feedering public transport mode available. Frequent in this case means at least four or six times per hour so as to enable public transport passengers to limit their waiting time for the main mode. Reliable and connecting public transport means that the feedering mode has a high probability of arriving on time at the public transport stop of origin and shortly before the departure time of the main public transport mode at the public transport stop of destination. In the case of high frequencies of the main mode the frequency and reliability of the feedering mode becomes less important, as it may be expected that the connecting main mode will always be available within reasonable waiting time. From this brief analysis simple rules of thumb can be derived for the assessment of the competitiveness of bike and ride versus ride and ride in specific situations. In addition it also has to be noted that low frequencies in feedering public transport modes do not only increase total travel time, but also decrease the flexibility of public transport users to determine their departure times.

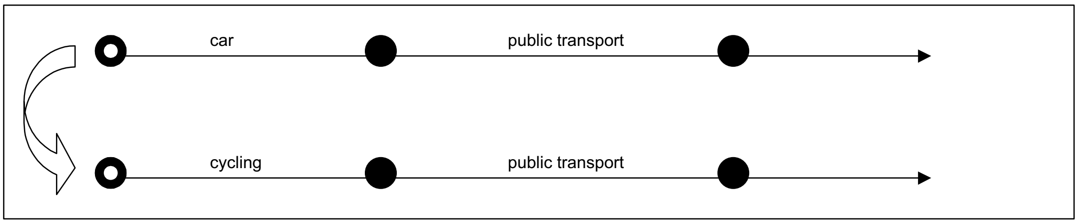
A third factor that affects the competitiveness between bike and ride and ride and ride is the unreliability of public transport. The unreliability depends on the variance in departure and arrival times of public transport vehicles, the variance in travel times, and on the quality of the connection between the feedering public transport mode and the main public transport mode. The connection between two public transport modes is especially crucial in the case of low frequencies. In such cases, a delay of five minutes of the feedering mode may mean that the connection to the main public transport mode is missed, in which case the delay can easily jump to 15 or even 30 minutes. A study by Hine & Scott (2000) shows that the uncertainty of catching a connection is one of the important reasons for public transport users to avoid interchanges on a trip. This is especially true for commuters and business users, as they often have to be at a specific time at a specific place. The preference of public transport users to avoid interchanges is underlined by the data for the Netherlands. Here, only 10% of all trips made by public transport consist of a combination of at least two modes of public transport (Van der Loop 1997). These findings point out that the attractiveness of public transport as a feedering mode in comparison to the bicycle depends to a large extent on the reliability of public transport. Here, again, the type of public transport plays a key role. Rietveld, Bruinsma & Van Vuuren (2001) show for the Netherlands that the unreliability levels differ substantially between various types of public transport. Especially unreliable are inter-urban buses, mainly because they run over relatively long distances through various, partly unpredictable, traffic situations (e.g. peripheral, urban and urban center areas). Not surprisingly, the metro services can operate best on schedule, because they run on a rather simple network and have their own separate track apart from other traffic.

The last factor that influences the attractiveness of bike and ride in relation to ride and ride is the cost of public transport. Data from the Netherlands provide some insight into this relation. In this country the share of public transport as an access mode for train stations has increased substantially after the introduction of a free public transport pass for students in 1990. The share of bus/lightrail/metro in pre-transport has jumped from 18% in 1988 to 27% in 1994, whereas the share of the bicycle went down from 45% in 1988 to 35% in 1994 (Ministerie van Verkeer & Waterstaat 2000b). These data – although they refer to only a specific group of public transport users – seem to suggest that the cost of public transport do play a role in the choice of a feedering mode. They also suggest that the bicycle will be less attractive as an alternative for public transport in cases where a large share of passengers is in the possession of a weekly, monthly or yearly public transport pass. In such cases it may be expected that the provision of dedicated bike and ride facilities will attract less bike and ride users.

2.4 Bike and ride versus 'drive and ride'

The third alternative feedering mode for the bicycle is the 'drive and ride'. Drive and ride refers to the use of the car as a feedering mode. Here, two possibilities can be distinguished. Someone can either drive him/herself to a public transport stop and and park their car there ('park and ride'), or he/she can be brought to the public transport stop with a car and thus travel as a car passenger ('kiss an ride'). The mode from drive and ride to bike and ride implies the replacement of the car trip with a trip by bicycle (Figure 2.8).

Figure 2.8 Replacement of 'drive and ride' (top) by 'bike and ride' (bottom).

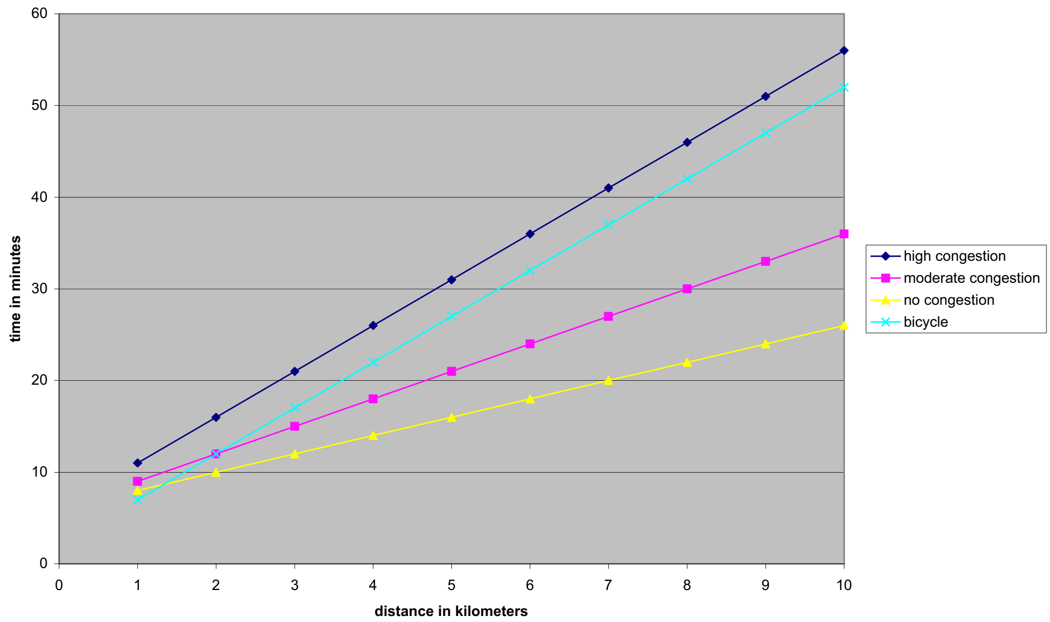


The attractiveness of bike and ride compared to 'drive and ride' depends mainly on three factors: the pre-transport distance, the levels of congestion on access roads of public transport stops, and the availability and cost of car parking at public transport stops. The importance of the pre-transport distance may be obvious. The car is a fast and comfortable mode of transport and is thus especially attractive for longer distances. The exact distance when the car becomes more attractive than the bicycle as a feedering mode will depend to a large extent on the level of congestion on access roads. Higher levels of congestion will reduce the speed of the car and will make the use of the car less attractive. Based on estimations of the average car speed under different circumstances and estimations of the average cycling speed, it is possible to estimate the travel time for various pre-transport and post-transport distances (Figure 2.9). The figure shows that the bicycle can compete fairly well with the car in the case of high congestion. In such circumstances the average car speed is comparable to that of the bicycle (ca. 12 km/h). However, because car parking at a public transport stop in general requires a longer time because of the longer distance between the car park and public transport stop, cycling will always be faster. The situation is different in the case of moderate congestion or no congestion. In the first case the bicycle is competitive for distances of up to two kilometer, while in the last case the bicycle is only competitive for distances of less then one kilometer. Bike and ride facilities may thus be expected to attract car users especially under circumstances of high congestion. The fact that high levels of congestion in many cases also imply high levels of unreliability with regards to travel times by car, further adds to observation.

This last factor that may influence the competitiveness of 'drive and ride' in relation to bike and ride is the availability and cost of car parking at public transport stops. The availability of car parking can have a substantial effect on the travel time by car. Limited car parking availability will increase the time that is spent on the search for a car park. It may also imply that the car has to be parked farther away from a station or public transport stop. Both factors will lead to an increase in time spent on the pre-transport trip.

Furthermore, limited car park availability may affect the reliability of the travel time by car, because it becomes difficult to predict how much time is necessary to find a parking space and walk to the platform or public transport stop. Limited availability of car parking may thus increase the attractiveness of bike and ride vis-à-vis drive and ride. High cost of car parking close to public transport stops may have the same effect, as it will make the combination of drive and ride relatively expensive compared to bike and ride. Of course, the cost related to cycle parking should also be considered here.

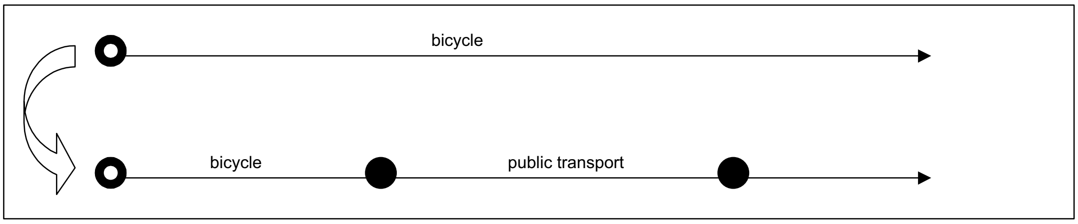
Figure 2.9 Travel times by car and bicycle for various levels of congestion.



2.5 Bike and ride versus 'cycle only'

The term 'cycle only' refers to a trip that is made solely with the bicycle. The move from cycle only to bike and ride implies that the bicycle is used for only part of the trip between origin and destination, while public transport is used for the remaining part of the trip (Figure 2.10). The replacement of cycle only by bike and ride is mainly viable for longer total trip distances. The distance at which bike and ride becomes more attractive than cycle only will depend on the quality of bicycle facilities and the quality of public transport. In the case of high quality bicycle facilities, people will be more inclined to cycle over larger distances. However, data from countries like the Netherlands and Denmark show that even in countries with a network of bicycle lanes, the majority of cycle trips is shorter than 5 kilometer and only a very small proportion is longer than 7.5 kilometer. Bike and ride could thus start to play a role for relatively short distances, provided that high quality public transport is available. The higher the quality of public transport in terms of travel speed, frequency and reliability, the lower the distances will be at which bike and ride can play a role in addition to cycle only. These observations point out that bike and ride can replace 'cycle only' especially in the case of larger urban areas, where a relatively large share of the trips are substantially longer than 5-7.5 kilometers and where frequent and speedy public transport is available.

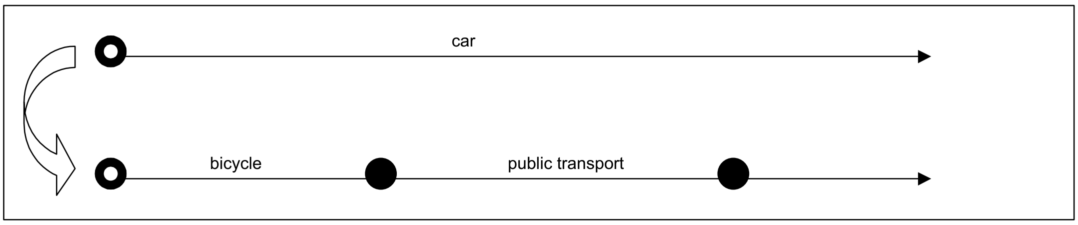
Figure 2.10 Replacement of 'cycle only' (top) by 'bike and ride' (bottom).



2.6 Bike and ride versus 'drive only'

The term 'drive only' refers to a trip that is made solely with a car, motorcycle or scooter. The move from drive only to bike and ride implies that the bicycle is used for only part of the trip between origin and destination, while public transport is used for the remaining part of the trip (Figure 2.11). The replacement of 'drive only' with bike and ride is only likely under specific has several is relatively attractive compared to bike and ride because of its high travel will mainly be feasible for longer total trip distances and under conditions of high congestion. For shorter distances and under circumstances of low congestion the car will generally be faster than bike and ride. This will be even true in the case of high quality and speedy public transport, because a bike and ride trip includes a relatively slow trip by bicycle, parking time, waiting time for public transport, and time related to post-transport. However, for longer total travel distances and situations of high congestion bike and ride becomes more attractive, because the time spent on pre-transport and post-transport has less weight in the total travel time. Bike and ride can thus be a real competitor for 'drive only' in cases of longer total trip distances, high quality public transport and high levels of congestion (Rietveld 2000b).

Figure 2.11 Replacement of 'drive only' (top) by 'bike and ride' (bottom).



2.7 Bike and ride as a strategic investment

Bike and ride is more than an alternative for 'walk and ride', 'ride and ride' or any of the other (combined) modes discussed in the previous sections. Investments in bike and ride are of strategic importance because they imply a substantial an improvement in the car-less accessibility of cities and places. Currently, car-free travel is very well possible for short distances and long distances (see e.g. Kramer 199#). Walking and cycling are excellent alternatives for the car for the short distances, while high quality public transport is a viable alternative for the long distances. The intermediair distances are currently the most problematic, because public transport in the form of 'walk and ride' or 'ride and ride' is often not fast enough due to the time related to pre-transport and post-transport. The introduction of high quality bike and ride facilities could reduce the pre-transport and post-transport times substantially and thus make car-free travel at the intermediair distances more viable.

The strategic importance of improved car-less accessibility is twofold. First, it is vital from an environmental perspective. Bike and ride facilities will not only enable more people to reach their destinations in an environmental friendly way. They will also enable the emergence of car-free lifestyles, because they make car-free travel at the intermediair distances more speedy and comfortable. Second, it is important from a perspective of social justice. Despite the rising car ownership, a substantial part of the population currently does not have access to a car and it may be expected that this will remain so in the future (Baeten, Spithoven & Albrechts 1997). The mobility and accessibility opportunities of these people are substantially limited in a society that in which much of the planning is based on the assumption of general car availability. The introduction of bike and ride facilities may enhance the accessibility opportunities of these car-less people and allow them to participate more fully in society.

2.8 Conclusions for Israel

The goal of this chapter was to give insight into the circumstances under which bike and ride can be an attractive alternative for other (combined) modes of transport. The main results are summarized in Figure 2.12. Several observations can be derived from the figure. First of all, it is clear that bike and ride is especially attractive for certain pre-transport and post-transport distances. The minimum distance lies somewhere between 500 and 1000 meter. Below these distances meter walking is a more attractive access mode, mainly because of the time related to bicycle parking. The maximum distance is harder to establish, because individual factors will play a more important role. It may be expected, however, that the bicycle is especially popular for pre-transport and post-transport distances of less than 5 kilometer. Longer distances are relatively unattractive to cover by bicycle and it may thus be expected that people will use public transport or the car as a feedering mode or that they will not use the specific public transport stop at all. Second, bike and ride is especially attractive in case alternative feedering modes are of poor quality, thus in case of poor public transport or heavily congested access roads. The third observation concerns total trip distance. Given the time that is spent on pre-transport and post-transport it may be expected that bike and ride is especially attractive for intermediair and longer distances. For shorter distances cycle only or drive only are more attractive. The last observation relates to the quality of public transport as a main mode. Bike and ride is especially attractive if the main mode is speedy and reliable.

Figure 2.12 also presents some impressions concerning the prevailing circumstances in the Israeli situation. While it should be noted that the circumstances will vary from station to station and from bus stop to bus stop, the presented overview does give a first impression about the attractiveness of bike and ride under the Israeli circumstances. Two observations deserve special attention here. First of all, it seems clear that bike and ride is relatively attractive compared to ‘ride and ride’. The attractiveness of ride and ride is limited under the Israeli circumstances, because of the low speed and low reliability of feedering modes of public transport (mainly bus services). Both factors can mainly be attributed to the high levels of congestion on roads, especially in the major urban areas. Second, bike and ride seems also relatively attractive compared to ‘drive and ride’. Here, again, the high levels of congestion on access roads of public transport stops play a major role, as they decrease the average travel speed of cars substantially. These observations thus suggests that there is a substantial market for bike and ride under the Israeli circumstances.

Figure 2.12 Bike and ride in relation to alternative modes of transportation.

Bike and ride versus	Bike and ride attractive in cases of	Holds true for Israeli situation
Walk and ride	Pre-transport and post-transport distances of more then 500-1000 meter	Yes, especially for train and intercity bus lines
Ride and ride	Relatively short pre-transport and post-transport distances	Yes, especially for suburban buses
	Low speed of feedering public transport	Yes, especially bus services in peak hours
	Low frequencies of feedering *and* main mode public transport	Yes, especially train stations and bus stops outside main urban areas
	High unreliability of feedering public transport	Yes, especially for bus services
	High cost of public transport	No
Drive and ride	Relatively short pre-transport and post-transport distances	Yes, especially for suburban buses
	Heavy congestion on access roads of public transport stops	Yes, especially for stations in Tel Aviv and Haifa
	Lack of parking at public transport stops	Yes, especially for smaller bus and train and for stops of intercity buses
	High costs of parking at public transport stops	Yes, especially for central stations in Tel Aviv and Haifa
Cycle only	Total trip distances longer than 5-7.5 kilometer	Yes, especially in major urban areas around Jerusalem, Tel Aviv, Haifa and Be'er Sheva
	Lack of longer distance cycling facilities	Yes, in most localities
	Speedy and frequent public transport	No, especially intra-city bus lines have low average speeds
Drive only	Long total trip distances	Yes, especially in case of intercity trips
	Speedy public transport	Yes, especially intercity train lines

Chapter 3
Bike and ride in practice

Bike and ride has been part and parcel of everyday life in many countries around the world. This chapter aims to learn from these international experiences and draw lessons for Israel. The chapter starts with an overview of the levels of bike and ride in four countries for which data are available: the Netherlands (nation-wide data), Denmark (Copenhagen), Germany (München) and the UK (selected train and bus stations). It continues with a discussion of the various factors that influence the levels of bike and ride. Section 3.2 covers the relation between pre-transport and post-transport distance and the use of the bicycle as an access mode. The travel motives of bike and ride users are discussed in the following section. Then the impact of bicycle and car availability of on the use of the bicycle as a feedering mode is addressed. The influence of factors like climate, safety and bicycle theft is outlined in Section 3.5. The final section of the chapter sums up the conclusions and outlines the consequences for the development of bike and ride in Israel.

3.1 Bike and ride in four countries

The popularity of the bicycle varies from country to country and from city to city. Consequently, there is also huge variation in the use of the bicycle as a feedering mode for public transport. The data for the Netherlands, Germany, Denmark, and the UK reveal, however, that the levels of bike and ride are more associated with the type of public transport than with the general levels of bicycle usage in a country (see Figure 3.1).

The Netherlands is without doubt the number one cycling country in the industrialized world. More than 27% of all trips in the Netherlands are made by bicycle (Ministry of Transport 2000b). The share is even more impressive within urban areas. At this level, bicycle shares vary from 28% in Amsterdam to 35% in Groningen and even 42% in the medium-sized city of Enschede (De la Bruheze 1999). The high level of bicycle usage is reflected in the high level of bike and ride among train passengers, but much less among the users of other types of public transport. About 30% of all train passengers use the bicycle for the trip between the home and the station. The use of the bicycle in post-transport is lower, but still substantial: about 8% of the people cycles from the train station to their final destination. Bus passengers use bike and ride substantially less than train passengers. Approximately 6% of all bus passengers use the bicycle to reach their bus stop and about 1% of them uses the bicycle to travel from a bus stop to their final destination. Express buses – which travel over larger distances than regular buses and have less stops – do slightly better than the average bus. About 14% of all express bus passengers uses the bicycle in pre-transport and about 2% in post-transport. The lowest level of bike and ride is found among the passengers of tram (light rail) and metro. About 1% of these passengers uses the bike in pre-transport or post-transport (see Van Goeverden & Egeter 1993; Traffic Test 1995; Rietveld 2000b; Ministry of V&W 2000b).

