More biking in
small and medium sized towns
of Central and Eastern Europe
by 2020

mobile
2020

HANDBOOK ON CYCLING INCLUSIVE PLANNING AND PROMOTION

Capacity development material for the multiplier training within the mobile2020 project

www.mobile2020.eu

Co-funded by the Intelligent Energy Europe
Programme of the European Union

IMPRINT

Prepared by (editors and authors):

Institute for Social-Ecological Research (ISOE)
Hamburger Allee 45
D-60486 Frankfurt am Main

Dr. rer. pol. Dipl.-Ing. Jutta Deffner (Introduction and part IV)
Tomas Hefter, Geograph M.A. (Introduction and part III)

www.isoe.de

Hamburg University of Technology (TUHH)
Institute for Transport Planning and Logistics
Schwarzenbergstr. 95 E
D-21073 Hamburg

Dipl.-Ing. Christian Rudolph (Part II)
Dipl.-Geogr. Torben Ziel, M.Sc. (Part I)

www.vsl.tu-harburg.de

General Editor and Distribution:

Mobile 2020 project consortium
www.mobile2020.eu

Suggestion for citation:

Deffner, Jutta; Hefter, Tomas; Rudolph, Christian; Ziel, Torben Eds. (2012): Handbook on cycling inclusive planning and promotion. Capacity development material for the multiplier training within the mobile2020 project. Frankfurt/Hamburg

The project is managed by

Baltic Environmental Forum Deutschland e.V.
Osterstraße 58
D-20259 Hamburg

Dipl.-Geogr. Matthias Grätz

www.bef-de.org

Frankfurt am Main/Hamburg, November 2012

Co-funded by the Intelligent Energy Europe Programme of the European Union

CONTENTS OF HANDBOOK

General aim of this handbook

The project "mobile2020 – more biking in small and medium sized towns of Central and Eastern Europe by 2020" aims to increase the modal share of cycling as a relevant mode of everyday transport. Cycling lacks the perception as a full means of everyday transport and is often seen as a recreational option or a means of transportation for socially marginalized people only.

Mobile2020 will enable a knowledge transfer and capacity development to increase cycling expertise in the target countries. The transfer of knowledge is ensured through the training of national multipliers from eleven Central and Eastern European countries on the state of the art in cycling promotion and planning. Our handbook addresses these national multipliers who are not decision makers or transport planners themselves. The multipliers will further the promotion of cycling in their countries by spreading their cycling expertise among as many decision makers as possible like politicians, urban and transport planners. However, we also aimed to make this handbook usable for transport and urban planners as well.

As the main target cities are small and medium sized towns of up to 350.000 inhabitants in Central and Eastern European countries, the material presented focuses on good practices in this realm.

This handbook therefore aims to provide material, case studies and theoretical background to intensify the professional knowledge on cycling as an efficient and full mode of transport in urban areas.

Structure of material

The promotion of cycling as an everyday mode of transport consists of different thematic fields which have close connections, overlaps and interdependencies. So the division in thematic fields is a pragmatic way to make the process of strengthening the capacities of multipliers in the target countries manageable.

Cycling transport and cycling promotion are interrelated and present the most important aspects to establish a more sustainable mobility culture whereby cycling is seen as a fully-fledged part of modern urban everyday mobility.

The four different thematic strands in the mobile2020 capacity development are:

- Strategic and integrated urban and transport planning
- Infrastructure planning
- Service for cyclists
- Communication and marketing aimed at behavioural change

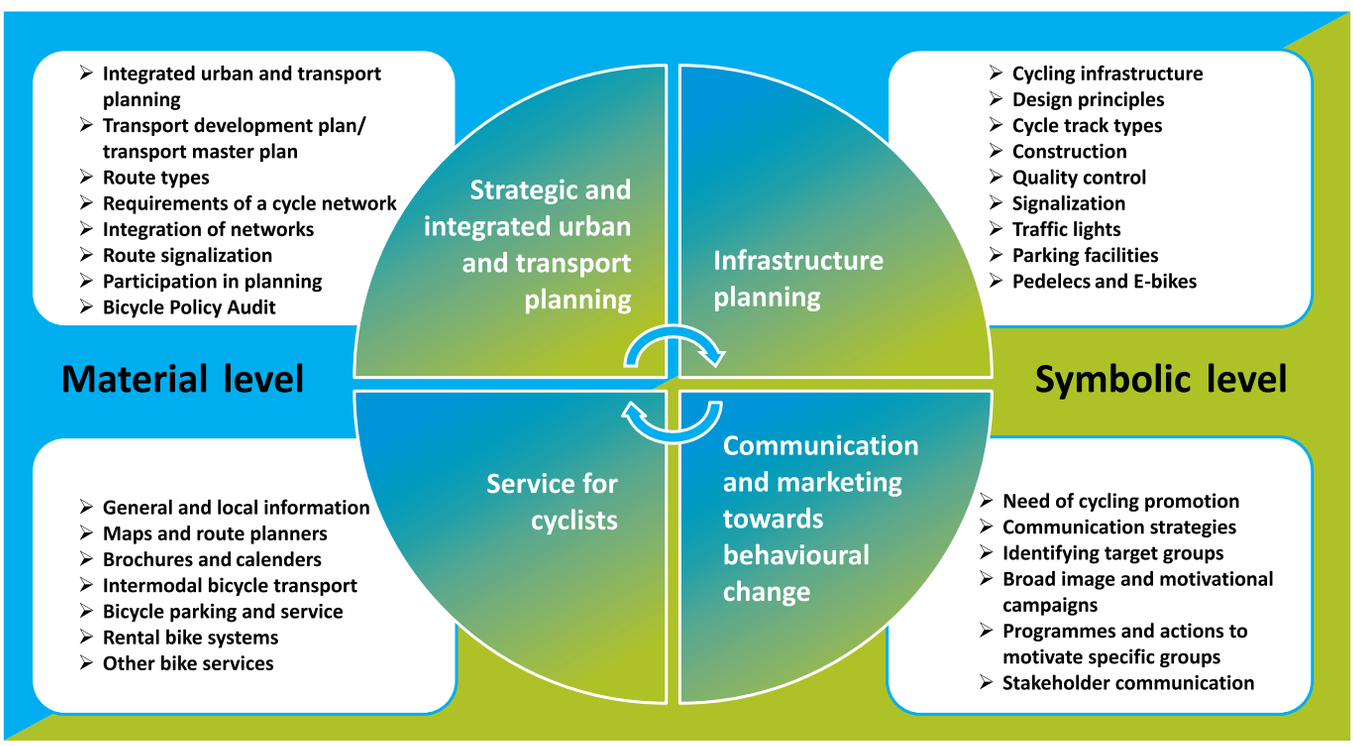

Figure 1: Mobile2020 - Cycling as a system
Source: Own compilation

It is significant to note that every thematic strand should be understood and implemented in connection with the other ones because isolated measures like building new facilities or infrastructure cannot be separated from measures like service, information or communication when intending to change the cycling conditions in towns and cities. No less important to note is that not all approaches and presented examples will fit for all local conditions in the mobile2020 partner cities. We had the aim, to show to some degree the broad variety of measures in order to inspire and give ideas on how well thought through cycling policies and conditions can be. The applicability of the presented best practices has, however, to be evaluated against the local background of where they are to be implemented.

Figure 1 gives a schematic idea about the concept of the four thematic strands of the mobile2020 materials. The figure also shows that cycling mobility is a system containing a whole set of different elements that allow an adequate use of the bicycle as a mode of everyday transport.

The concept of 'mobility culture' as framework for the capacity development process in mobile2020

The term 'mobility culture' is used in a number of contexts in the current debate on sustainable mobility and the quality of life. Other related terms such as 'traffic climate', 'bicycle-friendly climate', and so forth are likewise used in a somewhat metaphorical way to the extent that their meaning remains unclear.[1]

In brief, culture can be seen as a combination of "things" created by societies and their symbolic meaning. A good example of this is bicycle traffic. The symbolism attached to the bicycle, the way in which it is perceived and the degree of respect shown to it varies in different social and cultural milieus. It is possible to influence respect for bicycle traffic via rules and restriction or via a shift of meaning. The tool with which to achieve the latter is communication. It might help to illustrate this with an example: In the Netherlands ministers and the queen cycle, in India it is poor mans vehicle. In the worldwide cycle chic- movement, upper middle class people show their pride as cyclists.