Denmark is – just like the Netherlands – widely known as a cycling country. The bicycle has a modal share of about 20% of all trips, which makes Denmark the second cycling country in the industrialized world after the Netherlands (Pucher *et al.* 1999). Like in the Netherlands, the share of cycling in the total number of trips varies substantially between cities and towns. The medium-sized city of Arhus, for instance, shows a relatively low level of bicycle use (18%), while the bicycle has a substantial higher share than the national average in a medium-sized city like Odense (24%) (European Commission, Adonis Report, 1998). Copenhagen is without doubt the city with the highest bicycle usage: approximately 26% of trips are made by bicycle in the Danish capital. Bike and ride is also popular in the Greater Copenhagen area. Ege (2001) shows that 25% of all regional train passengers and 22% of all suburban train passengers use the bicycle to travel between their house and the train station. The shares are considerable lower for bus users, but still about 12%. The figure drops till about 4% for regular and city buses. The use of the bicycle is lower for post-transport for all types of public transport and varies between 1% and 3%.

Germany has seen a substantial growth in the use of the bicycle in the last decades. Bicycling's modal share for urban trips rose from 8% in 1972 to 12% in 1995 (Bundesministerium für VBW 1998; Pucher *et al.* 1999). Like in the Netherlands, many cities show higher bicycle shares than the national average. The most bicycle friendly city in Germany is Münster, with a share of 34%. Cities like Bremen, Freiburg, Karlsruhe and Hannover also score above the average, with shares between 15% and 22%. In a major city like München bicycle use is slightly lower than the national average, but still substantial with a share of 13% in 1997 (Bördlein 1998). Data about the levels of bike and ride are less readily available for Germany (Bundesministerium für VBW 2000). Mobinet (1999) provides data for the metropolitan area of München and shows that the level of bike and ride lies between 4% and 17% for pre-transport trips. Like in the Netherlands and Denmark, the shares vary according to the type of public transport. The lowest share of bike and ride is found for the city bus (4,2%), the highest for the regional train (16,4%). For the U-Bahn – München's metro-system – the number is 4,8%, while the S-Bahn – which resembles a regional train – has a share of 10,1%.

The use of the bicycle is much less popular in the UK than in the Northern-European countries discussed above. Only about 2% of all trips are made by bicycle in the UK. The low general level of cycling does not imply, however, that the shares of cycling are also low at the local level. In university cities like Oxford and Cambridge the bicycle has a very high modal share, even compared to countries like the Netherlands and Denmark. The bicycle's share in work trips is about 26% in Cambridge and 16% in Oxford (Taylor 1996). In many cities, however, the bicycle share is only 2% to 4%. Data about bike and ride are not readily available for the UK. Some insights into the level of bike and ride can be derived from the study of Taylor (1996). He has analyzed the level of bike and ride at five train stations and three Park & Ride locations in the UK. The bicycle use at the five stations – all located close to the center of a medium-sized city – was substantially higher than the national average: 55% of all train passengers at the five stations used the bicycle as the means to reach the train station. The situation is different for the three Park & Ride facilities. These facilities are located 4 to 5 kilometers from the city center adjacent to a highway. They combine a large parking lot with a bus connection to the city center and also include some facilities for bicycles parking. The use of the bicycle is much lower at these Park & Ride facilities: only 4% of all people uses the bicycle to reach the Park & Ride facility to switch to a bus to the city center.

The data on bike and ride for the countries discussed above are summarized in Figure 3.1. The table gives rise to three observations. First, the table shows that there is no direct relation between the general use of the bicycle in a country or a city and the level of bike and ride. Second, the level of bike and ride can be substantially higher than the share of the bicycle in all trips. Especially the UK data on bike and train are revealing in this respect, but also the figures for the Dutch trains stations and München's regional trains point in this direction. Finally, the table reveals that there is a strong relation between the type of public transport and the share of bike and ride. Rail transport and faster types of public transport show higher levels of bike and ride than bus transit and slower types of public transport. There are several reasons for this. First, fast modes of public transport tend to have relatively long distances between two stops or stations, resulting in relatively long pre-transport and post-transport distances. Second, passengers of faster modes of public transport tend to travel over longer distances. This, too, leads to longer pre-transport and post-transport distances and thus to a preference for the bicycle (see Section 3.2). Finally, faster types of public transport tend to attract passengers from a larger distance because of their high quality in terms of travel speed. All these factors thus point out that faster modes of public transport have longer pre-transport and post-transport distances. This, in turn, makes the bicycle a relatively attractive access mode compared to walking, which is the most popular mode for types of public transport that are utilized to travel for relatively short distances (city bus, tram, metro) (Van der Loop 1997).

Figure 3.1 Share of bike and ride for selected countries and cities.

Country / city	Type of public transport	Bicycle share in pre-transport	Bicycle share in post-transport	Bicycle share in all trips
The Netherlands	Train	30%	8%	27%
	Express bus	14%	2%	
	Bus	6%	1%	
	Tram / metro	1%	1%	
Copenhagen	Regional train	25%	3%	26%
	Suburban train (S-tog)	22%	3%	
	Fast bus (S-bus)	12%	2%	
	City bus	4%	1%	
München	Regional train	16%	-	13%
	Suburban train (S-Bahn)	10%	-	
	Metro (U-Bahn)	5%	-	
	City bus	4%	-	
UK	Train (five stations)	55%	-	2%-26%
	Bus (three P&R stations)	4%	-	3%-18%

Sources: Ministerie van Verkeer & Waterstaat (2000b) for train stations in the Netherlands; Van Goeverden & Egeter (1993) for bus and tram/metro in the Netherlands; Traffic Test (1995) for express bus in the Netherlands; Mobinet (1999) for München; Ege (2000) for Copenhagen; Taylor (1996) for selected train and bus stations in the UK.

3.2 Pre-transport and post-transport distance

The role of bike and ride as a feedering mode is strongly related to the travel distance between the place of origin and the public transport stop. Data from the Netherlands, Germany and the UK show that the use of the bicycle is especially popular for distances between 1 and 4 kilometer (Figure 3.2). Walking is the dominant feedering mode for distances less than 1 kilometer, while public transport and the private car become more important for distances of more than 4 kilometer.

The data for the three countries show again that there are substantial differences between various types of public transport. Metro stations have the most local orientation. In both the Netherlands and Germany, the vast majority of cyclists does not cycle further than 2 kilometers. The catchment area of bus stops and stations is substantially larger than that of metro stations. More than half of all the bike and bus users cycles more than 2 kilometers to their bus stop, while about 20% cycles even more than 4 kilometer. Train stations attract cyclists from the largest distance, with about two thirds of all bike and train users cycling more 2 kilometers to their train station. The difference in catchment area between metro, bus and train is reflected in the average pre-transport cycle distances for the Netherlands. For the metro this distance is 2.2 kilometer, for buses 2.4 kilometer, and for train stations even 2.8 kilometer.

Figure 3.2 The use of bike and ride for various pre-transport travel distances.

Distance	The Netherlands			Germany		UK	
	Train	Bus	Metro	Train	Metro	Train	Bus
0 – 1 km	5%	12%	16%	5%	60%	12%	13%
0 – 2 km	30%	46%	63%	38%	92%	41%	46%
0 – 3 km	57%	70%	79%	62%	97%	73%	67%
0 – 4 km	74%	80%	84%	74%	98%	87%	83%
0 – 5 km	83%	87%	87%	93%	99%	90%	92%
0 – 6 km	91%	93%	95%	96%	99%	92%	92%
Average	**2.8 km**	**2.4 km**	**2.2 km**	**-**	**-**	**-**	**-**

The data refer to the national average for the Netherlands, to the Grafing train station and Kiefergarten metro station for Germany, and to five selected train stations and three P&R bus stations for the UK. Source: Van Goeverden & Egeter (1993) for the Netherlands; Bickelbacher (2001) for Germany; Taylor (1996) for the UK.

The actual pre-transport and post-transport distances can, of course, vary from station to station and from public transport stop to public transport stop. The study of Janse & Van Bremen (1995) provides some detail about the variety in travel distances and times to seven bus stops of regional and high quality express buses in the Netherlands (Figure 3.3). They show that the average pre-transport distance varies between 1.2 and 4.3 kilometers and the average pre-transport times between 6.3 and 15.2 minutes. The differences can be attributed to the location of the seven stops and the travel motive of the bike and ride users. The stop that shows the largest travel distances (Werkendam-Sleewijk) is located along a major highway in some distance of several small towns and villages and is mainly used by students and scholars (80%). The lack public transport in the rural towns themselves and the lack of alternative modes of transport induces this group of bus users to cycle to the bus stop located at a substantial distance from their homes. The bus stop with the shortest pre-transport distance and time (Oosterhout-Napoleonlaan) is located in the center of a residential area, while the number of students and scholars that uses the stop is relatively small (40%).

Figure 3.3 Average distance and time spent on pre-transport for seven bus stops, the Netherlands.

Bus stop	Distance in kilometers	Time in minutes
Zevenbergen-Drie Hoefijzers	2,8	11,1
Oosterhout-Europaweg	1,5	6,7
Oosterhout-Napoleonlaan	1,2	6,3
Oosterhout-Elkhuizenlaan	1,3	6,4
Oosterhout-Busstation	2,3	9,1
Werkendam-Sleewijk	4,3	15,2
Raamsdonkveer-Busstation	2,0	8,2
Average	**2,6**	**10,2**

Source: Janse & Van Bremen (1995).

The number of data available on the relation between the total trip distance and pre-transport and post-transport distances is limited. Data from the Netherlands, however, suggests that there is a clear relation between the two. The data – derived from the Dutch annual travel survey (OVG) – show that bike and ride users tend to cycle further if the total trip distance is longer (Figure 3.4). The pre-transport and post-transport distances are especially short for total trip distances below 20 kilometers (about 2 kilometer or shorter). For longer trips the pre-transport and post-transport distance is about 3 kilometer or longer. Veeke & Bovy (1990) also find a relation between total trip distance and post-transport distance for bike and ride users that travel to and from the city of Delft. These results indicate that the relation between type of public transport and pre-transport and post-transport distances is partly related to the total trip distance. People generally travel over larger distances with higher quality types of public transport, like trains and express buses. The larger 'catchment area' of these systems with regard to bike and ride users may thus come as no surprise.

Figure 3.4 Relation between total trip distance and pre-transport and post-transport distance for bike and ride users, the Netherlands.

Total trip distance	Average pre-transport distance	Average post-transport distance
0 – 10 km	1.1 km	1.4 km
10 – 20 km	2.2 km	1.9 km
20 – 30 km	2.8 km	2.7 km
30 – 50 km	3.2 km	3.1 km
50 – 100 km	2.9 km	3.0 km
100- 200 km	3.7 km	4.6 km
More than 200 km	2.8 km	2.9 km

Source: Van Goeverden & Egeter (1993), processed.

3.3 Travel motives

The second characteristic of bike and ride users that needs to be discussed concerns the travel motives. The data for the Netherlands, Germany and the UK show again that there are strong similarities between the bike and ride users in the three countries. In each country bike and ride proofs to be especially popular among people that travel to work or school (Figure 3.5). The dominance of these travel motives may come as no surprise. Both commuters and scholars and students tend to make the same trip nearly everyday. They are thus more likely to be better informed about the various alternatives to travel between the home address and the address of destination and are more likely to choose the most efficient way to cover the distance between the two. They may thus be better informed about the possibilities for bike and ride and about the advantages it offers over other modes of transport. It is also more likely that they are willing to invest in the specific facilities that a bike and ride trip requires, such as a proper bicycle, theft-proof locks or the hiring of a bicycle locker.

The dominance of the work and educational motives in all countries does not mean that there are no differences between the countries. The data show on the contrary that there are substantial differences. These can be mainly attributed to two factors. The first is the location of the station of origin and possible stations of destinations. This factor can explain the differences between bike and train users when it comes to the importance of the shopping motive. The relatively high share for Germany concern only one station located in the suburbs of München. Given this location it may come as no surprise that a substantial amount of people use the bike and train combination to go shopping in the inner city of München. The 'location factor' can also shed light on the differences between bike and bus users in the UK and the Netherlands concerning the shares of the three main travel motives: work (45% in the UK versus 24% in the Netherlands), education (7% versus 30%), and shopping (31% versus 11%). The differences are mainly the result of the fact that the UK data refer to special P&R bus stations that connect the urban fringe with the city center. Both the high number of shops and jobs in the city center and the limited amount of parking available can explain the relatively large number of P&R users travel to work or shops. The relatively low share of bus and ride users that travel to educational facilities is, in turn, probably the result of the over-representation of these two groups.

The second factor that can explain the differences in travel motives concerns the characteristics of the public transport system. Here, the differences between bike and train users in the Netherlands and the UK can serve as an example. The differences in the shares of bike and train users that travels with a work purpose (66% in the UK and 40% in the Netherlands) and an educational purpose (12% in the UK and 30% in the Netherlands) can be attributed to two factors. First, the types of trains play a role. The UK system and the five selected stations are especially well served by long-distance trains, whereas the Dutch system is more dominated by medium- and short-distance trains. The short-distance trains are especially attractive for youth and students on their way to school or university as they travel in general over relatively short distances, whereas the long-distance trains may be especially attractive for commuters on the way to their workplace because of the competitiveness with the car. The second factor that plays a role is the cost of public transport. While students and scholars in the Netherlands have good access to train services thanks to free public transport pass, the train services in the UK are rather expensive and thus less accessible for students and scholars.

Figure 3.5 Travel motives of bike and ride users for the Netherlands, Germany and the UK.

Distance	The Netherlands			Germany		UK	
	Train	Bus	Metro	Train	Metro	Train	Bus
Work	40%	21%	##	64%	49%	66%	45%
Education	30%	51%	##	14%	32%	12%	7%
Shopping	6%	10%	##	14%	11%	1%	31%
Business	3%	1%	##	--	--	4%	0%
Other	21%	18%	##	9%	7%	17%	17%

The data refer to the national average for the Netherlands, to the Grafing train station and Kiefergarten metro station for Germany, and to five selected train stations and three P&R bus stations for the UK. Source: Van Goeverden & Egeter (1993) for the Netherlands; Bickelbacher (2001) for Germany; Taylor (1996) for the UK.

3.4 Bicycle and car availability

The availability of the bicycle and the car may be expected to influence the use of bike and ride. Both will be discussed in turn below.

Bicycle

An indication of the impact of bicycle availability on the levels of bike and ride can be obtained by comparing the bicycle share in pre-transport with its share in post-transport for countries like the Netherlands and Denmark. In these countries almost everybody owns one or more bicycles and bicycle availability for the pre-transport trip is thus no problem. Bicycle availability for post-transport remains a problem, however, despite the fact that various facilities exist. Bicycles cannot be transported on trains and buses during rush hours, bicycle rental is only available at main train and bus stations, and the purchase of a second bicycle can be costly and involves the risk of bicycle theft. The comparison between pre-transport and post-transport can thus give an indication of the possible levels of bike and ride in countries with low levels of bicycle ownership.

Data for both the Netherlands and Denmark show that the bicycle is far more popular in pre-transport than it is in post-transport. In the Netherlands, the use of the bicycle is four to nine times higher in pre-transport than in post-transport. The difference is relatively small for trips to work and school. This may be attributed to the fact that these trips are made frequently. It may thus be expected that people search for permanent solutions to the 'post-transport problem', like the purchase of a second bicycle. People will be less inclined to make such arrangements for less frequent trips, such as trips with a shopping purpose. It is therefore no wonder that train passengers use the bicycle nine times as much in pre-transport as in post-transport when they are on their way to do shopping (Figure 3.6). Data from Denmark point in the same direction. Wood (1993) has analyzed the use of the bicycle among the users of Copenhagen's suburban train system, the S-tog. He has found that about 25% of all S-tog passengers cycle from their home to the station, whereas only 3-4% cycles from the station to their final destination. Here, too, the use of the bike in pre-transport is six to eight higher than the use in post-transport.

Figure 3.6 Comparison of the use of the bicycle in pre-transport and post-transport, the Netherlands.

Type of public transport	Work		Education		Shopping	
	Pre	Post	Pre	Post	Pre	Post
Train	32%	7%	41%	11%	18%	2%
Bus	6%	0%	19%	4%	3%	1%
Tram/metro	1%	0%	4%	0%	3%	1%

Source: Van Goeverden & Egeter (1993), processed.

Car

The availability of a car offers people the opportunity to choose for 'drive and ride' or 'drive only' instead of bike and ride. It may thus be expected that the availability of a car will play an important role in the choice for the bicycle as a feedering mode. Data from Germany, the UK and the Netherlands show that car ownership does play a role, but also reveal that car availability does not automatically imply a preference for the car. Bickelbacher (2001) shows in his analysis for the three München train and metro stations that between 48% and 55% of all bike and ride users had a car available on the day of the survey. Taylor (1996) presents similar results for five train stations in the UK. Here, about 50% of all bike and train users had a car available on the day they made a pre-transport trip by bicycle. Car availability has a stronger influence on the number of people that choose the bike and bus option. The results of Taylor (1996) for three P&R bus stations show that only 12 % of the bike and bus users had a car available on the day of travel. Van Uum, Salverda & Veling (1995) present similar results for eleven bus lines in the Netherlands.

3.5 Other factors

The choice for the bicycle as a feedering mode for public transport is influenced by various other factors than the dominant ones discussed above. Some of the more relevant issues, especially for countries with little cycling experience, will be discussed in this section.

Location
The first factor that influences the level of bike and ride is the location of public transport stops and stations. This factor can play a role at various geographical scales. The first level is the level of towns and cities. Nägele, Wilbers & De Bruin (1992) show that the levels of bike and train vary substantially according to the size of the locality in which the station is located. The levels of bike and ride are the lowest in major cities, while smaller towns and suburbs show the highest levels of bike and ride (Figure 3.7). The differences can be mainly explained by the quality of feedering modes of public transport and by the type of passengers at the various stations. Main cities show lower levels of bike and ride, because public transport users have a relatively high quality public transport available for pre-transport and post-transport trips. Suburbs show higher levels of bike and ride because feedering types of public transport are largely missing and because a large proportion of the train users travels to and from work.

Figure 3.7 Location of train stations and shares of the bicycle in pre-transport and post-transport, the Netherlands

Location	Pre-transport	Post-transport
Main city	22%	5%
Medium-sized city	32%	8%
Large town	41%	9%
Suburb	43%	12%

Source: Nägele, Wilbers & De Bruin (1992), processed.

The location of public transport stops within the urban texture also influences the levels of bike and ride. Data for München show that the levels of bike and ride are substantially higher in the suburbs than in the city. In the towns surrounding München around 10% of the public transport users travel by bike to a public transport stop, while in the city only 4,5% of the people use the bicycle (Mobinet 1999). Van Uum Salverda & Veling (1995) also show that bus stops located in the city center have relatively low levels of bike and ride compared to bus stops located at the edge of neighborhoods, towns or in rural areas. These results can largely be explained by three factors. The first is the relative distances between public transport stops and points of origin and destination. These distances are relatively short in the city and city center, due to the more compact lay-out of these areas. The second factor is the existence of 'intervening opportunities'. The number of public transport lines and stops is generally much higher in the city and city center and people have thus more opportunity to choose a public transport that is located close to their origin or destination. Finally, the availability of feedering modes of public transport also plays a role. Again, such facilities will be more readily available in the city and city center offering people an alternative to bike and ride.

Climate and weather

Climate (long-term, seasonal changes) and weather (short-term and daily changes) are often considered a deterrent for cycling and may thus also influence the level of bike and ride. Data on the actual relation between cycling, climate and weather are scarce (Nankervis 1999). The only data that have been retrieved about this issue in relation to bike and ride are for München and thus refer to the Northern-European climate of relatively cold winters and moderate summers. Bickelbacher (2001) shows that there is a clear relation between the climatic changes in München and the use of bike and ride. In München's the moderate summer between 78% and 91% of all bike and ride users cycles more than four times to their station of origin, while in the colder and wetter winters the figures drop to 42% to 57%. Obviously, the percentage that regularly uses an alternative mode to reach the station of origin or the final destination is substantially higher in the winter (62%-68%) than in the summer (43%-50%). The weather also affects the levels of bike and ride in München. Between 34%-50% of all bike and ride users cycle less to their station of origin in the case of bad weather, while for 'only' 44% to 63% the use of bike and ride does not dependent on the weather (Figure 3.88).

The figures for München confirm the common knowledge that climate and weather influence the levels of cycling and therefore of bike and ride. Likewise, the Israeli climate and weather situations are bound to impact the levels of bike and ride. On the negative side, the hot and humid summer might act as an impediment for cycling, especially for purposes that require more formal dress. On the positive side the moderate autumn-winter-spring period (Oktober-April) and the generally stable weather can be noted. Especially the low number of rainy days and the generally moderate winds make cycling relatively attractive.

Figure 3.8 The impact of climate on the use of bike and ride in München, Germany.

Season	Percentage that uses bike and ride four times or more per week			Percentage that regularly uses an alternative to bike and ride		
	Pasing	Kiefergarten	Grafing	Pasing	Kiefergarten	Grafing
Summer	78%	79%	91%	46%	50%	43%
Winter	53%	42%	57%	62%	68%	65%

Source: Bickelbacher (2001).

Theft

Bicycle theft is a common phenomenon in nearly every modern country and the chances of bicycle theft are substantial in many countries. In the Netherlands, for instance, one out of every twenty bikes is stolen every year (Wesselink 2000). The risk of theft is a major impediment for bicycle use in general. It may be expected to be an even more important factor that influences the uses of bike and ride in specific, since this implies the parking of a bicycle at a public place (public transport stop or station) for a longer period of time and sometimes for overnight. 'Hard' data on the impact of bicycle theft on the levels of bike and ride are scarce. A study from the Netherlands suggests the impacts are substantial. This study among the users of eleven bus lines showed that more than 10% of the bus passengers did not use bike and ride because of the risk of bicycle theft. Bicycle theft proofed to be just as important a factor in explaining the use of bike and bus as the pre-transport and post-transport distances (Van Uum, Salverda & Veling 1995).

The study of Bickelbacher (2001) for three train and metro station in München underlines the worries of bike and ride users and the importance they attach to secure bicycle parking at public transport stops. A questionnaire among current bike and ride users revealed that between 63% and 69% felt that the existing bicycle parking facilities offered insufficient protection against bicycle theft. Likewise, they valued improvements in more secure parking facilities very highly. Between 53% and 59% of all bike and ride users wished to see an improvement in this respect. The only measure that was more popular among München's bike and ride users was the extension of the bicycle parking capacity.

Safety
Traffic safety is another factor that influences the levels of bicycle use and bike and ride. Again, hard data are hardly available on this issue. The study of Taylor (1996) into the use of bike and ride at five train stations and three P&R bus stations provides some insights. The study shows that 10% of the current bus users with access to a bicycle and even 16% of the current train passengers with accessibility to a bicycle would consider to use the bike and ride option if traffic would be less heavy. Likewise, bicycle paths or routes would induce 8% of bus users and 5% of the train uses to switch to bike and ride. The last finding is confirmed in the study of Van Uum, Slaverda & Veling (1995). They found that bus stops that are accessible via a bicycle path show substantially higher levels of bike and ride than bus stops with poor bicycle accessibility. Especially, free cycle lanes proofed to be related to higher bike and ride uses.

3.6 Conclusions and lessons for Israel

The goal of this chapter was to gain insight into the levels of bike and ride in various countries and into the factors that influence its popularity. The data provided give rise to several conclusions. First of all, the bicycle can be an important access mode of public transport stops. The international experiences show that shares between 10% and 20% are common, while even shares of more than 50% are possible under specific circumstances. The second conclusion is that the popularity of bike and ride depends to a large extent on the type of public transport. Faster and higher quality types of public transport attract more bike and ride users than slower and lower quality types of public transport.

The type of public transport also proofs to be an important determinant for the distances that bike and ride users are willing to cycle to and from their public transport stop. For slower modes of public transport – such as suburban buses or lightrail systems – the majority of bike and ride users does not cycle further than 3 kilometer. Faster modes of public transport – such as suburban and intercity train services – may attract bike and ride users from an area of up to 4 or even 5 kilometer. Specific groups of travelers may be willing to accept longer pre-transport or post-transport cycle distances under specific circumstances. Students and scholars may be such a group given their lack of alternative transportation modes and their fitness to cycle. However, longer distances will only be accepted if there are no 'intervening opportunities' in terms of alternative public transport services. Finally, it should be noted that the pre-transport and post-transport distances of bike and ride users can vary substantially between stops/stations of the same type of public transport. The lesson from these observations is clear: bike and ride facilities are especially important at public transport stops that are located in the vicinity of residential, employment or educational areas.

The third conclusion concerns the travel motives of bike and ride users. The main conclusion here is that bike and ride is most popular among public transport users that travel to work or some kind of educational facility (school, college, university). The travel motive shopping can also have a substantial share among bike and ride users, but only under special circumstances. The implications of these observations are also clear: investments in bike and ride are especially worthwhile at public transport stops that provide a connection to major employment areas or major educational facilities or that are located adjacent to such areas and/or facilities. The first type of stops offers opportunities for the use of the bicycle in pre-transport, the second type for the use of the bicycle in post-transport.

Chapter 4
Policies to promote bike and ride

The recent attention in policy for multi-modal trips as an alternative for the car has also sparked attention for bike and ride among governmental agencies. In various countries and localities policies have been developed and implemented in order to induce people to use the combination of bicycle and public transport and raise the levels of bike and ride. This chapter discusses some of these policies and their impacts on the use of bike and ride. The goal of the chapter is again to learn from international experiences and draw conclusions with regard to possible policy measures that are feasible within the Israeli context.

Bike and ride policies have been adopted in a number of countries and localities. In Japan, for instance, it has been common practice for years to develop residential suburbs in conjunction with railway construction and bike and ride parking facilities (Koike 1991; Replogle 1993). Belgium is working on the introduction of automated bicycle parking at main train stations (Sully 2000), while the city of Innsbruck was the first to introduce such a facility in Europe in 1995 (Bundesministerium für Verkehr 1997). And in the United States the so-called 'bikestation' concept has been developed and the first of a series of stations has been erected at the transit station of the Berkeley. These are just a few examples and the list could be easily extended with countries such as Denmark and Sweden, and localities such as Bogota (Colombia) and Ferrara (Italy).

The focus in this chapter is on three countries for which a substantial amount of information on policies and policy measures is available. These three countries are: the Netherlands (with a special focus on bike and bus), Germany (with a special focus on Nordrhein-Westfalen and München), and the UK (with a special focus on bike and train). The sections below will provide a brief description of the national bike and ride policies in each of these countries and provide more detail about specific measures taken at regional and local levels and about the impacts of these measures. The chapter will end with lessons for Israel.

4.1 The Netherlands

The Netherlands has a long history of promoting the use of the bicycle. The roots of the national bicycle policy lie in the early seventies. The environmental impacts of the expanding road network, the impacts of car use on the quality of life in cities and neighborhoods, the decrease in traffic safety for car users, cyclists and pedestrians alike, and the oil crises of the early seventies, all these factors contributed to the growing awareness that cycling deserved more attention in national policy. This growing awareness resulted in a national policy with a strong focus on the construction of bicycle paths within and in between urban areas. The combination of the bicycle and public transport received hardly any attention in these years. Investments were limited to the upgrading and extension of bicycle parking facilities at train stations (De la Bruheze & Veraart 1999).

The situation changed in the early nineties. The harsh criticism on the lack of attention for the bicycle in the new transportation plan of the Ministry of Transportation, resulted in the formation of a special task force to develop a bicycle master plan. The work of the task force resulted in the publication of the Bicycle Master Plan (BMP) in 1992. One of the central goals of the plan was the promotion of bike and ride (see Figure 4.1). The idea of the master plan was to stimulate regional and local authorities, companies and organizations, and public transport operators to embed a bicycle policy in their policy plans and activity programs. The strategy of the master plan was to provide these actors with knowledge, arguments and instruments through a large set of research, pilot and model projects. A total of 112 projects were distinguished. Twenty four of these focussed on the issue of bike and ride. The projects varied from experiments with automated bicycle storage facilities to a study into the combination of bus and bicycle lease, and from experiments with daytime lockers for bicycles to pilots with improved bicycle parking facilities at major bus stops (Ministerie van V&W 1999). Several of the projects will be discussed below.

Figure 4.1 Goals of the Dutch Bicycle Master plan and the number of projects per goal

- ➲ The switch from the car to the bicycle: an increase of 30% in the number of kilometers cycled by the year 2010.
- ➲ The switch from car to bike and ride: an increase of 15% in the number of kilometers traveled by public transport by the year 2010 through a better connection between bicycle and public transport infrastructure and facilities.
- ➲ Cyclist safety: a decrease of 15% in the number of casualties among cyclists, and a decrease of 10% in the number of injured cyclists by the year 2010.
- ➲ Bicycle parking facilities and reduction in bicycle theft: a substantially lower number of bicycle thefts by the year 2010.
- ➲ Communication: improved communication about the bicycle as a transportation mode

Bike and bus

Several of the BMP pilot projects focused on the combination of bicycle and bus. This combination has been neglected for quite a long time in the Netherlands. Generally the bicycle has been viewed as a competitor of bus lines. The fact that most buses travel over relatively short distances in the Netherlands has strengthened this opinion (Ligtermoet &

Welleman 1997). Another major problem is the unclear division of responsibilities between public transport operators, municipalities, regional authorities and the road management authority. The provision of special facilities at bus stops is often hindered because none of these parties take the initiative or because the parties disagree about the priorities and possibilities (Van Uum, Salverda & Veling 1994). The lack of systematic attention for the combination of bicycle and bus/tram/metro is reflected in the limited number of stops that are equipped with bicycle parking facilities. A study among ten regional bus lines showed that less than 20% of all stops along these lines had such facilities. Estimates point out that the percentage is even lower for many other bus lines. The bicycle parking facilities that are currently available have mainly been provided following an apparent demand in terms of parked bicycles at bus stops. Only in a limited amount of cases more large-scale facilities were built in order to serve existing and generate additional demand (Van Uum, Salverda & Veling 1995b).

The main goal of the BMP bike and bus projects was to show public transport operators, local and regional authorities and road management authorities the advantages of bike and bus and stimulate them to start investing in facilities that would promote bike and bus. Several research and pilot projects were carried out for this reason, partly in cooperation with some of the target groups of the master plan.

The Province of Brabant is one of the regional authorities that was involved in a BMP pilot project. The experiment carried out in this province consisted of improved bicycle parking facilities at seven bus stops along seven high quality bus lines (Janse & Van Bremen 1995). Each of the bus stops was equipped with bicycle parking facilities varying from simple bike stands to larger covered facilities and secure bicycle cages. In most cases also other measures were taken to improve the quality of the bus stop, such as the placement of a bus shelter or a public telephone booth. In all cases the improvements were combined with a marketing campaign to make the public and public transport users aware of the new facilities. The results of the measures varied from bus stop to bus stop. Five of the bus stops showed an absolute growth in the number of bike and ride users (Figure 4.2). The improved bicycle facilities have also had an impact on the behavior of the people that used the bus before *and* after the improvements. About 9% of this group has started to use the bicycle instead of another access mode, while about 1% of them has changed the bus stop of origin. Maybe even more important than these positive developments, has been the impact of the new facilities on the absolute number of passengers at five bus stops. Janse & Van Bremen point out that this growth was in most cases much higher than the growth at comparable bus stops. They attribute the growth in the total number of passengers to the increased attractiveness of the bus stop as a result of the various improvements that were implemented. These observations are confirmed by several other studies (Haskoning 1991; Awareness 1995; Van der Loop 1997). The study of Haskoning (1991), for instance, showed that the improvement of bus stops including bicycle parking facilities resulted in an increase in bus use among regular bus users (13%), car users (2%) and cyclists (‘cycle only’) (1%).

Figure 4.2 Change in number of passengers and bike and ride users for seven bus stops before and after bicycle parking facilities have been improved (the Netherlands).

Bus stop	Growth in passengers	Growth in bike and ride users	Share of bike and ride users	
			Before	After
Zevenbergen-Drie Hoefijzers	+ 0%	- 18%	82%	65%
Oosterhout-Europaweg	+ 47%	+ 250%	13%	30%
Oosterhout-Napoleonlaan	+ 8%	+ 90%	5%	8%
Oosterhout-Elkhuizenlaan	- 3%	+ 80%	11%	22%
Oosterhout-Busstation	+ 58%	+ 35%	41%	34%
Werkendam-Sleewijk	+ 43%	+ 32%	71%	69%
Raamsdonkveer-Busstation	+ 7%	- 6%	47%	41%
Total	**+ 26%**	**+ 20%**	**38%**	**36%**

Source: Janse & Van Bremen (1995).

As part of the Bicycle Master Plan another pilot project was carried out along the ten kilometer long corridor between the towns of Enschede and Oldenzaal. This so-called the ‘Combi Route Project’ involved the improvement and extension of bicycle paths, preferred bicycle treatment at traffic lights, bicycle parking facilities at three bus stops, and a promotional campaign. The project was financed by the Dutch Ministry of Transport and the municipalities of Enschede and Oldenzaal. The results of the project were rather disappointing in terms of the switch from the car to a combination of bike and bus. This was mainly attributed to the short distance of the corridor. It was felt that bike and ride could not compete with the car for the travel distances in the corridor, which were in many cases less than ten kilometer (Grontmij 1994).

Bike and bus projects have also been initiated outside the framework of the Bicycle Master Plan. The Province of Utrecht is one of the regional authorities that have invested in improved bicycle parking facilities at bus stops. During the first half of 1993 42 bus stops were equipped with various kinds of parking facilities, ranging from simple bike stands for two to ten bicycles to larger scale covered facilities for up to thirty bicycles. The impacts of the improved facilities were studied at five of these bus stops directly after the facilities had been installed. The results of the study show that about 20% of the bus users have changed their travel behavior as a result of the bicycle parking facilities. Some of these bus users have started to use the bicycle in pre-transport instead of the car or public transport, some of them have started to cycle more often to the bus stop instead of using alternatives like carpooling, and some have changed the bus stop they used in favor of the bus stop with the bicycle parking facilities. The bike and bus users especially appreciate the parking facilities because it allows them to park their bicycle on a dry location and because the facilities decrease the chances of bicycle theft (AGV 1994).

The Regional Transportation Authority of Friesland is another regional authority that has initiated a study into bike and ride independently from the Bicycle Master Plan. The study aimed to classify public transport stops according to several criteria and to provide guidelines about the facilities that should be offered at each of these stops. One major area of interest were bike and ride facilities Figure 4.3. The results show that bicycle paths and bicycle racks are needed at almost all public transport stops. More secure, theft-proof bicycle parking facilities in the form of bicycle lockers were expected to be economically viable only at stops with a higher number of passengers (Vervoerregio Friesland 1991). Some of these recommendations were implemented in a BMP pilot project in Friesland. In this case, 15 bus stops were equipped with bicycle lockers and covered and uncovered racks. The racks proofed to be very well used, but only 16% of the bicycle lockers were rented out to public transport users. The high cost, long rental periods and relatively infrequent use of the bike and bus option were considered to be the main reasons for this disappointing result (Ministerie van V&W 1999).

Figure 4.3 Required bike and ride facilities for various types of public transport stops.

Type of public transport stop	Required type of bike and ride facility			
	Bicycle path	Guarded bicycle parking	Bicycle lockers	Bicycle stands
Main train station	necessary	necessary		necessary
Small train station, bus station, busy bus stop	necessary	optional	optional	necessary
Bus stop of high quality bus line within urban area	necessary		necessary	necessary
Average bus stop with catchment area of less than 400 meter				
Average bus stop with catchment area of more than 400 meter	necessary		optional	necessary
Average bus stop in rural area	optional		optional	necessary
Quiet bus stop inside urban area				
Quiet bus stop outside urban area	optional			

Source: Vervoerregio Friesland (1991).

Bike and train

Bike and train has been part and parcel of the Dutch transportation system for a long time. Currently, specialized cycle centers with guarded parking, bicycle hire and maintenance facilities are the norm at main train stations. At smaller train stations bicycle lockers and covered parking facilities are usually available (Figure 4.4). However, despite substantial investments in the eighties and nineties, there are still problems with the quantity and quality of bicycle parking facilities at many stations. The bicycle accessibility of stations is often also poorly developed: the spatial lay out of the area directly around train stations is unclear and dangerous for cyclists, direct bicycle paths to parking facilities are missing, the walking distance between bicycle parking facilities and train platforms is often too long, and many stations are only accessible from one side

(Nägele, Wilbers & De Bruin 1992; Welleman 1997). In a joint effort with among others the Dutch Cyclist Association (enfb) and the Dutch Organization for Public Transport Passengers (Rover), the Dutch Ministry of Transport has assessed the available bike and ride facilities at all train stations in the Netherlands and has defined a set of quality standards for various kinds of stations (De Leeuw 1998). The quality standards include the following principles:

- bicycle parking places are available for regular and incidental train travelers;
- a mix of secure (guarded parking and bicycle lockers) and regular parking facilities is available at all stations;
- the maximum walking distance between secure parking facilities and the station entrance is 200 meter;
- regular parking facilities should be visible from busy areas so as to reduce bicycle theft and vandalism.

These criteria play a central role in the extensive program developed by the Ministry of Transportation and the Nederlandse Spoorwegen (NS) (Dutch Railways) to upgrade the bicycle parking facilities at all 380 railway stations in the period 2000-2006. The 300 smaller stations will be equipped with automated bicycle lockers, while the 80 large stations will have guarded parking facilities with automated entrance. The bicycle accessibility of the parking facilities, the lay out of the individual bicycle stands and the walking routes between the bicycle parking and platforms will also be improved. The program also envisages a substantial increase in the number of both guarded and not-guarded bicycle parking places (Nederlandse Spoorwegen 2000, Haverman *et al.*.2000). It should be noted that these improvements will not only serve train passengers, as a substantial amount of all bus stations is located adjacent to train stations. Bus passengers will thus also profit from these improvements.

Figure 4.4 Number of bicycle parking places at Dutch train stations.

Type of bicycle parking facility	1985	1992	1999
Guarded	115,000	100,000	120,000
Bicycle lockers	3,000	8,500	16,000
Not guarded	65,000	90,000	143,000
Total	**183,000**	**198,500**	**279,000**

Source: Ministerie van V&W (2000b).

The Nederlandse Spoorwegen is also leading a coalition of parties that is developing an innovative concept to promote the use of the bicycle in post-transport trips. The concept has been dubbed the 'OV-fiets' ('public transport-bicycle') and basically offers public transport passengers an easy accessible bicycle at their station of destination. The Ov-fiets aims to reduce the inconvenience that is related to the use of a rental bicycle: the need for identification, the need to pay a deposit, and the time that is involved in these transactions. The OV-fiets cuts down on all the bureaucratic facilities through a system of user registration. Public transport users who expect to use an OV-fiets in the future can register for free with a special administrative organization. They will receive a special OV-fiets card in return that contains their personal details. The card allows for fast identification and easy payment when someone wants to use an OV-fiets. The location of the OV-fiets is also a crucial element of the concept, as it determines the speed with which a public transport passenger can get hold of a bicycle. Thus, the OV-fiets will be parked close to the exit of (train) stations in a specially designed bicycle locker. Public transport passengers can get an OV-fiets by simply inserting their OV-fiets card into a slot in the locker. The details of the user are send to a central computer and the door of the locker will open automatically. Upon return, the OV-fiets user can again put the bicycle back in the locker through the use of the OV-fiets card. The cost of the use of the OV-fiets will be identical to the price of a return fare by city bus: 2,50 Euro. Frequent users will pay a maximum of 22.50 Euro per month, for which sum they will be able to use an OV-fiets for the whole month at all stations throughout the Netherlands. Since the summer of 2001 four stations have been equipped with OV-fiets facilities (Utrecht Centraal Station, Utrecht Overvecht, Alphen aan den Rijn and Delft). Ten more stations will provide OV-fiets facilities in the summer of 2002. The ultimate goal is to offer the OV-fiets at all 380 train stations in the Netherlands (Haverman *et al.* 2000; and 'Pak de OV-fiets' at www.ov-fiets.nl).

4.2 Germany

Germany has much less of a tradition in promoting the bicycle than the Netherlands. The roots of the federal bicycle policy lie in 1981, when the federal government decided to financially support the realization of bicycle paths along roads of national importance. Recently the federal government has stepped up its efforts to stimulate the use of the bicycle. The current policy of the government is outlined a national plan with the title '*Fahrrad! Nationaler Radverkehrsplan 2002-2012*' (Bundesministerium fuer VBW 2002). The plan, published in April 2002, presents the goals of the German government with regard to cycling and provides an overview the measures the government will take in the coming ten years in order to achieve these goals. The main goals are the increase of the bicycle share in the total number of trips, the promotion of cycling as part of a comprehensive sustainable transportation policy, and the promotion of traffic safety. The federal government aims to achieve this goal through a set of measures and incentives. The most important are without doubt the doubling of the federal budget for the development and maintenance of cycle lanes, the adjustment of laws and regulations to the needs of cycling, the implementation of a set of pilot projects, and the establishment of a working group that will promote and guide the translation of the national plan into the policies of lower-level authorities.