With such an understanding, the built environment, means of transport, roads and railway infrastructure do not just exist as such, they are also symbols and subjects of discourse. A cultural term of this nature must abandon the idea of linear traffic control. Culture is a dynamic process whereby both intended and unintended effects as well as complex feedback may be generated. Variations of how feedback is allowed, occurring or taken into consideration by users, officials, decision makers are an essential element of changing the mobility culture. Examples of this are quality-improving participation as a form of communication, or feedback arising from a re-designed traffic space, and the behaviour, perception and communication of road users as set out in the 'Shared Space' concept (see Part II Infrastructure).

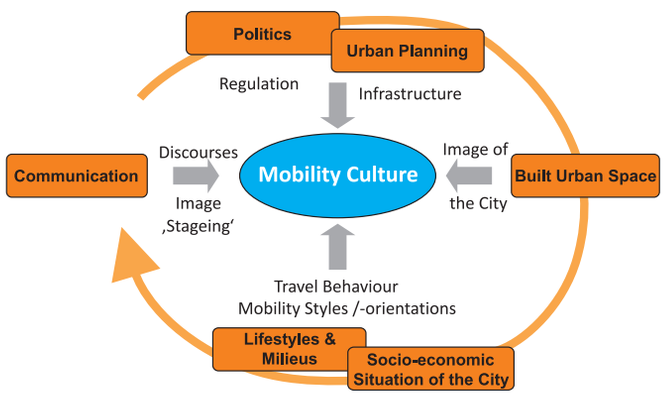

Figure 2: Influencing factors of mobility cultures
Source: Adapted from Götz/Deffner 2009

Cultures can first and foremost be viewed in a pluralistic and relational context.[2] Just as various mobility cultures exist, so, too, are there different pathways leading to a more sustainable mobility culture. The introduction of the 'economic', 'ecological' and 'social' triad determines the regulatory framework within which transport and mobility ought to develop. The term 'social' here means not merely avoiding discrimination and injustice when dealing with mobility, but also enabling a diversity of lifestyles and hence mobility styles.

In this way of thinking, a more sustainable mobility culture is multimodal and multioptional. This means, that there is not one universal mode of transport which is used to fulfil all purposes. Multimodality means to have many options as to which transport mode is most adequate, effective and enjoyable for the trip. This demand is not new to transport policy and traffic science, but hardly any towns/players are daring to confront the subject of 'combined transport' head on, i.e. in the public arena.

Communication and participation are the main parameters for firmly establishing a sustainable mobility culture. There are three distinct levels to this kind of communication:

1 Götz/Deffner (2009)

2 Janowicz (2006)

- Giving possibilities of self regulation/interaction in traffic by adequate infrastructure
- Exchange of information and presentation/staging
- The aim of feedback and exchange is not just to relay information from planners, developers or providers to the user. It is also important for information to flow in the other direction as an opportunity for users to provide feedback on what they want, need and dislike.

Presentation and image borrowing from product marketing: new transport possibilities must be presented as something meaningful and practical, but they must also be aesthetically and coherently designed to ensure their sensuous and emotional appeal. Implementation needs to follow the laws of marketing communications.

Cycling as part of a sustainable mobility culture

The promotion of everyday cycling is a continuous process which needs more than just well-thought-out investments in bicycle infrastructure. The decision of people to use the bicycle as an everyday means of transport is not just influenced by infrastructure alone. Therefore, it is crucial to consider, that travel behaviour is rather influenced by lifestyles and long-term mobility-routines than short-term rational choices. An example for routine behaviour is the use of the bike or the car for a short trip. It is not necessarily a decision taken anew for every journey.

As non-rational choices are difficult to change by infrastructure improvement for cyclists, it means that a systematic approach is needed in which non-rational (emotional) as well as rational aspects of traffic behaviour have to be taken into account. Creating safe cycling conditions by building a cycle infrastructure is undoubtedly a major and urgent task in the Central and Eastern European countries. But it also means including emotional and symbolic benefits of cycling, which could change the long-term mobility-habits and image of cycling. Mobility styles of people are influenced by the symbolic meaning attached to different mobility options. This symbolism varies depending on different social and cultural backgrounds.

As it is not possible to change these long-term mobility-habits and meanings attached to bicycle-traffic by simply establishing new bike lanes or facilities, professional communication towards behavioural change is essential for achieving a more frequent bicycle use in urban transport. Every kind of communication towards behavioural change has to take into account the fact that the symbolism attached to cycling is a basic part of action. To influence this symbolism in people's minds by communication means to aim at long-term established emotions, values, fears and needs of the people.