The guiding principle of the national plan is the so-called '*Radverkehr als System*' ('bicycle mobility as a system') concept. The concept is a response to, on the one hand, the experiences with the provision of bicycle infrastructure (lanes, paths, parking facilities). These experiences show that such facilities can increase the bicycle share in the total number of trips substantially, but that they are not enough for a more sustained and more significant impact on overall mobility patterns. On the other hand, it is a response to the current domination of the 'car system' which offers a complete set of connections, services and information to car users. The long-term goal of the idea of a 'cycle system' is to create a set of facilities and services that are comprehensive in nature, high in quality, and widely available, so that the 'bicycle system' will be able to compete with the car-system.

The connection between the bicycle and public transport is one of the major elements of the envisaged 'cycle system'. The national plan dedicates a whole chapter to this issue and proposes a set of measures to promote the use of bike and ride. The measures cover six areas (see Figure 4.5). The responsibility for the majority of these measures is in the hands of regional and local authorities and public transport operators. The federal government asks these lower level authorities to take integrate bike and ride measures in all plans for public transport facilities and in plans to upgrade existing bike and ride facilities. The federal government has limited funds available for the financial support of concrete measures taken at the lower level.

Figure 4.5 Measures proposed in the German national bicycle plan to promote bike and ride.

1. Integration of public transport stops in the network of bicycle lanes:
   - Attractive access route to public transport stops
   - Adequate and uniform sign posting to public transport stops
2. Adequate services at all public transport stops:
   - Bicycle parking facilities for all target groups (short and long term, free and paid parking)
   - Special services at larger stations (bicycle rental, repair, information, guarded parking, rental of bicycle accessories such as child seats)
   - Integrated ticketing (nation-wide uniform pricing, creation of 'combi-cards')
3. Design of public transport stops
   - Easy access for bicycles of platforms and public transport vehicles
4. Arrangements to take bicycles on public transport vehicles:
   - Local and regional buses: space for two bicycle
   - Long-distance buses: bicycle space especially at buses in tourist areas
   - Local and regional rail (tram, metro, lightrail, train): bicycle space for at 10% of public transport users at an attractive price
   - Long distance rail (trains): attractive pricing
5. Possibilities to send bicycle with long distance public transport vehicles
6. Information services
   - Improvement of current public transport users information system
   - Extension of 'bicycle hotline' of the Deutsche Bahn (e.g. more languages)
   - Preparation of a comprehensive digital map of bicycle facilities as basis for an information system

Bike and ride policies at the Länder-level

In recent years several Länder have engaged in efforts to promote bike and ride within their jurisdiction. Examples are Baden-Wuerttemberg, Berlin, Bremen, Sachsen-Anhalt, and Nordrhein-Westfalen. The first two have developed a medium-term plan and have reserved a special budget for the realization of bike and ride facilities. Bremen has developed a bike and ride program in combination with the organization that manages the parking garages in the city, while Sachsen-Anhalt has extended the regulations for public transport operators with regard to bike and ride issues (Bundesministerium für VBW 1998, 2002).

Nordrhein-Westfalen is without doubt the one with the most advanced cycle policy and bike and ride program among the German Länder. Since the late seventies, the government of Nordrhein-Westfalen has invested considerably in bicycle facilities such as cycle paths and sign posting of cycle routes. Its current goal is to rise bicycle's share of 12% to 20% of all trips in 2010. The bicycle policy of Nordrhein-Westfalen includes various programs, the most important of which is without doubt the 'bicycle friendly cities' program. The responsibility for the program is in the hands of a special 'working group' ('Arbeitsgemeinschaft') that has been initiated by the government of Nordrhein-Westfalen. The working group has been established in 1993 and consists of 32 urban and rural authorities that aim to become 'models for a modern, ecological and city-friendly mobility'. The partners in the working group aim to establish in their localities a safe and attractive bicycle network, an atmosphere in which the use of the bicycle is accepted by the general public, and special bicycle services comparable to the current car-related services. The task of the working group is to guarantee the exchange of information and experiences between the participating authorities, to give advice and support on issues of common interest, and to promote the interest of the 'bicycle-friendly' communities in the public debate. The government of Nordrhein-Westfalen financially supports the local authorities that are participating in the working group (Arbeitsgemeinschaft n.d.; Deutscher Bundestag 2000; Bundesministerium für VBW 2002).

Since 1996 the government of Nordrhein-Westfalen has developed a special policy to promote bike and ride. In this year the so-called '100 cycle stations' program was launched. The aim of the program is to establish up to 120 bicycle stations at railway stations throughout Nordrhein-Westfalen. The program not only aims to offer cycle parking facilities at the train stations in the region, but also to improve the quality of the station buildings in order to increase the attractiveness of the stations for (potential) customers. Another goal of the bicycle stations is to offer jobs and opportunities for unemployed people. The responsibility for the program is in the hands of a special development agency. The agency was established in a joint venture between the Ministry of City Development, who is responsible for the financial support, and the regional bicycle association (Allgemeiner Deutscher Fahrrad Club of Nordrhein-Westfalen), who was given the task of building up the development agency. Other partners in the project are the Deutsche Bahn, the municipalities, non profit-making institutions and the chambers of crafts (unions). DB has entered into an agreement with the government of Nordrhein-Westfalen whereby, whenever it has land it can release for bike and ride facilities, it will be made available rent free for ten years. The '100 cycle stations' program is open for all municipalities in Nordrhein-Westfalen, but there are a few conditions that must be fulfilled. A cycle station should have at least 100 bicycle stands and should provide a certain level of services (guarded parking of bicycles, bicycle repair and bicycle hire). The economic viability of the bicycle stations is also an important criterion. In practice this means that cycle stations will not be established at the smallest train stations, because of the limited demand for bicycle parking facilities at such stations. The development agency has already achieved a substantial part of its goal: in January 2002 42 cycle stations with a total of about 13.000 bicycle parking places were available to the public. Especially popular elements of the bicycle stations are facilities for bicycle washing and the high quality waiting facilities (Bundesministerium VBW 2002; Sully 1998).

Bike and ride policies at the local level

Like in other countries, the priority given to bicycle policies varies from local authority to local authority in Germany. In recent years, the number of municipalities that have engaged in major efforts to stimulate the use of the bicycle is rising. Examples are cities like Kiel, Bonn, Nürnberg, Potsdam, Hannover und Leipzig and the 32 localities in Nordrhein-Westfalen. The number of municipalities that invest time and money in bike and ride facilities is also on the rise. Many of these municipalities have focused on bicycle parking facilities at main train stations. A survey in the early nineties among 286 train stations showed that adequate parking facilities were lacking at nearly half the stations, while improvements were planned for only a minority of these stations. The main problems were an under- or oversupply of bicycle parking, insufficient quality of parking facilities in terms of protection against theft and weather, and user-unfriendly types of bicycle stands (Jaquet 1997). Many cities have engaged in an effort to improve the situation. Cities like Bonn, Erfurt, Freiburg, Kiel, Mannheim, Münster and München have all erected large-scale bicycle stations at their central train stations in the nineties. Bicycle stations are expected to be opened soon in Augsburg, Mainz and Köln. Mainz will be the first city in Germany with a fully automated parking facility for approximately 300 bicycles. The City of Köln is planning a comprehensive improvement of bike and ride facilities around its main station. The plan includes a cycle station for with several hundred bicycles, unguarded bicycle parking facilities at each of the station entrances to ensure minimal cycle distances, improvement of cycling routes on the access roads of the station, and a cycle ring directly around the station to ensure optimal bicycle accessibility (VIA Planungsbüro 1999). Most of the cycle stations are financed by the local authority with some financial support of the regional government (Länder). The operating costs of the more successful bicycle stations are covered by the income generated from the use of the facility (Bundesministerium für VBW 1998, 2002).

The combination of bicycle and other types of public transport has received less attention than the combination of bike and train in Germany. Nevertheless, several authorities have been investing in bike and ride facilities at stops of tram, metro and suburban train lines. Freiburg and München are the ones with the most extensive network of bicycle parking facilities along these lines. Freiburg has established bicycle parking facilities at many stops of tram and suburban train lines, while München has focused on stops of underground and suburban train lines (see below). The number of localities that has paid special attention to the combination of bike and bus is limited. Most of the bus stops and stations with bicycle facilities are located adjacent to train stations. Bike and ride facilities that only serve bus stops and bus passengers are much less common. The most sophisticated facility has probably been erected in Münster. Here, a special facility was erected adjacent to a central bus stop in the southwest of the city. The facility included bicycle lockers, bicycle hire, repair service, and a kiosk. The facility was supposed to promote the combination of bike and ride for trips into the city center. However, because of the relative proximity of the city center, the facility was less intensively used then expected. The number of initiatives to promote bike and bus in rural areas is also increasing. Lohmar, Nordrhein-Westfalen, is among the rural authorities that have created bicycle parking facilities at stops of regional bus lines. A recently initiated pilot project by the Bundesministerium für Bildung und Forschung is intended to promote the combination of bicycle and regional bus in rural areas (Auf dem Land Mobil 2001).

München
The City of München has been actively promoting the use of the bicycle since the early eighties. During the first years the city has primarily focused on the provision of cycle paths along major roads. A more comprehensive policy was developed in the early nineties. The main goal of the new policy is to create an integrated network of bicycle paths throughout München. An important element of the integrated network is the bicycle accessibility of main areas of destination. In addition to employment centers, shopping areas and schools, the policy pays specific attention to the accessibility of metro and train stations (U-bahn, S-bahn and long distance train stations). Many public transport stops are already connected to the existing network of bicycle paths, which encompasses 207 kilometer of main routes and 491 kilometer of feedering routes. It is expected that the ongoing investments in the bicycle network will lead to a further improvement the bicycle accessibility of many public transport stops (Bördlein 2000; Landeshauptstadt München 2000).

The City of München has also invested substantially in the bicycle parking facilities at public transport stops. Since the second half of the eighties such facilities have been created at many stops along metro, suburban and long distance trains. The number of parking places in München and the adjacent localities has more than doubled from about 19,000 in 1986 to more than 41,000 in 1998, half of which are located within the area of the city itself (Bördlein 2000). A further 9,000 new places are planned at metro and suburban train stops, while a new bicycle station for about 900 bicycles will be erected at

München's central train station. The station will offer guarded parking, a bicycle shop and repair and washing facilities. The bicycle station will be built by the Deutsche Bahn. The City of München will finance the building and expects that part of the cost will be covered by the user charges. Despite these investments, it is expected that at several stations the number of parked bicycles will outnumber the amount of parking places for several years to come.

The City of München also participates in the 'Mobinet' pilot-project initiated by the Bundesministerium für Bildung und Forschung. Mobinet stands for 'multi-modal mobility management, innovative transportation technology and new forms of mobility services'. The goal of the Mobinet initiative is to learn about new and innovative ways to promote sustainable mobility in large urban areas. Part of the pilot are several projects to promote multi-modal transportation. One of these focuses on the issue of bike and ride. The project focuses on three distinctly different stations: one major node of metro, suburban and long-distance train lines within München (Pasing Bahnhof); one metro station also within München (Kiefergarten), and one suburban train station in a suburb of München (Grafing Bahnhof). For each of these stations a survey has been conducted among the current bike and ride users and among potential users. Based on the findings measures for improvement have been proposed. The measure for the Pasing station consists of the creation of an automated bicycle parking facility. One of the reasons to propose such a high quality facility is the relatively high willingness to pay among the current bike and ride users (mainly commuters). For the metro station of Kiefergarten an extension of the current relatively simple covered bicycle parking facility is preferred. Here, students dominate the bike and ride population and it is expected that their willingness to pay for parking facilities is relatively low. The fact that a large share of bike and ride users arrives within a relatively short time span is another reason not to propose an automated parking facility for this station. The set of measures for the Grafing station includes an extension of the current bicycle parking facility, replacement of the current bicycle stands with more theft-proof stands, an improvement in the bicycle access routes to the station, and marketing of the improvements to attract new customers. Among the reasons to propose these measures were the relatively low willingness to pay among the bike and ride users (again mainly commuters), the relatively high quality of the bicycle used by the bike and ride users calling for adequate theft prevention, and the complaints about the current access routes. The cost of the proposed measures will be divided between the various parties of the Mobinet project. Major contributions will come from the Bundesministerium für Bildung und Forschung, the Freistaat Bayern, the City of München, and the car-builder BMW.

4.3 United Kingdom

From the three countries discussed in this chapter, the United Kingdom is without doubt the one with the least tradition in promoting the use of the bicycle. However, during the last decade much has changed. For several years various organizations are active to promote the use of the bicycle in general and the bike and ride option. Three major actors can be distinguished.

First, there is the UK Department for the Environment, Transport, and the Regions (#check new name#). DETR works according to the policy lines laid down in the Integrated Transport White Paper 'A new deal for Transport - Better for Everyone'. The bottom-line of the paper is a shift from car use to more sustainable modes of transport: train, bus, bicycle and walking. The provision of facilities for seamless journeys by the sustainable modes is considered a crucial prerequisite for such shift. Bike and ride is viewed as one of the promising combinations that can ensure seamless travel between points of departure and points of destination. Since the publication of the White Paper in 199#, DETR has engaged in various alternatives to promote the popularity and use of bike and ride. The department has published various leaflets that present good practice examples of bicycle parking at public transport stops and on the combination of bike and train. The department is also responsible for various schemes that offer support to local authorities and public transport operators that want to create bike and ride that are not commercially viable. DETR has been able to fund several small-scale projects through the so-called Rural Bus Challenge, the Rural Transport Partnership Scheme and the Rail Passenger Partnership Fund (NCS 2001). DETR thus expects local authorities and public transport operators to take the lead responsibility in the development of bike and ride facilities.

DETR is also one of the partners that have established the so-called National Cycling Forum. The Forum comprises of representatives from central and local government, business and the voluntary sector. The Forum is responsible for the coordination of the so-called National Cycling Strategy, which it in 1996. The goal of the strategy is to establish a culture favorable to the increased use of bicycles for all age groups; to develop sound policies and good practice; and to seek out effective and innovative means that improve the accessibility per bicycle. The central target of the strategy is to quadruple the number of bicycle trips in the period 1996-2012. The Forum recommends policies, advises local and national governments and suggests research and publicity that can further promote the use of the bicycle. Bike and ride is one of the main topics on the agenda of the Forum. Up till now the work on bike and ride has mainly resulted in the publication of research reports and of brochures on the combination of bike and train, bike and bus and bikes on buses. The brochures contain general information on the advantages of bike and ride and provide some details of examples of good practice in the UK.

The third organization that has been increasingly active in promoting bike and ride is Sustrans. Traditionally, Sustrans is mainly responsible for the development of long-distance cycling routes in the UK. Recently, however, the organization has started to participate in several efforts that promote bike and ride. One of these is the 'Safe Routes to Stations' program. The program is a joint effort of Sustrans, public transport operator Railtrack, the DETR, local authorities and several other parties. The aim of the project is to make it easier to cycle and walk to rail and bus stations. Twelve pilot schemes were started in 2000. The schemes will primarily involve the development of well-signed, direct and safe cycling and walking routes, the improvement of route facilities, and the provision of adequate bicycle parking. The pilot schemes are still under way and have not yet yielded results. Sustrans is also one of the supporters of the CycleMark award scheme. The aim of this schema is to highlight the progress made by rail operators and local authorities in integrating bicycle and rail travel on long distance, commuter and rural services. The CycleMark can be awarded for increased capacity for bicycle parking or bicycle carriage on trains, for upgrading of existing bike and ride facilities, for passenger information and for marketing initiatives. Finally, Sustrans also financially supports initiatives to link train stations by good quality bicycle routes to the national cycle network.

Bike and ride policies at the local level
Like in the Netherlands and Germany, local authorities in the UK vary strongly in their approach of the bicycle. Many local authorities pay hardly any attention to the position of the bicycle in their transportation policies. The situation is slowly changing, however, and more and more localities are taking initiatives. Bike and ride policies are especially popular in localities with rail services and a substantial amount of daily commuters. Examples of such localities are Bedford, Cambridge, Guilford, Milton Keynes, Edinburgh and Lankashire. In most cases, the available facilities are limited to covered and uncovered bicycle parking places. Some localities, however, have also invested in bicycle paths and have provided links to the train station. Bedford and Cambridge are two of such localities (Taylor 1996). The increasing cost related to car parking at railway stations has been one of the reasons to look more closely into the possibilities of bike and ride. An example is Woking, the main commuter station in Surrey. Here, a steep increase in parking charges resulted to a marked switch from the car to the bicycle. This happened despite the poor bicycle accessibility of the station and the relatively low quality bicycle parking facilities. It is expected that a further improvement in bicycle access and parking facilities may induce up to 25% of the rail commuters to leave their cars at home and use a bicycle to get to the station (DETR 1999a).

One of the local authorities that has invested substantially in bike and ride facilities is Hampshire County. This local authority has developed, in cooperation with train operator South West Trains, a bike and ride scheme for the provision of relatively small-scale bicycle parking facilities at ten stations in the area. Nearly half of necessary funds came from the Cycle Challenge scheme of DETR, while the remaining funding was provided jointly by Hampshire County Council and South West Trains. These two later parties decided in a later phase to extent the project and provide bicycle parking facilities at five more stations. The majority of the parking facilities consisted of covered and uncovered bicycle stands. A limited amount of bicycle lockers was provided at busy commuter stations. It was felt that such lockers would be attractive for commuters, because it would enable them to park relatively expensive bicycles and to store additional equipment such as a cycle helmets, lights and luggage. South West Railways decided from the start to provide the lockers free of charge. However, a deposit was charged to ensure that the lockers would be taken by cyclists regularly using them. The provision of the bicycle parking facilities was accompanied by a publicity campaign in order to ensure that the details of the scheme were widely known among potential bike and ride users. Central element in the campaign was a leaflet giving details of cycle parking options at each train station together with useful contact telephone numbers. An evaluation of the measures taken revealed that the measures generally had a positive impact. The number of parked bicycles dropped in some cases directly after the provision of the new parking facilities, but rose again in the period afterwards. Especially stations with a high percentage of commuters, such as Havant and Winchester, showed a considerable increase in the number of bike and ride users. The most successful stations were heavily used by commuters going to London and, to a lesser extent, Southampton and Portsmouth. The poor performance at Liphook station, in turn, is attributed to the fact that the new bicycle stands were located out of sight of the main entrance (Figure 4.6). Both the Hampshire County Council and South West Trains were satisfied with the results of the project and felt that a lot had been achieved for a relatively small sum of money (DETR 1999b).

Figure 4.6 Change in number of parked bicycles at eight selected stations in Hampshire (UK).

Station	Before (1996)			After (1998)		
	Parking places	Parked bicycles	Occupancy rate	Parking places	Parked bicycles	Occupancy rate
Brockenhurst	10	8	80	22	10	45
Eastleigh	15	5	33	32	26	81
Havant	56	10	18	76	35	46
Liphook	17	13	76	12	10	83
Lymington	10	4	40	8	7	88
Micheldever	10	0	0	9	0	0
St. Denis	6	2	33	14	2	14
Winchester	16	5	31	24	35	145

Source: DETR (1999b)

4.4 Lessons for Israel

The analysis of policies to promote bike and ride in the Netherlands, Germany and the UK gives rise to various observations and lessons for Israel.

The first observation is that the governments in each of these countries consider bike and ride a crucial element of a wider policy to promote sustainable transport. More than in the past the authorities are aware that a move to sustainable transport requires the development of alternatives that can compete with the car in terms of speed, reliability and comfort. The combination of the bicycle and public transport is seen as one of the most promising alternatives.

The second observation concerns the type of measures that are currently being implemented in the three countries. Many of these are of a basic nature and can be implemented in other localities with relative ease. The most obvious of these measures - and also the most popular in the three countries - is the provision of bicycle parking facilities at public transport stops. These facilities do not have to be large-scale or extremely sophisticated to have an impact on the levels of bike and ride. Both in countries with a strong cycling culture, like the Netherlands, and in countries were cycling is much less common, such as the UK, simple small-scale bicycle parking facilities have had a positive impact on the number of bike and ride users. The example from the UK even shows that such measures can be successful in cases of relatively poor bicycle accessibility of public transport stops. These observations point out that a bike and ride policy could be relatively easily developed in Israel.

The third observation concerns issues of micro-design of public transport stops. The experiences in the three countries show that good mirco-design can have a substantial influence on the levels of bike and ride. This is true for major stations with high numbers of boarding and alighting passengers as well as for public transport stops with limited numbers of passengers. In the case of major stations, attention should be paid to clear and safe cycle routes in the area directly around the station, short walking distances between bicycle parking facilities and bus and train platforms, multiple accessibility of the stations for cyclists, and high quality design of bicycle parking facilities. In the case of small public transport stops, special attention has to be paid to the walking distances from and visibility of bicycle parking facilities. The last aspect is especially important to reduce the chances of bicycle theft.

The last observation concerns the 'division of labor' in each of the countries. The three countries show strong similarities in this respect. Each of the national governments focuses on pilot and research projects that teach other parties about the possibilities and advantages of bike and ride, funding programs that support investments in bike and ride, and improvements in the legal framework that secure the position of cyclists vis-à-vis other road users. The major responsibility for the provision of bike and ride facilities is in the hands of regional and local authorities and public transport operators. They are responsible for research into the local potential for bike and ride, for the provision of bicycle paths to improve the accessibility of public transport stops, for the development and management of bicycle parking facilities, for the lay-out of station areas, and for campaigns to promote the use of bike and ride facilities. The major problem with the promotion of bike and ride also occurs at this lower level. The unclear division of responsibilities between regional authorities, municipalities, public transport operators, and road management authorities often hinders the development of an adequate bike and ride policy. At the same time, various successful initiatives show that these institutional barriers can be overcome through active cooperation between the various partners.

Chapter 5
Promoting bike and ride in Israel

The previous chapters have provided a window on the use of and policies to promote bike and ride in various countries. This chapter brings the information together and draws conclusions for the way in which bike and ride can be promoted under the Israeli circumstances. The chapter starts with an analysis of the types of public transport that offer the most promising opportunities for bike and ride. The next section than provides guidelines on how to select public transport stops and stations with the highest potential for bike and ride. Section 5.3 gives an overview of the type of measures and facilities that are feasible under the Israeli circumstances. Finally, the roles of the various authorities and organizations will be discussed.

5.1 Promising combinations of bike and ride

The international experiences have provided clear insights into the types of public transport that offer high potentials for bike and ride. Especially promising are types of public transport that are fast and reliable, have long distances between subsequent stops and stations, and cover relatively long distances. Several of the Israeli public transport services match these criteria.

The first type of public transport service that offers opportunities for bike and ride is the train service. There are several arguments that suggest that there is a high potential for the combination of bike and train under the Israeli circumstances. First, the improvements over the last decade have turned the train lines into a speedy and reliable service between the major cities in the urban plain. Second, the majority of the passengers on the intercity and suburban trains travel over a substantial distance, often substantially longer than ten kilometers. Third, the increase in the number of stations implies that more and more places of origin and destination are located within cycling distance of a train station. Finally, the continuous increase in the number of passengers and the dominance of the car as a feedering mode suggests that parking problems will sooner or later occur without drastic and often expensive expansions of the car parking capacity. Taken together these arguments point out that bike and train may be able to compete with other modes of transport, especially ‘drive and ride’ and ‘drive only’.

The second public transport service that can offer a substantial potential for bike and ride are longer distance bus lines. The chances are especially high for suburban bus lines and for intercity lines that have several stops along the route, i.e. non-direct intercity lines. Both these types of bus lines are characterized by relatively long trip distances and may thus be expected to have relatively long pre-transport and post-transport distances. The number and location of bus stops also point at a high potential for bike and ride. The number of bus stops tends to be relatively high, with several bus stops located within one urban area. The common distance between two stops matches the reach of the bicycle, as the distance tends to exceed acceptable walking distances. The location of most bus stop is also favorable for bicycle use, as they are usually located within or adjacent to residential or employment areas. In many cases places of origin and destination may thus be expected to be located within cycling distance. The accessibility of these intermediate bus stops also makes the combination of bus and bike attractive. Many of the intermediate bus stops are poorly served by feedering forms of public transport and usually lack car parking facilities. The accessibility of the bus stops from distances that exceed 'normal' walking distances is thus very poor. The bicycle could improve this substantially. In addition, the non-direct intercity bus lines also tend to have bus stops along major roads on the edge of or at a substantial distance from urbanized areas (smaller towns, kibutzim, moshavim). The pre-transport and post-transport distances in these cases are substantially longer than acceptable walking distances. Many of the bus passengers currently depend on 'kiss and ride' as an access mode to the bus. The distances between residential areas and the bus stops and the relatively moderate traffic on the roads in smaller towns suggest that bike and ride facilities could improve the accessibility of these bus stops substantially. The high levels of bicycle use in some of these localities - especially kibutzim and moshavim - seems to point out that there may be a substantial demand for such facilities. While there are thus several factors that suggest that there is a substantial bike and ride potential for longer distance buses lines, it should also be noted that some characteristics of these lines are at odds with the demands of bike and ride. The main problems are the low travel speed, especially in rush hours, and low levels of reliability, especially for stops farther away from the station of origin. These drawbacks of longer distance buses suggest that bike and ride will not so much compete with 'drive only'. The 'market' of bike and bus seems to lie more among current and new passengers without a car. It should also be noted that the problem of reliability is less relevant for highly frequent bus lines, such as several commuter lines or intercity lines. A frequency of four times per hour or more can compensate for poor reliability, as waiting times may be expected to be fairly limited.

The third type of public transport service that could benefit from bike and ride facilities are the planned light-rail services in Tel Aviv and Jerusalem. Both light-rail services stand out among other forms of urban public transport for their speed and reliability. This, in combination with the relative length of the planned light-rail lines, suggests that there will be a substantial potential for bike and ride. The potential will especially be high at the more outlying stations of the lines. Three reasons can be given for this. First, the number of bus lines tends to be substantially lower in the outlying areas and it may thus be expected that potential light-rail passengers have alternative public transport services available. Second, the building densities tend to be lower in the outlying areas and pre-transport and post-transport distances will thus be relatively long. Finally, it is likely that the people who board the light-rail in the outlying areas travel over rather long distances, as it may be expected that a majority of the people will travel to the inner city areas.

5.2 Selection of public transport lines and stops

The identification of public transport services that offer opportunities for bike and ride is only a first step in the development of bike and ride facilities. The identification of promising public transport stops and stations is the next step in the development of a bike and ride policy. The aim of this section is provide some guidelines for this step. Two types of approaches are distinguished: one that focuses on public transport stops and stations and one that focuses on public transport lines. The first is feasible for train and light-rail services, while the second is especially viable in the case of bus lines. The guidelines presented below may help regional and local authorities and public transport operators to develop a bike and ride policy.

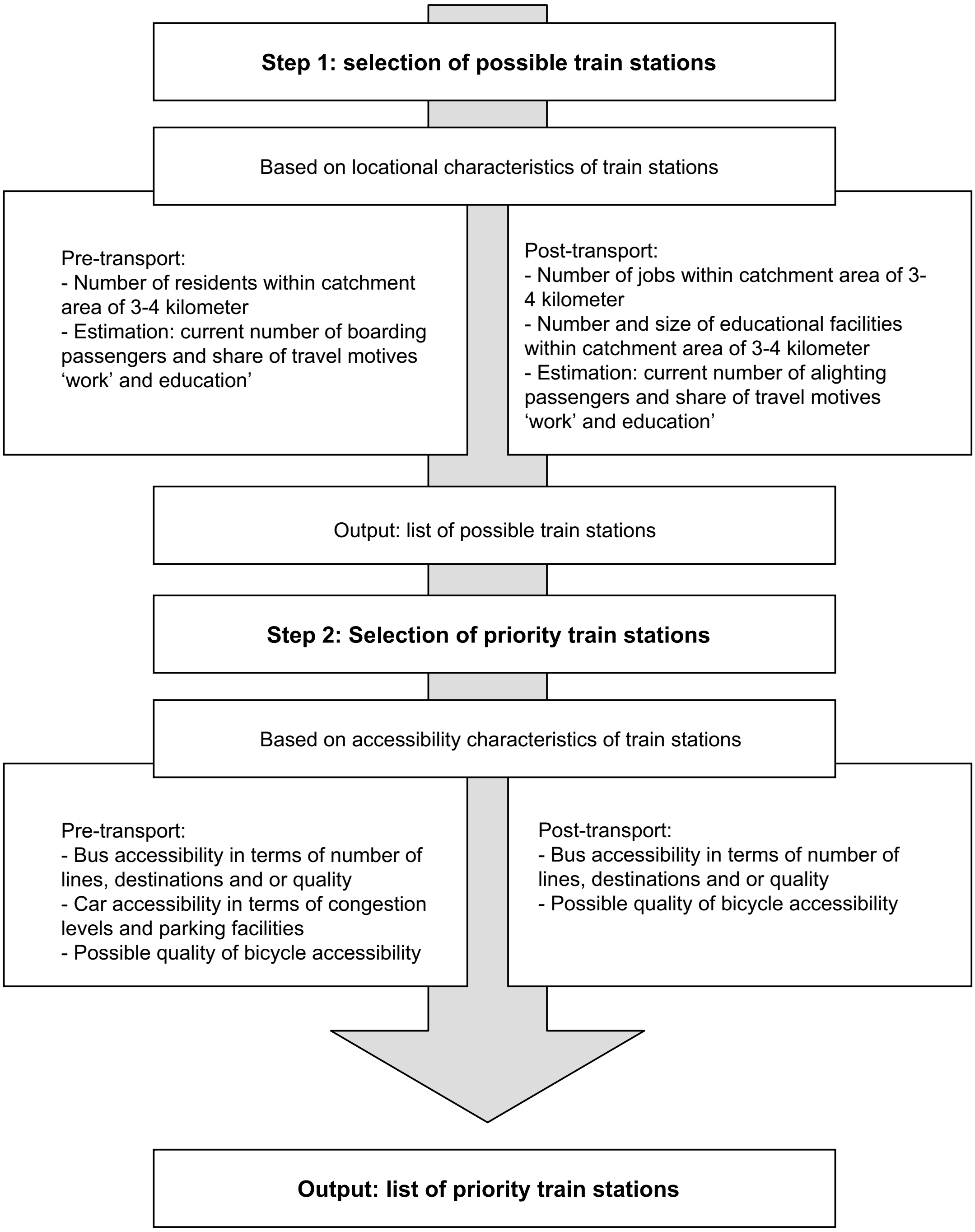
Identification of promising train stations
The identification of train stations with a high potential for bike and ride can be dome through a station-based approach. This approach is feasible for several reasons. First of all, all current train lines provide a speedy and reliable service over longer distances. All lines thus match the demands of bike and ride and a further selection is not necessary. Second, the train lines operate as one system. Each station is connected to all other stations and the coordination of departure and arrival times of the various lines allows passengers to travel smoothly from one station to the other. This means from each train station the same number and type of destinations can be reached. There is thus no need to assess whether a specific station provides a connection to major employment areas or major educational facilities. The assessment of the bike and ride potential can thus be conducted on a station-by-station basis.

Based on the previous chapters a two step selection process has been developed (Figure 5.1). The aim of the first step is to make a pre-selection of train stations based on their locational charateristics. The criteria in this step cover the location of a station vis-à-vis residential areas and vis-à-vis employment areas and educational facilities. A location amidst residential areas points at a high potential for the use of the bicycle in pre-transport, while a favorable location vis-à-vis the latter is related to a high potential for bicycle use in post-transport. Crucial factor for both is, of course, the size of the catchment area. The high quality of the trains in terms of speed and reliability and the generally long trip distances of train passengers point at relatively long pre-transport and post-transport distances, while the limited experience of Israelis with cycling suggests lower distances. It is therefore recommended to assess the situation in an area between 3 and 4 kilometer around a station, which is slightly smaller than the situation in the Netherlands. In case data about the number of residents, jobs and educational facilities are lacking, the current number of boarding and alighting passengers can serve as a 'proxy'. The number of boarding passengers in the morning rush hours gives an estimation of the bike and ride potential in pre-transport, while the number of alighting passengers in the morning rush hours provides insight into the possible the bike and ride potential in post-transport. in both cases it is important to focus especially on the number of passengers that travel with a work or educational motive, as these groups are most prone to use the bike and ride option. In all cases it will be important to distinguish between the bike and ride potential in pre-transport and post-transport, since the popularity of the bicycle varies substantially even in countries with high bicycle usage. To put it simply: a station with thousand residents in its vicinity will probably generate higher levels of bike and ride than a station with thousand working places in its vicinity. The other reason to distinguish between pre-transport and post-transport is the fact that they require different kinds of facilities and a different approach (see Section 5.3). The first step in the selection process results in a list of train stations with high bike and ride potential.

The second step in the selection procedure focuses on the accessibility of train stations. The levels of bike and ride will not only depend on the number of people that live within cycling distance of a station, but also on the quality of alternative access modes. The second step focuses on these alternatives and on the possible quality of the bicycle accessibility. The main alternatives are feedering types of public transport (mainly bus lines) and the car. The quality of the first can be assessed in various ways. The most simple method only looks at the number of bus lines that stop at a train station. more complicated measures include the routes of bus lines (to assess whether all areas around a station are accessible by bus) and the speed and frequency of the line (to assess whether the lines are attractive compared to the bicycle). The quality of the car accessibility depends to a large extent on the levels of congestion on the access roads of a train station and the availability of parking places. For the first, average travel speeds in the morning rush hours are most important, for the latter average occupancy rates can be used as a measure. The possible quality of the bicycle accessibility of a station depends the traffic situation on the access roads (heavy traffic make these roads unattractive for cyclists), the relative ease with which bicycle paths could be provided (available space on access roads or alternative routes), and geographical circumstances (such as hilly terrain or major barriers such as rivers). The assessment of the 'pre-list' of stations will result in a number of priority stations at which a (relatively) high number of bike and ride users may be expected if measures are taken (see Section 5.3).

The appendix of this report provides a first assessment of the train stations in Israel, based on the criteria described above. The assessment is based on rather rough data about, among others, the number of residents and jobs in the vicinity of stations, and the travel motives of boarding and alighting passengers. The assessment thus does not provide a 'final score' for each of the stations. Yet, it does provide a first indication of the stations with the highest bike and ride potential.

Figure 5.1 Two-step procedure to select train stations with the highest potential for bike and ride.



Identification of promising bus stops

The identification of promising bus stops requires a slightly more complicated procedure, as bus lines vary much more in terms of qualities and the types of destinations. The procedure encompasses three steps (Figure 5.2).

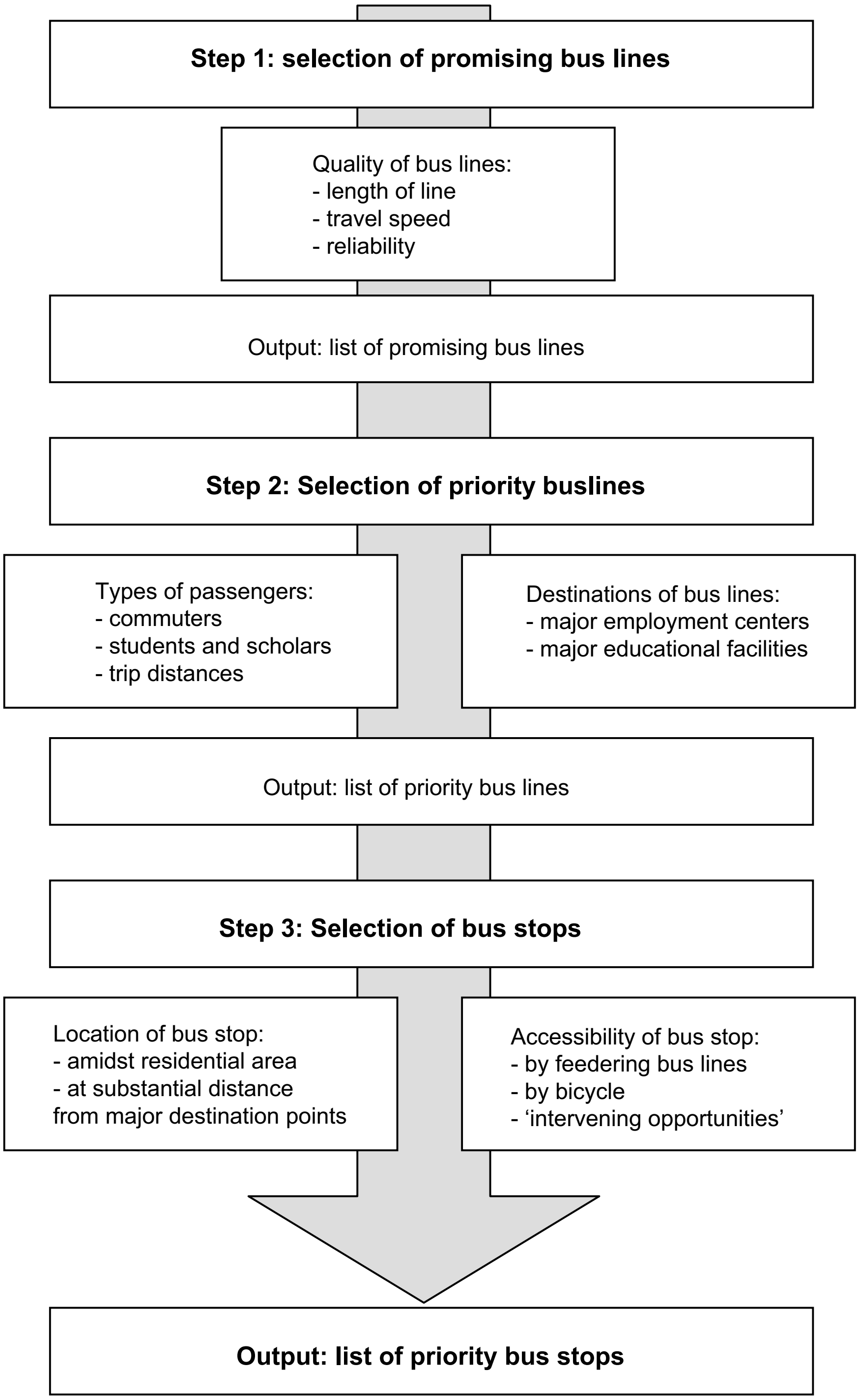
The aim of the first step is to identify bus lines of high quality. These lines are most likely to attract people from substantial pre-transport and post-transport distances. The potential for bike and ride will thus be highest on these lines. Three criteria can be distinguished to assess the quality of bus lines: average travel speed, frequency and reliability. A fourth criterion concerns the length of a bus line. Only lines that are substantially longer than ten kilometers are likely to attract bike and ride users. Below these distances bike and ride is not attractive, because the total travel time will be too high compared to the total travel distance (even if bike and ride is used instead of walk and ride). The first step results in the identification of 'promising bus lines'.

The second step narrows the promising bus lines down to a set of priority bus lines. Priority bus lines are those bus lines that are used or can be used by passengers that are most likely to use bike and ride: commuters and students and scholars. There are two possible ways of selecting the priority bus lines. The most accurate are data about the travel motives of bus users and the trip distances over which they travel. Such data can show very clearly which bus lines have high shares of the motives 'work' and 'education'. There are, however, problems connected to this approach. First, data will not be available for many bus lines. Second, if data are available they only refer to the current bus users and thus ignore potential new travelers if bike and ride facilities were to be provided. The second possible way to select priority bus lines thus focuses on the destinations of the lines. Bus lines that connect residential areas to major employment areas or educational facilities deserve priority over others. The higher the number of jobs and the larger the educational facilities along a bus line, the more a bus line can profit from bike and ride facilities.

The final step aims to select priority bus stops along the priority bus lines. Two sets of criteria are relevant here. The first focuses on the location of bus stops vis-à-vis residential areas and vis-à-vis areas of destination. Bus stops located in densily built residential areas and bus stops located at a substantial distance of major employment areas and educational facilities (at least ten kilometer) deserve priority over other bus stops. The second set of criteria concerns the accessibility of a bus stop. The question here is whether attractive feedering bus lines are available, whether bus users have alternative bus stops available within shorter distance, and whether the bus stop is reasonably well accessible by bicycle. Finally it should be noted that, f course, bus stops that are served by several priority and non-priority lines deserve priority over bus stops that are served by only one priority line.

The three-step procedure is summarized in Figure 5.2.