When considering communication towards behavioural change, it is also important to emphasize that communication is not subordinated to cycling infrastructure. Both the material dimension of the transport infrastructure and the symbolic dimension are an expression of a specific mobility culture. For the promotion of cycling as a mode of everyday transport in mobile2020-cities it is therefore essential to see the planning and building of bicycle infrastructure, service for cyclists and the communication towards behavioural change as one intertwined process. The mobile2020 folder will therefore follow the integrated approach of the mobility culture concept.

Approach of starter, climber and champion cities

Within the chapters of the mobile2020-handbook a lot of bicycle promotion and planning know-how is presented, which was originally compiled for the 2011 expired project "PRESTO".[3] The PRESTO material is based upon an approach which distinguishes cities into starter, climber and champion cities depending on their bicycle development levels based on two indicators. As this approach can be helpful for the mobile2020 partner countries the following paragraph will give a short explanation on this approach.

The level of cycling development of a given city depends on two indicators:

1. Cycling conditions and
2. Cycling rate

The assessment of cycling conditions includes: how safe, easy, convenient, and attractive is cycling at present? Here, the following aspects are analysed qualitatively:

- Cycling infrastructure
- Traffic intensities and speed levels
- Traffic policies such as traffic calming, car-free areas
- Urban lay-out: Is the city fairly compact, mixed and dense, with short distances between destinations, or is it more sprawling and car-dependent? Conditions may vary between areas within the same city.

3 Paragraph taken from Dufour (2010) and edited

Measuring the cycling rate as quantifiable indicator:

- Measuring the proportion of daily trips is done by bicycle defined on-street counting or surveys.

Starters have a low score on both, champions a high one. There will be no cities with top-notch infrastructure and no cyclists, and none with impressive cycling rates and awful conditions. But a large and diffuse group of climber cities faces very diverse challenges. There are cities with mid-range cycling rates (roughly between 10% and 30%), although cycling conditions are really quite poor. Then again, some other cities have made efforts to improve cycling conditions, but cycling still remains at disappointingly low levels.

The following diagram suggests a sequence of cycling development efforts across the three cycling stages (These recommendations are consistent with the BYPAD[4] quality levels in cycling policy). There is no direct correlation between a single specific measure and the effects on cycle use and safety. But it is possible to define broad aims and packages of measures more suited to the respective level of the city in question. Taken together, these can guide cities in developing a step-by-step strategy to take them from starter to climber and to champion level and beyond.

The diagram illustrates a number of ideas. Cycling policy at each level has different aims,

- Starter: from making cycling possible, safe and respectable
- Climber: getting people on a bicycle and
- Champion: keeping people on their bicycles.

This requires a different policy mix of infrastructure and promotion efforts, with greater efforts on infrastructure in the starter and champion stages, and more on promotion in the climber stage.

Please note that the proportions in the diagrams are indications of relative effort. They should not be understood as quantified indications of cost or investment. Overall costs are likely to be lowest at the start and to keep rising, as infrastructure is extended to a city-wide network and as it moves to more costly high-profile efforts, such as large-scale bicycle stations or long-span cycle bridges. Overall, promotion costs are much lower than infrastructure costs.