Figure 5.2 Three-step procedure to select bus stops with the highest potential for bike and ride.



5.3 Measures to promote bike and ride

The identification of priority train stations, bus lines and bus stops is only a first step in the development of a bike and ride policy. The main element of such a policy are, of course, measures that actually promote the use of bike and ride. Before translating the international experiences to the Israeli situation, a short discussion of the specific Israeli circumstances is necessary.

The first factor that should be taken into account is the relatively low level of bicycle use in most localities. While the international experiences show that the use of bike and ride can be higher than general bicycle use, it is obvious that the low levels in ridership will to some extent be reflected in relatively low levels of bike and ride use. The fact that adequate bicycle facilities are currently lacking in most localities underlines this point. Where bike and ride facilities in countries like Germany can benefit from the availability of bicycle paths along at least some parts of the roads, in Israel planning for bike and ride can hardly profit from existing bicycle facilities and has to be developed 'from scratch'. The third factor that plays a major role is the current image of the bicycle. The low levels of ridership go hand in hand with a negative attitude towards cycling among a substantial part of the Israeli population. Many people do not recognize the rights of cyclists as a road user and a minority has an outright hostile attitude towards cyclists. These attitudes reflect on the choices of people who might be willing to cycling. A last factor that has to be mentioned is the security situation, which translates into demands concerning the design and lay-out of public transport stops and stations.

Given these specific circumstances and based on the international experiences and the specific Israeli circumstances, several guidelines can be presented with regard to possible measures to promote bike and ride.

1. Bicycle parking facilities
The promotion of bike and ride is most easily achieved through the provision of bicycle parking facilities. The attractiveness of parking facilities lies in the fact that they can be developed fairly easy. They do not require a major planning effort, decisions about the division of available road space, or the involvement of many bodies. In most cases, space can be found relatively easy close to a public transport stop. Cooperation between a local authority and a public transport operator is usually enough to achieve results (see Section 5.4).

The number of bicycle parking places will, of course, have to be adjusted to the size and type of public transport stop. The main factors that should be taken into account are the number of parked bicycles (actual demand), the number of passengers (potential demand), the number of residents in the vicinity of the public transport stop (possible demand), and the accessibility of the stop for all access modes (competitive position of the bicycle). Based on these criteria an estimation can be made of the demand for bicycle parking places. It may be expected that bus stops along longer distance bus lines will generally need no more than a few bicycle racks, unless the stop serves several priority bus lines. Major train and bus stations will require more parking places, as the number of passengers is substantial. However, given the availability of alternative access modes and low levels of bicycle ridership, it may be expected that the initial demand will not be sufficient to justify a bicycle center with extensive facilities. Given the low levels of bicycle ridership, it is recommended to start small in all cases and expand facilities when demand grows. This will require regular monitoring into the use of the available facilities. The same approach can be adopted with regard to the type of bicycle parking facility that is offered. In the first stages secure bicycle racks can be offered, while more expensive facilities such as bicycle lockers can be provided in later stages in response to growing demand. This also provides the opportunity to check the demand among current bike and ride users for such facilities, their willingness to pay, and the types of arrangement they would prefer (e.g. bicycle lockers for personal use only versus generally available bicycle lockers).

The bicycle parking facilities that will be provided at public transport stops will have to be able to live up to certain standards if they are to attract bike and ride users. The international experiences point out that the facilities have to match five criteria. They have to be:

- Fast. This requires that bicycle facilities are located at an attractive location vis-à-vis the major access routes of public transport stop and vis-à-vis platforms or bus stops.
- Easy to use. This translates into design criteria, e.g. bicycle stands that are placed at sufficient distance from one another or bicycle lockers that are not too low.
- Secure. This requires types of bicycle racks that enable cyclists to tie both frame and front wheel to the rack and requires that all stands are located in a visible location.
- Affordable. The price of bicycle parking facilities should be adjusted to the local situation. The current low levels of bicycle ridership suggest that bicycle parking facilities should be free of charge if they are to attract bike and ride users. This is also true for bicycle lockers. The fact that car parking is for free at many train stations is an extra argument to also provide bicycle lockers free of charge. The monitoring among actual bike and ride users, as suggested above, can provide information on the willingness to pay for various types of facilities.
- Extendable. Given the step-by-step approach, parking facilities should be planned and located in such a way that they can be easily extended if the levels of bike and ride increase.

The common demand among bike and ride users in northern European countries concerning covered parking is less relevant in the Israeli circumstances, given the favorable climate. This provides considerable advantages in terms of the costs related to, and possible lay-outs of, the bicycle parking facilities. The security situation, in contrast, puts extra limits on the possible location and designs of bicycle parking facilities (e.g. in the case of bicycle lockers because of the luggage that can be stored in them).

2. Bicycle paths

Good bicycle accessibility is another measure that can have a substantial influence on the levels of bike and ride. Good accessibility is, however, more difficult to achieve than adequate bicycle parking. First, it requires investments on the various access routes of stations, instead of investments at one public transport stop or at the entrances of a station as is the case for bicycle parking facilities. Second, the provision of bicycle paths will in most cases require the redistribution of available road space among bicycles, cars and buses. This is a very sensitive issue and thus a major political challenge. Third, bicycle paths require substantial financial investments compared to the provision of bicycle parking. Finally, the planning of bicycle paths can be a complicated affair as it may involve local and regional planning bodies, several municipalities, the Ministry of Transportation, and even local land owners. On the positive side it should be noted that the provision of bicycle paths does not only serve bike and ride users, but also other cyclists.

Given these considerations, the provision of bicycle paths along access routes of should especially be considered in the following situations:

- Excess space on existing access roads. Many roads in Israel are relatively wide and offer opportunities for a re-distribution of road space without reduction in the number of lanes reserved for cars. In such cases, bicycle paths can be provided through simple measures such as painted white lanes, painted bicycle symbols, and bicycle warning signs.
- Refurbishment and/or widening of existing access roads. The refurbishment of existing roads can offer an opportunity to provide more safe types of bicycle paths, especially in cases of excess space. The widening of existing roads may also provide such an opportunity, as a re-distribution of road space is often part of such widening efforts.
- Provision of new access roads. The planning and provision of new access roads obviously offers an excellent opportunity to provide bicycle lanes. It merely requires that bicycle paths are incorporated in every planning stage. Special attention should also be paid to the provision of bicycle paths on new roads adjacent to public transport stops, as such bicycle paths can generally be fairly easily connected to the public transport stop, e.g. via an existing secondary road.
- Development of new neighborhood in the vicinity of a public transport stops. This offers an excellent opportunity to guarantee optimal accessibility of a public transport stop by bicycle, as the whole design of the neighborhood could be adjusted to provide safe and short cycling routes to public transport stops.
- Provision of bicycle paths as part of bicycle plan. Localities that are investing in bicycle paths and are developing a bicycle network could give priority to bicycle paths along access routes to major public transport stops.

- Major campaign to promote bike and ride. Major, longer term campaigns to promote bike and ride may lead to substantial levels of bike and ride, especially in suburban neighborhoods or employment centers located close to a train station (see below). The provision of a bicycle path(s) on a major access road(s) will in such cases strengthen the campaign and add to its success.

3. Facilities for bike and ride in post-transport

The low levels of bike and ride use in post-transport in many countries points out that promoting bike and ride for this part of a public transport is not easy. It will be even harder under the Israeli circumstances of low levels of bicycle use and the lack of bicycle facilities such as bicycle paths and parking facilities at many destinations. These observations point out that special efforts to promote bike and ride in post-transport do not deserve the highest priority in the Israeli situation. In most cases it will suffice to provide adequate parking facilities, as they can also be used by people who want to use a bicycle in post-transport. A simple additional measure could be to reserve bicycle lockers - if provided - for people who wish to use them to park their ‘post-transport bicycle’.

More for-reaching measures to promote the use of the bicycle in post-transport can be considered in cases that offer a high potential for bike and ride in post-transport and clear opportunities for a dedicated campaign among potential bike and ride users. Possible examples are the Matam area close to the Chof HaCarmel train station in Haifa, the Weizman Institute close to the Rechovot train station, and the campus of the Ben Gurion University of the Negev close to the Be’er Sheva Tzafon train station. Each of these areas is located close to a train station served by a high quality train service, lacks adequate bus services for post-transport and is located in an area that is relatively attractive for cycling (flat, low to moderate levels of car traffic). The areas thus offer a high potential for bike and ride. Each of the areas is also dominated by one or a relatively small number of organization and institutes. This allows for dedicated campaigns among possible bike and ride users and for the implementation of measures in conjunction with the institute(s) or organizations. The measures to promote bike and ride will depend on the circumstances, but are likely to include bicycle stands and lockers at stations, bicycle paths (on road or separate facilities) and bicycle parking facilities at the destinations (employers, institutes). The possibility to work with the institutes also opens the opportunity to provide work-based incentives to bike and ride users.

4. Promotion and marketing

Given the low levels of bicycle ridership in Israel, the provision of measures to promote bike and ride needs to go hand in hand with a campaign to market the new facilities. This is true for all of the measures discussed above. The message of thse campaigns should be twofold. First, it should inform the public about the availability of a new facility and its use. Second, and more important, it should inform the public about the advantages of the bicycle as an access mode of public transport and of bike and ride as an integrated mode of travel. Given the low levels of bike and ride and the poor image of cycling this second message is of great importance.

The target group of the promotional campaign will vary according to the type of measure that is implemented. In the case only bicycle parking facilities are provided, smaller scale campaigns among current public transport users, especially boarding passengers in morning rush hours, is sufficient to guarantee the use of the new facility. The higher use of the parking facility, in turn, may induce other public transport users to consider the combination of bike and ride. The provision of bicycle paths justifies a larger campaign among both public transport users and residents living in the vicinity of a public transport stop, given the attractiveness of this facility for all potential bicycle users and the relatively high investment related to bicycle paths. In cases of a specifically high bike and ride potential, such as suburban neighborhoods close to train stations, campaigns could span a longer period or repeat itself several times. Measures to promote the use of bike and ride in post-transport should be taken in close cooperation with the organizations located within post-transport distance of a public transport stop. Such cooperation makes it easy to target potential bike and ride users and it may create a favorable climate towards bike and ride within the institutions in general. It should also be noted that campaigns to promote bike and ride will be more effective if they are combined with campaigns to promote bicycle use in general in a locality.

A final issue concerns the timing of any promotional campaign. The influence of climate and weather on levels of bike and ride suggest that the timing of the opening of bike and ride facilities (bicycle lanes, bicycle parking) and the timing of activities to promote bike and ride can have a substantial impact on the success of the measures and campaign. The best time for such a campaign seems to be the beginning of seasons with favorable circumstances for bike and ride. In the Israeli circumstances, the beginning of the autumn (September-October) seems to be the best period to promote bike and ride.

5.4 Who is responsible?

The international experiences show similar divisions of labor between the various levels of government and public transport operators. It seems reasonable to follow this division for the Israeli situation, albeit with some adjustments.

National level
The international experiences show that the national government fulfils three roles in the promotion of bike and ride. They initiate and co-finance research, pilot and demonstration projects, they co-fund lower level investments in bike and ride facilities, and they develop and improve the legal framework regarding cycling. These activities are embedded in a more comprehensive policy to promote the use of the bicycle in general.

The international experiences thus suggest a major role of the national government as a catalyst for local level investments in cycling and bike and ride. There are, of course, all reasons for the Israeli government to take up such a challenge and develop a comprehensive national bicycle policy that follows the footsteps of the international examples. At the same time it should be acknowledged that it is unlikely that the national government would engage in such an effort. The country does not seem to be 'ready' for a national comprehensive bicycle policy, nor for a major program of pilot and demonstration projects that show what can be done. Given these circumstances, the role of the national government and especially the Ministry of Transportation could be limited to low-budget and low-profile activities to promote bike and ride. Two crucial activities can be distinguished:

- Change the eligibility criteria of the current funding scheme of the Ministry of Transportation for local transportation investments. The criteria should be changed in such a way that lower level governments and – possibly – public transport operators can apply for funding for projects that promote bike and ride, including bicycle parking facilities on private land (at employers, within stations). The fact that the fund is currently under-utilized shows that there is no budgetary constraint for wider eligibility criteria.
- Develop and improve the legal framework for cycling. Some work has already been done on this issue, but the position of cyclists on the road, the recognition of on-road and on-pavement bicycle paths, and the traffic signs for symbols, still require a clear legal framework.

Both measures may be expected to make the work of the lower level governments substantially easier and in this way have a substantial impact on the levels of bike and ride.

Public transport operators

Public transport operators can have a major role in the promotion of bike and ride. They have knowledge about the quality of bus and train lines, the number of passengers, the type of passengers, the popularity of various bus stops, and the current use of various access modes. They are also the ones that will profit most directly from bike and ride measures in terms of increased numbers of passengers. They thus both have the knowledge and the impetus to set priorities and plan for bike and ride measures. They have, however, limited possibilities for implementation. This is true for both bicycle parking facilities and bicycle paths. Especially bus operators will depend heavily on the cooperation of local authorities, as most of them are not even in a position to provide bicycle parking on own terrain. Rakevet Israel can operate more freely in this respect, as most station areas will enable the provision bicycle parking. However, they too are depended on local authorities for the improvement in bicycle access routes to the stations.

Local level

The international experiences show local authorities play a crucial role in the planning and implementation of bike and ride measures. A crucial role of local authorities in the promotion of bike and ride seems also to match the Israeli circumstances. The local authorities are currently responsible for transportation investments at the local level and for local traffic regulations. They are thus in a position to plan and provide for bicycle paths and to develop adequate regulations concerning e.g. bicycle parking. Furthermore, several local authorities have already developed a bicycle policy or are intending to do so in the future. The promotion of bike and ride can merge easily into these more comprehensive plans. The local authorities are, however, also limited in their possibilities. First, they have no data available on the specific quality of public transport lines, on the number of users, or on the importance of various access modes. They will thus have difficulties to develop an effective and efficient bike and ride plan without close cooperation with public transport operators. Second, they will need to cooperate with public transport operators or owners of public transport stations when it comes to the location and size of bicycle parking facilities. Cooperation will also be necessary in case bicycle lockers are provided, as it is most reasonable that the management of these facilities will be in the hands of the public transport operator.

Cooperation at the local level

Given the interdependency of local authorities and public transport operators, cooperation between the two will be a prerequisite for a successful bike and ride policy. Two models can be distinguished here. In the first model, the local authority takes the lead and is responsible for the planning of bike and ride facilities and their implementation. Public transport operators provide the local authority with data on the bus lines and bus stops and are intensively involved in priority setting. They are also actively involved in the campaign to promote bike and ride, as these campaigns focus (partly) on the current public transport users. The management of such a campaign is, however, in the hands of the municipality. The advantage of this model is that the municipality can integrate bike and ride measures in a more comprehensive policy to promote cycling. This does not only offer opportunities for the provision in bicycle access of public transport stops, but also for the improvement in the acceptance of the bicycle as a normal mode of transportation within the locality. Here, the bicycle is the target rather than public transport.

In the second model, the public transport operator takes the lead based on his ambition to increase the number of public transport passengers. He will develop a bike and ride plan according to the guidelines presented in the previous sections of this chapter. The plan would identify key public transport stops and/or bus lines that promise high bike and ride potentials. Based on the plan, a program of detailed measures will be developed in close coordination with the local authority or authorities in which the priority bus stops are located. The plan will include bicycle parking facilities, bicycle paths and campaigns. The provision of the first will be in the hands of the public transport operator, while the municipality will be responsible for the detailed planning and provision of bicycle paths. The public transport operator also takes the lead in the promotional campaigns, both those which target current public transport users as those that target potential public transport users (residents, employees, scholars and students that reside in the vicinity of public transport stops). The focus of this model is thus public transport ridership rather than bicycle use.

Appendix
Assessment and selection of stations

A.1 The train system and its users

Before starting with the assessment of the train stations, it is good to shed some light on the train system and its users. Data on these issues provide a general background against which bike and ride has to proof itself.

The train system
The Israeli train system currently encompasses five passenger lines: two intercity services and three suburban services. The two intercity lines run between Nahariya and Tel Aviv and Be'er Sheva and Tel Aviv. The northern suburban line runs alon gthe tracks of the first intercity line and connects the Krayot with Haifa. The longest suburban line runs from Binyamina all the way to Ashdod, while the Rosh Ha'ain-Tel Aviv suburban line serves several towns to the east of Tel Aviv (see map). The five existing passenger lines thus mainly serve cities and towns on the coastal plain.

The train system will be further extended in the near future. The line between Tel Aviv and Ben Gurion International Airport is already under construction, while a further extension of this line towards Modi'in and Jerusalem is planned. A re-opening of the old Tel Aviv-Jerusalem railway line via Bet Shemesh is scheduled for the coming years. In addition to this, there are detailed plans to open a railway line between Kfar Saba and Tel Aviv. The bicycle accessibility of the stations along each of these new lines definitely deserves attention in due time. They are, however, outside the scope of this study.

The five passenger lines served a total of 30 stations at the beginning of 2001. Two more station were recently opened: the Caesarea-Pardes Chana station and the Lev HaMifratz station in Haifa. Two more stations are expected to open by the end of the year (Hutzot HaMifratz in Haifa and Tel Aviv HaHagana). The study will focus on the 30 stations that were in service at the beginning of 2001, as there are adequate data available for these stations.

Figure A.1 The Israeli train system and the train stations that will be assessed.

-- Insert map of train system --

The train users
The Ministry of Transportation has recently conducted an in-depth on board research as part of the preparation of the regional plan (Tochnit Av) for the Tel Aviv Metropolitan Area (MoT 2001). This study provides a lot of information on the train users and their characteristics and it will be used here to give a first impression of the

potential for bike and ride. It has to be noted that the study focuses on the passengers traveling to, from and within the metropolitan area and on the stations within this area, and thus does not give a fully representative picture of the train passengers in the whole of Israel. It does, however, cover most passengers traveling on the train and more than half of the 30 stations under study. In the following sections attention will be paid to the travel motives of train passengers, the modal split in pre-transport and post-transport and the time spent on pre-transport and post-transport. Data on all these issues provide some first insights into the potential for bike and ride among the current train passengers.

Travel motives

The MoT study provides detailed figures on the travel motives of train passengers. The study shows that ‘work’ is the most important travel motive: nearly half of all trips by train is made with this purpose. Next travel motive in row is ‘army’ with 18% of all trips. The rest of the trips is almost equally divided over ‘studies’, ‘arrangements and other motives’, ‘work-related’ and ‘friends and family’. The lowest number of trips is made with a shopping motive.

The picture is even more clear for the morning peak hours. The travel motive ‘work’ has a substantially higher share in this period, as might have been expected (64%). The ‘army’ purpose also has a large share in the morning peak hours (19%). The other travel motives are less important. The travel motive ‘study’ accounts for 7% of all morning peak trips and ‘work-related’ for 6%, while the other motives have a share of 1% to 2%.

These figures point at a high potential for bike and ride. The data presented in the previous chapter have shown that the ‘work’ purpose is the dominant travel motive among the people that use bike and ride in other countries and localities. The reason for this is simple: people who travel to work do this regularly and they are thus more likely to invest in a bicycle, acquire knowledge about the most efficient and safe cycling routes to and from and parking facilities at the stations of origin and destination, and/or about adequate parking facilities at work place. Most trips to work also start and end at the home address, where it is usually relatively easy to find a save and comfortable parking place for the bicycle (see Chapter 2). A high percentage of the current users of the Israeli train system is thus a potential candidate to use bike and ride. This holds even more true for the morning rush hours, which is just a period in which the bicycle might be an effective alternative for the car (no congestion) or the bus (no congestion, no crowding).

The ‘army’ purpose also has a large share among the train passengers in Israel. It seems less likely, however, that passengers traveling with this purpose are potential candidates to use bike and ride. First of all, many of the passengers spend several days in a row at an army base and thus travel only once or twice a week to and from a railway station. Less frequent travelers are less likely to use the bike to reach the station, as has been discussed before. Another factor which makes bike and ride less attractive is the fact that many people traveling to the army carry luggage, which might be difficult to transport by bicycle. A third reasons why especially the use of the bike in post-transport might not be popular, is related to the fact that the army has special services to pick up people at various train stations.

Figure A.2 Travel motive of train passengers.

travel motive	all trips	trips till 09.00 h
work	49%	64%
work related	7%	6%
army	16%	19%
studies	9%	7%
shopping	2%	1%
friends / recreation	7%	1%
arrangements / others	9%	2%

Source: Ministry of Transport et al. 2001

Modal split in pre-transport and post-transport

The MoT study also gives insight into the current transportation modes that train passengers use to travel to and from the stations of origin and destination. It has to be noted, though, that the data make it difficult to distinguish between pre-transport (between the home place and the station and vice versa) and post-transport (between the station and another place of destination and vice versa). This is because the MoT study differentiates between trips *to* the station (whatever the origin is) and trips *from* the station (whatever the destination is). Trips between the home place and the station are thus divided over both groups, depending of the direction of the trip. The same goes for trips between the train station and the place of destination.

Figure A.3 presents the most relevant data from the MoT study on modal split in trips to and from train stations. The figure shows that the car is the dominant means of transportation, both in trips to and from the station. About 30% of all people travel to and from the station by car, either as a driver or as a passenger. Second in row are passengers traveling by foot to and from the station (26%), while the bus comes third with a share between 19% and 27%. The current share of the bicycle is not clear, as it has not been measured separately. Since the share of 'other modes' is 4% and since this also includes mopeds and motors, it may be expected that the current share of the bicycle only a few percent.

The car is even more important in pre-transport. Both the data on the trips to the station with origin at home and data for the morning rush hour point this out. The car accounts for 55% of all the trips from home, while only 15% of the trips are made by foot and 12% by bus. Nearly the same picture emerges for trips *to* the station in the morning rush hour, 90% of which originates at the home place. Here the car is good for 58% of all trips and the bus for 18%, while 9% of the passengers goes to the train station by foot.

The picture is totally different for post-transport, as the data on trips with an 'other' origin and on trips from the station in the morning rush hour show. In both cases, most train passengers travel by foot to their destination (around 40%). The bus is also an important mode in post-transport, with a share between 23% and 31%. The car is much less important and accounts for only 9% to 17%. As may be expected, the share of the taxi is rather high (7% or 8%).

What do these data imply for the position of the bicycle as a transportation mode for pre-transport and post-transport trips? It is difficult to provide definite answers to this question, but some observations can be made. First of all, the low share of passengers traveling by foot in *pre-transport* shows that proximity between the home place and the train station is not the most important reason to choose to travel by train. Other qualities, such as travel speed, comfort, and proximity between station and the location of destination, seem to play a more important role in the train passengers' choice. This seems to indicate that the bicycle may fill a 'gap' for people who wish to travel by train, but live to far away from the station to make the pre-transport trip by foot and who do not have any other means of transport available (car, bus or other). Second, the high share of passengers traveling by foot in *post-transport* shows that the current 'reach' of a station on the destination side is rather limited. The causes have been described before: many people do not have a transportation means available on this end of the trip, and public transport might be inefficient or non-existent. The bicycle might fill another 'gap' here, in that it might extend the 'reach' of a railway station into a larger area. Finally, the high share of the car shows that a large part of the train passengers appreciates its obvious advantages: its flexibility and comfort. Because the car is available at all times and can be used when needed, it offers travelers the opportunity to arrive at the train station as close to train departure as possible thus limiting the waiting time. Since the bicycle also has these qualities, there may be substantial potential for bike and ride among train passengers once adequate cycle facilities are provided.

Figure A.3 Modal split in trips to and from train stations.

	trips to the station		**trips to the station**		**trips from the station**	
mode	**all trips**	**till 09.00h**	**with origin at home**	**with other origin**	**all trips**	**till 09.00 h**
Foot	26%	9%	12%	40%	27%	43%
Bus	19%	18%	15%	23%	27%	31%
Car	19%	36%	32%	6%	16%	3%
Car passenger	17%	22%	23%	11%	14%	6%
Taxi	7%	4%	6%	7%	7%	8%
Other mode	4%	5%	3%	4%	4%	4%
Train	9%	6%	8%	10%	5%	5%

Source: Ministry of Transportation et al. 2001

Travel time

The MoT study does not only provide data on the means of transport that train passengers use to travel to and from a train station, but also on the amount of time they spend on traveling to a station. The details are presented below in Figure A.4. The table shows that most passengers (73%) are willing to travel up to 15 minutes to a train station. For train passengers traveling by foot to the station the number of people that does not travel longer than 15 minutes is even 85%, while the figure is 71% and 75% for car drivers and car passengers respectively. Bus users tend to spend more time on the trip to the station: only 52% of the bus users travel less than 15 minutes.

These data provide a measure to assess the possible reach of bike and ride around train stations. Given the fact that most passengers do not spend more than 15 minutes on their trip to the station, it seems reasonable to use the same 'time limit' for bike and ride. Combination of this limit of 15 minutes with an average cycling speed of 15 km/h, results in a 'reach' of the bicycle of nearly 4 kilometers around the station. This figure thus delineates a 'priority area' in which the provision of adequate cycling facilities deserves the most attention.

Bicycle facilities may can thus considerably extend the 'reach' of a station for people without a car or adequate bus facilities. The current reach of the station for these people is based on the 'travel limit' of 15 minutes and travel speed by foot. Assuming that pedestrians travel at an average speed of approximately 4 km/h – which is in the context of urban areas with crossings of major roads even a rather high speed –, the reach of pedestrians is only 1 kilometer around the station. The provision of cycling facilities may thus extend the reach of a station with a factor 4 when measured in distance and a factor 15 measured in surface.

Figure A.4 Travel time used for trips to train stations.

	trips to the station							
travel time	**foot**	**bus**	**car**	**car pass**	**taxi**	**other**	**train**	**total**
0 – 5 minutes	24%	8%	17%	19%	15%	13%	15%	17%
6 – 10 minutes	40%	23%	37%	40%	42%	27%	34%	36%
11 – 15 minutes	21%	20%	21%	20%	17%	11%	15%	20%
16 – 20 minutes	8%	14%	8%	10%	17%	12%	10%	10%
21 – 30 minutes	5%	19%	12%	6%	5%	15%	12%	10%
> 30 minutes	3%	16%	5%	5%	4%	21%	13%	8%

Source: Ministry of Transportation et al. 2001

A.2 Classification of stations

The aim of the last stage of the project is to learn how the stations can be connected to their surrounding and vice versa. To learn as much from this stage as possible, it is valuable to select stations that offer different opportunities and pose different challenges for bike and ride and the necessary bicycle facilities. For this reason, the 30 stations have been divided into three groups. From each of these groups, a station will be selected based on the criteria and data presented in this chapter. The selected station will subsequently feature as the pilot stations in the next chapter.

Stations located in a large urban area
These stations have an excellent location vis-à-vis the number of residents and/or residents in the vicinity of the station. The stations will therefore offer the highest \potential for bike and ride as reflected in the number of possible bike and ride users. They have the drawback that cycling facilities will have to be created within a dense and often congested urban area and have to be integrated into an already contested road space.

Stations located at the edge of a large urban area
These stations are either located directly on the edge of an urban area or on a distance of several kilometers from such an area. Because of the peripheral locations vis-à-vis the urban area, the potential for bike and ride of these stations is lower than that of the urban stations. The stations also pose different challenges when it comes to creating bicycle facilities to connect station and surrounding, especially when the station is a few kilometers away from the urban area. In that case, bike and ride will only be a viable alternative for other modes of transport if a fast and efficient bicycle path can be created. The urban edge stations also pose an interesting challenge when it comes to the areas on the other side of the station, where in many cases smaller towns and

communities are located. The question is if and how these smaller towns should be connected to the station.

Stations located in or in the vicinity of a smaller town(s) or employment centre(s)
The third group consists of stations that are located outside the reach of larger urban areas. These stations are located in a smaller town or in the vicinity of (several) a small town(s). On the one hand, the potential for bike and ride is obviously low for these stations, since the number of residents and/or jobs in the vicinity of the station is relatively low. On the other hand, the stations may offer favorable circumstances to create dedicated bicycle facilities, as the level of congestion is often lesser in these areas and as there is likely to be (road) space available. The less congested and thus more pleasant roads and the more rural surrounding also make cycling relatively comfortable and bike and ride might thus become relatively attractive once dedicated infrastructure is provided.

In the table below the 30 stations are divided over the three categories.

Figure A.5 Classification of train stations.

urban stations	urban edge stations	'ex-urban' stations
Nahariya	Chof HaCarmel	Chatsrot Yasaf
Akko	Hadera Maarav	Kishon
Kiryat Motzkin	Netanya	Atlit
Kiryat Chaim	Bet Yehoshua	Binyamina
Haifa Merkaz	Hertzliya	Kfar Chabad
Haifa Bat Galim	Lod	Be'er Yaacov
Tel Aviv University	Rechovot	Yavne
Tel Aviv Merkaz	Kiryat Gat	Rosh Ha'ain
Tel Aviv HaShalom	Be'er Sheva Tzafon	
Be'er Sheva Merkaz	Ashdod	
	Bnei Brak	
	Petach Tikva	

A.3 Travel characteristics of the stations

The first group of criteria by which the train stations will be assessed, encompass the so-called travel characteristics of the stations. Three criteria fall under this category: the number of lines that serve a station, the number of boarding and alighting passengers and the presence of a bus station in the vicinity of a station. Each of the criteria will be dealt with below.

Criterion 1: Number of railway lines
The more railway lines stop at a certain station, the more attractive this station will be for passengers, and therefore the more attractive it will be to create special facilities for bike and ride users. The number of railway lines that stop at one station currently varies between one and four.

It may come as no surprise that within the group of *urban stations* the stations in Tel Aviv are the ones that are served by the most lines. Tel Aviv University and Tel Aviv HaShalom are served by three lines, while Tel Aviv Merkaz is the only station that is served by four lines (the intercity service to Nahariya, the intercity service to Be'er

Sheva, the suburban service to Binyamina and Ashdod Darom and the suburban service to Rosh Ha-Ain).

Two of the *urban edge stations* are served by two railway lines, while the other ten stations are served by only one. The first group comprises of the stations of Chof HaCarmel and Lod.

The *ex-urban stations* are also relatively poorly served by the current passengers lines of Rakevet Israel. Only two stations are served by two lines: Kishon and Binyamina.

Figure A.6 Number of railway lines by which stations are served.

	Served by			
Type of station	**1 line**	**2 lines**	**3 lines**	**4 lines**
Urban stations	Nahariya Akko Be'er Sh Merkaz	Kiryat Motzkin Kiryat Chaim Haifa Merkaz Haifa Bat Galim	T"A University T"A HaShalom	T"A Merkaz
Urban edge stations	Hadera Maarav Netanya Bet Yehoshua Hertzliya Rechovot Ashdod Darom Kiriat Gat Be'er Sh Tzafon Bnei Brak Petach Tikva	Chof HaCarmel Lod		
Ex-urban stations	Chatsrot Yasaf Atlit Kfar Chabad Be'er Yaacov Rosh Ha'ain	Kishon Binyamina		

Source: Timetable Rakevet Israel 2001

Criterion 2: Number of passengers

The number of passengers that use a train station is an important indicator of the potential for bike and ride of that station. The more people currently use a station, the more people might shift from a combination of walk and ride, bus and ride or drive and ride to the combination of bike and ride once adequate cycling facilities are provided. A high number of passengers further points at the attractive location of a station vis-à-vis residential and employment areas and vis-à-vis the traffic situation. The provision of cycling facilities might thus attract new train passengers under these supportive circumstances (see Chapter 2).

Rakevet Israel conducts regular surveys on the number of people that use the trains and on the stations at which they board to and alight from the various passenger lines. For the purpose of this report, data are used from the survey of May 2001. It has to be noted that the data from this survey on boarding and alighting passengers per station include passengers that change trains at the stations. The numbers are thus higher than the number of people which is relevant from the perspective of bike and ride, that is the number of people for which a station is the origin or destination of a trip. The difference between the two figures will be especially large for the stations which serve as an interchange between different passenger lines, such as the stations of Haifa Bat Galim, Binyamina, Tel Aviv Merkaz and Lod. Since exact data on the share of passengers that change trains at each stations are lacking, it is not possible to adjust the data of the Rakevet Israel survey. A recent research carried on behalf of the Ministry of Transportation does provide some insight into this issue, however (MoT 'On board' study 2001). Below the unadjusted figures of the Rakevet Israel survey are presented. Where necessary and possible, the share of changing passengers will be elaborated upon.

The Rakevet survey provides data on the number of boarding and alighting passengers for various periods of the day. From the perspective of bike and ride, the number of boarding and alighting passengers in the morning and afternoon rush hours are the most important. Experiences in other countries show that bike and ride is mainly used for trips to work or to school, and these trips are mainly made in the peak hours of the day (between 6.00-9.00 h in the morning and between 15.00-18.00 h in the afternoon).

From the perspective of bike and ride it is also valuable to assess whether a station mainly has boarding or alighting passengers in the peak periods. Boarding passengers in the morning peak and alighting passengers in the afternoon peak points at a high potential for bike+ride, since it is likely that most of the passengers in these hours either travel from or to their home address. In contrast, alighting passengers in the morning peak hours and boarding passengers in the afternoon peak hours points at a high potential for ride+bike, since it may be expected that most of these passengers travel to or from their address of destination (e.g. workplace, university, army base).

The data of the Rakevet survey have been adjusted according to this division between bike+ride and ride+bike. The results for the 30 train stations are shown in Figure A.7. The table shows that there are huge differences between the stations in the three groups.

Within the group of *urban stations*, the Tel Aviv Merkaz, Tel Aviv HaShalom and Kiryat Motzkin stations show the highest number of passengers boarding in the morning peak and alighting in the afternoon peak. These stations thus have a high potential for bike+ride. Especially the high score of the Kiryat Motzkin station is noteworthy. From the perspective of ride+bike, the Tel Aviv Merkaz, Tel Aviv HaShalom and Haifa Bat Galim stations offer the highest potential within the urban stations group.

Among the *urban-edge stations*, the stations of Rechovot, Netanya and Hadera Maarav offer the highest potential for bike+ride. Rechovot also offers quite a high potential for ride+bike, as do the Hertzliya and Chof HaCarmel stations. The relative high score of the station of Lod is partly caused by the fact that it serves as interchange station between the Binyamina-Tel Aviv suburban line and the Tel Aviv-Be'er Sheva intercity service. Figures from the 'On board' research show that the share of changing passengers various between 10% and 40% (MoT 2001).

Bnyamina is clearly the station with the highest potential for both bike+ride and bike+ride among the group of *ex-urban stations*. This holds true even if the figure for Binyamina would be corrected for the number of passengers that change trains. Exact data are missing, but the 'On board' research shows that at least a quarter of all boarding and alighting passengers are actually people that change trains at Binyamina. But even if the figure would be as high as 50%, the station in Binyamina still serves much more passengers than any of the other ex-urban stations. The high number of passengers at Binyamina must be attributed to the fact that the station is served by both the Tel Aviv-Nahariya intercity service and the Binyamina-Ashdod suburban service, and by the fact that the town lies within commuting distance of the metropolitan area of Tel Aviv. From the other ex-urban stations, only Rosh Ha'ain, Be'er Yaacov and Yavne offer some potential for bike+ride. Except for Binyamina, none of the ex-urban stations seems to attract a substantial number of passengers for ride+bike (with a possible exception of Kishon and Kfar Chabad).

Figure A.7 Number of boarding and alighting passengers at the train stations.

Station	**number of passengers**				**rate between b+r and r+b**
	potential for bike+ride boarding between 6.00-9.00 alighting between 15.00-18.00		**potential for ride+bike** alighting between 6.00-9.00 boarding between 15.00-18.00		
	abs	**%**	**abs**	**%**	**(1)/(3)**
Urban stations					
Nahariya	950	4.3%	460	1.6%	2,1
Acco	1010	4.5%	225	0.8%	4,5
Kiryat Motzkin	1727	5.9%	241	0.8%	7,2
Kiryat Chaim	1073	4.7%	206	0.7%	5,2
Haifa Merkaz	627	2.2%	1197	4.2%	0,5
Haifa Bat Galim	1524	5.2%	2272	7.9%	0,7
Tel Aviv University	651	2.2%	1225	4.3%	0,5
Tel Aviv Merkaz	2764	9.5%	8133	28.3%	0,3
Tel Aviv HaShalom	1963	6.7%	7076	24.6%	0,3
Be'er Sheva Merkaz	479	1.6%	135	0.5%	3,5
Urban edge stations					
Chof HaCarmel	1216	4.2%	786	2.7%	1,5
Hadera Maarav	1616	5.6%	325	1.1%	5,0
Netanya	1750	6.0%	526	1.8%	3,3
Bet Yehoshua	1407	4.8%	495	1.7%	2,8
Hertzliya	881	4.0%	765	2.7%	1,2
Lod	1339	4.6%	741	2.6%	1,8
Rechovot	2184	7.5%	895	4.1%	2,4
Kiryat Gat	255	0.9%	63	0.2%	4,0
Be'er Sheva Tzafon	54	0.2%	69	0.2%	0,8
Ashdod	463	1.6%	22	0.1%	21,0
Bnei Brak	118	0.4%	230	0.8%	0,5
Petach Tikva	257	0.9%	89	0.3%	2,9
Ex-urban stations					
Chatsrot Yasaf	12	0.0%	49	0.2%	0,2
Kishon	12	0.0%	202	0.7%	0,1
Atlit	121	0.4%	124	0.4%	1,0
Binyamina	3018	10.4%	1779	6.2%	1,7
Kfar Chabad	150	0.5%	182	0.6%	0,8
Be'er Yaacov	343	1.2%	90	0.3%	3,8
Yavne	331	1.1%	8	0.0%	41.4
Rosh Ha'ain	811	2.8%	128	0.4%	6,3
Total	**29,106**	**100.0%**	**28,738**	**100.0%**	**1,0**

Source: Rakevet Israel, Survey May 2001

The data from the survey of Rakevet Israel make it possible to classify the stations according to the number of passengers boarding or alighting in the peak hours. The last column in Figure A.7 shows the rate between the passengers boarding in the morning/alighting in the afternoon on the one hand, and the passengers alighting in the morning/boarding in the afternoon on the other. Based on these rates, the stations are classified into three groups: destination stations, mixed stations and origin stations. The results are shown in Figure A.8.

The stations that have a low rate are dubbed destination stations. They have a relatively high number of alighting passengers compared to the number of boarding passengers in the morning peak hours. The two large Tel Aviv stations fit this description, as do the two small stations of Kishon and Chatsrot Yasaf. For these stations, the facilities available for ride+bike are at least as important as the facilities for bike+ride, since many people travel from these stations to the workplace, army base or educational institution. It has to be noted, however, that bike+ride facilities remain very important at the Tel Aviv Merkaz and Tel Aviv HaShalom stations due to the high absolute number of boarding passengers in the morning peak hours.

The stations with a rate between 0,5 and 1,5 are dubbed mixed stations. They attract both boarding and alighting passengers in the morning peak hours. Haifa Bat Galim, Tel Aviv University and Hertzliya are among these stations. The efforts to stimulate bike and ride around these stations could focus on both bike+ride and ride+bike.

The stations that have high numbers boarding but hardly any alighting in the morning and thus have a high rate, are typical commuter stations. Most passengers arrive to these stations from their home address and travel from these stations to their workplace or other destination. These stations are dubbed 'origin stations' in the figure below. Typical examples are Kiryat Motzkin, Hadera Maarav and Rosh Ha'ain. The focus for these stations should clearly be on bike+ride.

Figure A.8 Classification of stations according to the rate between boarding and alighting passengers in peak hours.

type of station	rate	urban stations	urban edge stations	ex-urban stations
destination stations	**0,0 – 0,5**	Tel Aviv Merkaz Tel Aviv HaShalom		Kishon Chatsrot Yasaf
mixed stations	**0,5 – 1,0**	Haifa Bat Galim Haifa Merkaz Tel Aviv University	Be'er Sheva Tzafon Bnei Brak	Kfar Chabad
	1,0 – 1,5		Hertzliya	Atlit
origin stations	**1,5 – 2,0**		Chof HaCarmel Lod	Binyamina
	2,0 – 3,0	Nahariya	Bet Yehoshua Rechovot Petach Tikva	
	3,0 – 4,0	Be'er Sheva Merkaz	Netanya	Be'er Yaacov
	4,0 – 5,0	Acco	Kiryat Gat	
	> 5,0	Kiryat Motzkin Kiryat Chaim	Hadera Maarav Ashdod	Yavne Rosh Ha'ain

Source: Based on data from Rakevet Israel, Survey May 2001

Criterion 3: Presence of bus station
The presence of a bus station in the direct vicinity of a train station makes it extra attractive to develop bike and ride facilities, since these facilities will not only serve train passengers but also bus passengers. Railway stations with a bus station, like Haifa Bat-Galim and Tel Aviv Merkaz, are thus more attractive candidates for the case-studies, than railway stations that have no bus station in their vicinity (all other things being equal).

The analysis shows that only four urban stations (Nahariya, Haifa Bat Galim, Tel Aviv Merkaz and Be'er Sheva Merkaz) and one urban edge station (Chof HaCarmel) have – or will have in the near future – a bus station in their vicinity. The vicinity of a bus station especially increases the potential for bike and ride of the Haifa Bat Galim station, as this is a very busy hub in the Haifa bus network. This also goes to a lesser extent for Tel Aviv Merkaz. It also should be noted that Nahariya does not have a bus station in its vicinity, but all city and intercity bus lines pass along and have a stop near the railway station.

Figure A.9 Presence of bus station in the vicinity of train stations under research.

urban stations		urban edge stations		ex-urban stations
bus station	**no bus station**	**bus station**	**no bus station**	**no bus station**
Nahariya Haifa Bat Galim T"A Merkaz Be'er Shev Merkaz	Akko Kiryat Motzkin Kiryat Chaim Haifa Merkaz T"A University T"A HaShalom	Chof HaCarmel	Hadera Maarav Netanya Bet Yehoshua Hertzliya Bnei Brak Petach Tikva Lod Rechovot Ashdod Darom Kiryat Gat Be'er Shev Tzafon	Chatsrot Yasaf Kishon Atlit Kfar Chabad Be'er Yaacov Yavne Rosh Ha'ain

Source: Website of Rakevet Israel (www.israrail.org.il), October 2001

A.4 Location characteristics of the stations

The second group of criteria are related to the location of the station. Two criteria fall under this category: the number of residents living in the vicinity of a train station and the number of jobs within the vicinity of a station. The first criterion is an indicator of the potential for bike+ride of a certain station (pre-transport), while the second criterion gives insight into the possibilities for ride+bike (post-transport).

There are two reports available with relevant data on population and employment:
- רשות הנמלים והרכבות, אומדן הביקוש לנסיעות ברכבת לשנת Report prepared by the Israel Institute of Transportation Planning and Research (IITPR report);
- Israel Railways (April 2000) Development of a direct demand passenger model, Draft Report. Report prepared by the IBI Group (IBI report).

The IITRI report contains data for 28 of the 30 train stations under study. Details are only lacking for the Chatsrot Yasaf and Kishon stations. The report gives figures on the number of people and employees within 15 minutes travel by foot, bus or car from each train station. This catchment area of 15 minutes gives quite a good estimate for the number of residents and employees that could use the bicycle to reach the train

Figure A.10 Population and employment in the vicinity of train stations.

Station	Population		Employment	
	IBI 1999	IITPR 2020	IBI 1999	IITPR 2020
Urban stations				
Nahariya	44.300	61.900	22.000	22.140
Akko	44.500	59.100	20.000	19.460
Kiryat Motzkin	75.500	64.700	35.000	15.990
Kiryat Chaim	37.800	46.300	18.000	17.930
Haifa Merkaz	80.300	45.900	40.000	48.300
Haifa Bat Galim	160.600	25.600	80.000	17.360
Tel Aviv University	--	124.200	--	44.860
Tel Aviv Merkaz	196.600	116.800	162.000	89.860
Tel Aviv HaShalom	196.600	105.700	162.000	114.920
Be’er Sheva Merkaz	174.200	274.800	61.000	84.700
Urban edge stations				
Chof HaCarmel	44.500	36.200	22.000	31.440
Hadera Maarav	71.000	101.000	22.000	45.460
Netanya	110.500	121.500	36.000	60.000
Bet Yehoshua	76.800	36.900	15.000	7.370
Hertzliya	65.200	104.000	27.000	38.410
Lod	66.100	27.000	24.000	5.700
Rechovot	101.700	75.200	37.000	27.410
Kiryat Gat	47.200	80.700	17.000	29.160
Be’er Sheva Tzafon	174.200	274.800	61.000	84.700
Ashdod Darom	166.500	195.500	45.000	56.490
Bnei Brak	--	135.000	--	32.210
Petach Tikva	--	39.700	--	4.200
Ex-urban stations				
Chatsrot Yasaf	10.000	-	5.000	-
Kishon	20.700	-	8.000	-
Atlit	10.000	51.400	4.000	8.660
Binyamina	62.400	55.000	20.000	17.320
Kfar Chabad	20.000	12.000	7.000	6.000
Be’er Yaacov	30.600	10.000	11.000	9.260
Yavne	--	34.700		11.270
Rosh Ha’ain	--	44.500		5.500

Source: Report of the IBI Group (April 2000) (IBI report) and Report of the Israel Transportation Research Institute (August 1998) (IITPR report).

station. Yet, since the bicycle is in general slower than the car, it may be expected that the number of residents and employees in the catchment area of the bicycle is lower than the figures shown below. Next to these positive qualities of the IITPR report, it also has a drawback. It only gives data for the year 2020 and thus does not reflect the current situation. It also has to be kept in mind that the figures are relatively unreliable because of the uncertainties connected to any forecast. Finally, it should be noted that the report does only give data on the total number of residents and employees in Be'er Sheva and not on the number that is located within the 15 minutes catchment area.

The IBI report contains data on only 24 stations. Data for recently opened stations, such as Petach Tikva and Tel Aviv University, are missing. The report also does not provide separate data for the Ashdod and Be'er Sheva stations, but only for the total built-up areas of Ashdod and Be'er Sheva. The IBI report divides the market area of a station into three parts: the primary area, the secondary area and the tertiary area. The exact size of the three areas cannot be derived from the report. The data provided show, however, that the primary area is much larger than the 15 minutes travel area of the Transport Institution report. For instance, in the case of the Tel Aviv stations, half the population of the municipalities of Tel Aviv-Yafo and Givataim are supposed to lie within the primary zone. The data thus are less relevant from the perspective of bike and ride. The data from the IBI report are nevertheless used below, as there are no other data available about the current situation around the train stations.

Both reports thus have their drawbacks. For the purpose of this study it is most reasonable to take the data from both reports as a basis to assess the potential of bike and ride of each station. The results are presented below for population and employment respectively.

Criterion 4: Number of residents within vicinity of train station

Figure A.10 presents the available data on the number of residents which live within the vicinity of the 30 train stations under research. The right-hand column provides data for the current situation but covers a large catchment area, while the left-hand column gives the data for the situation in 2020 for an area comparable to the catchment area of the bicycle. Taken together the data provide insight into the *current* potential of each of the stations for the use of the bike in pre-transport (bike+ride).

The group of *urban stations* is headed by the three train stations in Tel Aviv. Especially the Tel Aviv Merkaz and Tel Aviv HaShalom stations have a high numbers of residents living in their vicinity. Both stations have an excellent location within the urban structure of Tel Aviv and the surrounding municipalities. The current location of the Tel Aviv University station is less optimal for bike+ride, as the station is located close to several areas with a minimal number of residents (Tel Aviv University, Park HaYarkon and the Exposition Centre). However, the station is also located within cycling distance of several residential neighbourhoods. The station of Kiryat Motzkin also offers a high potential for bike+ride. The central location of the station vis-à-vis residential areas implies that a high number of residents is living within the cycling distance from the station. The Haifa stations also have high number of residents within the larger area, but given the location of the stations within a hilly environment it is more reasonable to take a smaller catchment area as the basis for the assessment. From this perspective, the number of residents in the vicinity of both Haifa Merkaz and Haifa Bat Galim is much lower than that of the Tel Aviv stations and probably even lower than that of the Kiryat Motzkin station.

Within the group of *urban edge stations* the following stations have a high potential for the use of bike and ride in pre-transport: Hadera Maarav, Netanya and Rechovot. These three stations have in common that they lie within a short distance of the urban area of each of the cities. Many residents thus live within cycling distance of the stations, despite their urban edge location. The station of Hertzliya has also a relatively favorable location among the urban edge stations. Finally it has to be noted that the Bnei Brak station might have a high potential for bike+ride and in the future.

The *ex-urban stations* offer a relatively low potential for bike+ride. The station of Yavne offers the most favorable circumstances, due to the location of the station in the direct vicinity of this town. The stations of Binyamina and Rosh Ha'ain also offer a relatively high potential for the use of the bicycle in pre-transport. The Binyamina station is located inside the northern part of the town and is thus within cycling distance of at least a part of the population of Binyamina. The station of Rosh Ha'ain is located at a distance from the town, but due to the town size still a substantial number of residents live within the vicinity of the station.

Criterion 5: Number of jobs in vicinity of train station
Figure A.10 presents the available data on the number of jobs located with the vicinity of the 30 train stations under research. The right-hand column provides data for the current situation but covers a large catchment area, while the left-hand column gives the data for the situation in 2020 for an area comparable to the catchment area of the bicycle. Taken together the data provide insight into the *current* potential of each of the stations for the use of the bike in post-transport (ride+bike).

It may come as no surprise that within the group of *urban stations* the station of Tel Aviv and Haifa have the highest number of jobs located in their vicinity. The highest number is found in the areas around the Tel Aviv HaShalom and Tel Aviv Merkaz stations, while the Tel Aviv University, Haifa Merkaz and Haifa Bat Galim stations come next in row. Compared to these five station, the number of jobs in the vicinity of the other urban stations is rather limited.

Among the *urban-edge stations*, the highest number of jobs is found around the stations of Netanya and Ashdod Darom. The stations of Hadera and Hertzliya are next in row, while also the Chof HaCarmel and Bnei Brak stations offer a substantial potential for ride+bike.

Within the group of *ex-urban stations* it is again the Binyamina stations that offers the highest potential for ride+bike. While the number of jobs in the vicinity of this station is relatively low compared to the urban and urban edge stations, it is still much higher than the number of jobs located around the other ex-urban stations.

A.5 Accessibility characteristics of the stations

The accessibility of a train station by various modes of transport will have a substantial influence on the potential for bike and ride of a station. If a stations has an excellent accessibility by car or bus, it is less likely that many people will use their bicycle to reach the station, than if a station has a poor car and bus accessibility. This section provides data on the accessibility of the 30 stations under research. Three accessibility related criteria are distinguished: accessibility by car, accessibility by bus and geographical circumstances. The criteria will be dealt with subsequently below.

Criterion 6: Accessibility by car
The car accessibility of a station depends on factors such as the availability of a car among the people living in the vicinity of a station, the number of access roads from various neighbourhoods, the level of congestion on the access roads, and the number of (free) parking places available at the station. Given the availability of data the car accessibility is based on a qualitative assessment of the congestion levels on the access roads to the train stations in rush hours. This is an important figure, as a high level of congestion will make the bicycle a relatively attractive means of transportation compared to the car. The results of the assessment are shown in Figure A.11.

Figure A.11 Number of railway lines by which stations are served.

Type of station	level of congestion		
	high	**moderate**	**low**
Urban stations	Kiryat Motzkin Kiryat Chaim Haifa Merkaz Haifa Bat Galim T"A University T"A HaShalom T"A Merkaz	Nahariya Akko Be'er Sheva Merkaz	
Urban edge stations	Bnei Brak Petach Tikva Rechovot Hadera Maarav Netanya Hertzliya Lod	Chof HaCarmel Bet Yehoshua Ashdod Darom	Kiriat Gat Be'er Sheva Tzafon
Ex-urban stations			Chatsrot Yasaf Atlit Kfar Chabad Be'er Yaacov Rosh Ha'ain Kishon Binyamina

Source: Qualitative assessment.

Criterion 7: Accessibility by bus

The accessibility by bus is another factor that might influence the potential for bike and ride. The indicator that is used for the purpose of this report is the number of bus lines that have stops at a railway station. The higher the number of bus lines, the higher the bus accessibility of the station, and the lower the potential for bike and ride. The figures for the 30 stations under research are presented in Figure A.12.

The stations of Kiryat Chaim, Kiryat Motzkin, Tel Aviv HaShalom and Tel Aviv University show the lowest levels of bus accessibility among the *urban stations* and they are therefore also characterized the highest potential of bike and ride. The highest bus accessibility is found at the stations of Nahariya, Haifa Bat Galim, Tel Aviv Merkaz and Be'er Sheva Merkaz. Each of these stations is located adjacent to a (central) bus station or a node of bus lines and is likely to have a good or excellent bus connection with the neighborhoods and employment centres in its surrounding. It thus seems less likely that train passengers will choose to travel to each of these stations by bicycle.

Within the group of *urban edge stations*, the stations of Hadera Maarav, Petach Tikva, Netanya and Ashdod Darom are poorly served by bus lines. The passengers that use these stations could thus benefit most from adequate cycling facilities. The stations of Lod and Rechovot are relatively well served by buses, while Chof HaCarmel is located adjacent to a planned bus station.

The *ex-urban stations* are relatively badly served by bus lines. Worst of are the stations of Atlit, Yavne and Rosh Ha'ain. Binyamina is slightly better served. Each of these stations, however, seems to be in need of cycling facilities for people who do not possess a car.

Figure A.12 Number of bus lines by which stations are served.

Type of station	Served by				
	1-2 lines	**3-4 lines**	**5 and more**	**bus station**	**no data**
Urban stations	Kiryat Chaim Kiryat Motzkin	T"A HaShalom T"A University		Nahariya Haifa Bat Galim T"A Merkaz B"S Merkaz	Akko Haifa Merkaz
Urban edge stations	Hadera Maarav Petach Tikva	Netanya Ashdod Darom	Lod Rechovot	Chof HaCarmel	Bet Yehoshua Hertzliya Kiryat Gat B"S Tzafon Bnei Brak
Ex-urban stations	Atlit Yavne Rosh Ha'ain	Binyamina			Kishon Chatsrot Yasaf Kfar Chabad Be'er Yaacov

Source: Website of Rakevet Israel (www.israrail.org.il), October 2001

Criterion 8: Geographical circumstances

The bicycle accessibility of a station depends to a large extent on the provision of adequate cycling facilities. There is, however, another factor that will influence the use of bike and ride: the geographical circumstances around stations. A station that is located in a flat area will be more easily accessible by bicycle, than a station that is situated in a hilly surrounding. For this reason, the geographical circumstances in an area of 4 to 5 kilometer around the stations have been assessed. The circumstances have been labeled 'unfriendly' for cycling if the surrounding of a station is very hilly, 'moderate' if there are limited differences in height, and 'friendly' for cycling if the area is (almost) flat. The results are presented in Figure A.13.

The table shows that most of the *urban stations* are located in a cycling friendly environment. A moderate environment is found around the Tel Aviv University station, mainly due to the height difference between the station and the university campus. The two Haifa stations are situated in unfriendly geographical circumstances due to their location between the Carmel mountains and the Mediterranean Sea, although it has to be noted that a substantial part of the area around the station of Haifa Bat Galim – including several residential and employment areas – is flat.

Almost all the *urban edge stations* are located in a bicycle friendly environment. There are just two exceptions to the rule: Chof HaCarmel and Hertzliya. Like the two Haifa stations, the Chof HaCarmel station is between the Carmel mountains and the Mediterranean Sea. The most important employment center in its vicinity is, however, located in the relatively flat area along the coast. The Hertzliya station is located between the two parts of the city, both of which are built on moderately hilly surface.

The situation is less cycle friendly around the *ex-urban stations*. Three of the eight stations are located in areas with limited height differences. This is true for Binyamina, Yavne and Rosh Ha'ain. The other five stations are located in bicycle friendly geographical circumstances.

Figure A.13 Geographical circumstances in relation to cycling.

	geographical circumstances in relation to cycling		
Type of station	**unfriendly**	**moderate**	**friendly**
Urban stations	Haifa Merkaz Haifa Bat Galim	Tel Aviv University	Nahariya Akko Kiryat Chaim Kiryat Motzkin Tel Aviv Merkaz Tel Aviv HaShalom Be'er Sheva Merkaz
Urban edge stations	Chof HaCarmel	Hertzliya Kiryat Gat	Hadera Maarav Netanya Bet Yehoshua Lod Rechovot Ashdod Darom Be'er Sheva Tzafon Bnei Brak Petach Tikva
Ex-urban stations		Binyamina Yavne Rosh Ha'ain	Chatsrot Yasaf Kishon Atlit Kfar Chabad Be'er Yaacov

A.6 Conclusion

The results of the assessment of the bike and ride potential of the train stations are summarized in Figure A.14. The scores on each of the criteria have been translated into a three point scale:

0 = neutral circumstances for bike and ride
+ = positive circumstances for bike and ride
++ = very positive circumstances for bike and ride

The scores in the table reflect the position of a station relative to the other stations *within specific group of stations*. The double plus score of the *urban* Tel Aviv Merkaz station for the number of passengers is thus not necessarily comparable to the double plus score of the *urban edge* station of Rechovot. Yet, the double plus does mean that both stations have very positive circumstances for bike and ride compared to the other stations *within their group* (urban stations respectively urban edge stations).

It also has to be noted that the scores in the table reflect the circumstances for bike and ride. A double plus on the bus accessibility criterion thus does not imply that the station has a good accessibility by bus. Rather, it means the opposite and points at a poor bus accessibility and thus a high potential for bike and ride. The same goes for the car accessibility criterion.

Finally it has to be stressed that the final assessment of the bike and ride potential of each train stations is not simply a matter of computing the total number of plusses. Such a way of computing would ignore the relative importance of the various criteria. It may be clear, for instance, that number of passengers and the size of population and employment in the vicinity of the station are relatively important criteria in the assessment. A simple computation of the number of plusses would also ignore the fact that some criteria refer only to pre-transport or post-transport, while others refer to the bike and ride potential in both pre-transport and post-transport. The final assessment of each of the stations is thus a matter of careful and qualitative analysis of the results presented in Figure A.14 and of the data on which the scores are based. The table itself is only a tool to make the final assessment. In this way it can be an aid for all those individuals and organizations that want to promote bike and ride in a specific locality.

Figure A.14 Overview of the bike and ride potential of the stations according to the various criteria.

Station	number of railway lines	number of passengers		bus station in vicinity	population in vicinity	employment in vicinity	car accessibility	bus accessibility	geographical circumstances
		bike+ride	ride+bike						
Urban stations									
Nahariya	0	+	0	+	0	0	??	0	++
Acco	0	+	0	0	0	0	??	??	++
Kiriyat Motzkin	+	++	0	0	++	0	??	++	++
Kiriyat Chaim	+	+	0	0	0	0	??	++	++
Haifa Merkaz	+	0	+	0	+	+	??	??	0
Haifa Bat Galim	+	+	+	+	+	+	??	0	0
Tel Aviv University	++	0	+	0	++	+	??	+	+
Tel Aviv Merkaz	++	++	++	+	++	++	??	0	++
Tel Aviv HaShalom	++	++	++	0	++	++	??	+	++
Be'er Sheva Merkaz	0	0	0	+	+	0	??	0	++
Urban edge stations									
Chof HaCarmel	+	+	++	+	0	+	??	0	0
Hadera Maarav	0	++	0	0	++	+	??	++	++
Netanya	0	++	+	0	++	++	??	+	++
Bet Yehoshua	0	+	+	0	0	0	??	??	++
Hertzliya	0	+	++	0	+	+	??	??	+
Lod	+	+	+	0	0	0	??	+	++
Rechovot	0	++	++	0	++	0	??	+	++
Kiriyat Gat	0	0	0	0	0	0	??	??	+
Be'er Sheva Tzafon	0	0	0	0	0	0	??	??	++
Ashdod Darom	0	0	0	0	0	++	??	+	++
Bnei Brak	0	0	0	0	0	+	??	??	++
Petach Tikva	0	0	0	0	0	0	??	++	++
Ex-urban stations									
Chatsrot Yasaf	0	0	0	0	0	0	??	??	++
Kishon	0	0	+	0	0	0	??	??	++
Atlit	0	0	0	0	0	0	??	++	++
Binyamina	+	++	++	0	+	+	??	+	+
Kfar Chabad	0	0	+	0	0	0	??	??	++
Be'er Yaacov	0	0	0	0	0	0	??	??	++
Yavne	0	0	0	0	+	0	??	++	+
Rosh Ha'ain	0	+	0	0	+	0	??	++	+

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