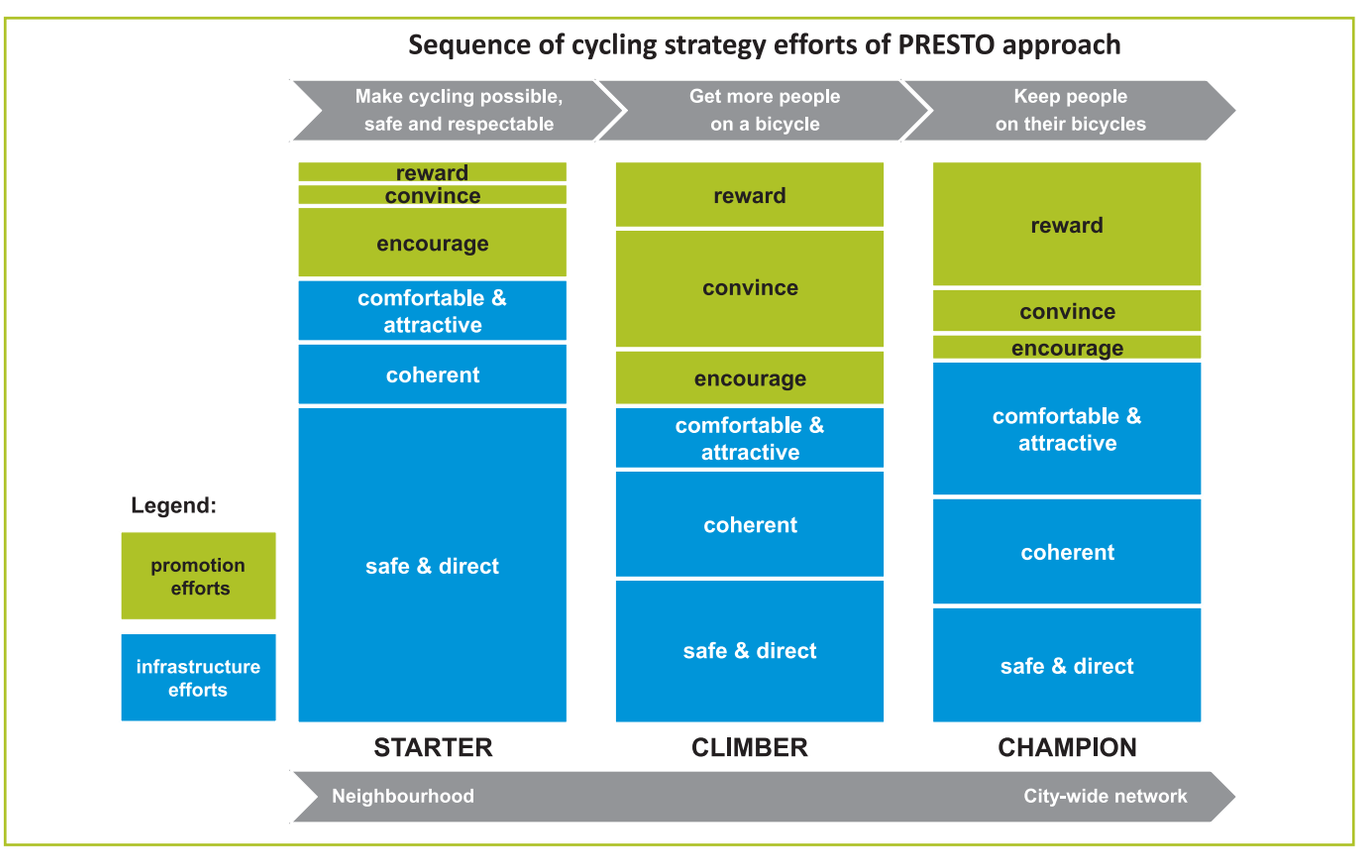

Figure 3: Diagram of PRESTO explaining the framework
Source: Dufour 2010

4 BYPAD (Bicycle policy audit) – see chapter in Part I Strategic planning

The diagram also suggests that all sorts of measures may be relevant at all levels, but that the focus may need to shift. This reflects the levels at which specific efforts are likely to be most effective. Cities should of course adapt this to their local situation and move measures forward or back as they see fit.

For more details on the PRESTO approach see publication “PRESTO Cycling Policy Guide General Framework”.

Note of the editors and acknowledgements

The following handbook is an edited compilation of texts, information and case studies which has been closely reviewed, newly structured and complemented for our specific purpose.

The editors of this handbook would like to greatly thank all authors and organizations having contributed with their publications, texts, photos and information to the compilation of this folder. Very useful for the compilation of this part of the handbook have been the following publications and information sources:

- Complete material of the IEE supported project “PRESTO” - Promoting Cycling for Everyone as a Daily Transport Mode. (www.presto-cycling.eu)
- CROW National information and technology platform for infrastructure, traffic, transport and public space, Design manual for bicycle traffic, Record 25, Netherlands
- FGSV - Forschungsgesellschaft für Straßen- und Verkehrswesen
- Case study data base of the IEE supported Eltis website (www.eltis.org)
- Handbook Urb-AL project: Integrating cycling in traffic engineering in Latin American and European medium sized cities written by Ton Daggers, Jeroen Buis, Ruud Ditewig, Claus Köhnlein, Walter Vogt, Stefan Alber and Jutta Deffner,
- GTZ (Publisher) / Godefrooij, Tom; Pardo, Carlosfelipe; Sagaris, Lake (Editors) (2009): Cycling-Inclusive Policy Development. A Handbook. Eschborn, Utrecht. (www.sutp.org)
- Trendy Travel Project
- Büttner et al. (2011): Optimising Bike Sharing in European Cities. A Handbook. (www.obisproject.com)
- Publications and case studies of the project LIFE CYCLE (http://www.lifecycle.cc)
- Case studies and activity documentations of the ADFC Germany (www.adfc.de)
- Good practice example data base of the German bicycle-portal website (www.nationaler-radverkehrsplan.de/en/praxisbeispiele/)
- Buis, Jeroen (2001) Planning for cycling as part of an integrated urban transport policy: reallocating public space. In: Daggers, Ton; Buis, Jeroen; Vogt, Walter; Deffner, Jutta; Ditewig, Ruud; Koehnlein, Claus (2002): Integration of cycling planning in urban and transport planning. Handbook. Urb-Al project. Utrecht.

The editors and authors also want to heartily thank the mobile2020 reviewers Willem Bosch, Ton Daggers, Andrej Klemenc, Konrad Kosecki, Csaba Mezei, Greg Spencer, Wioletta Szymanska, Linas Vainius and Ventzislav Vassilev, who took time and effort to read the draft version of this handbook and made very helpful suggestions. In addition we thank Irina Aļeksejeva, Tomas Rehacek, Greg Spencer, Wioletta Szymaska and Markus Müller for the good photographs they collected. We also thank Heidi Kemp, Linda Strelau and Steffi Schwerdtfeger for the proofreading and Nadia Nabaoui-Engelhard for her creative layout work.

This handbook was made possible by the funds of Intelligent Energy Europe programme.

Frankfurt/Hamburg, November 2012

Jutta Deffner
Torben Ziel
Tomas Hefter
Christian Rudolph

Figure 4: Cycling sign, Budapest (Hungary)
Source: Schuster 2011

Part I:
Strategic Planning

mobile
2020

CONTENTS

1. Strategic planning as an integral part of mobility culture

Planning is a relevant part of cycling promotion. Main objectives are to correct deficiencies in the status-quo, to define targeted measures and to use funds and resources efficiently. For this purpose, planning helps to structure and organise the efforts to be undertaken. Another important part of strategic planning is the ability to mediate between sometimes contradicting interests. Since bicycle planning does not stand alone but has to take other means of transport and urban development into account as well as superordinate topics such as finances or general politics it is necessary to adjust conflicting goals. During a planning process, objectives are formulated. If they are conciliated with other plans and interests, it is easier to implement the resulting measures to achieve the set objectives. This means that strategic planning supports bicycle promotion by being a useful tool for implementing measures and achieving goals in an efficient way.

Figure 1: Signpost of a cycling network, Hamburg (Germany)
Source: Rudolph 2011

2. Integrated transport policies

In the last decades many cities all over the world started to promote cycling as a mode of urban transport. However, few succeeded to integrate cycling as a full-fledged mode of transport in their urban transport system. [1]

Successful cycling policies are developed as part of an integrated transport policy for all modes of transport and should be reinforced by other policies such as land-use policies, urban development policies and even socio-economic policies as these policies influence each other. For example constructing cycle tracks on one hand and building new high-speed routes for motorised traffic on the other, will in most cases increase delays and decrease safety for cyclists and consequently lead to less cycling and more accidents. An integrated transport policy balances the different modes of transport and the space they use in the city by giving each mode its own function in the urban transport system. As a result travel times will be reduced for all road users. The city will become safer and the quality of life will increase for all citizens, cyclists and non-cyclists.

Although this chapter deals with cycling policy, it is essential to pay attention to the broader issue of urban transport policy, since an effective cycling policy cannot be pursued on its own. Any cycling policy should be developed as part of a broader urban transport policy and be firmly embedded therein. Traffic and transport determine to a large extent what a city looks like, they are essential for the economy and can have a very negative effect on the quality of life in a city because of problems of road safety, noise nuisance, pollution and in the case of car transport, even an increase of travel time as an effect of congestion. Cities have developed around transport systems, but simultaneously, transport systems and networks have adapted to cities. The huge role of transport in everyday city-life makes transport related objectives important for general objectives for a city.

An integrated urban transport policy consists of a vision that envisages the desired future transport system for the respective town or city, a set of objectives that need to be met and an overview of the measures, both physical (infrastructure) and nonphysical (pricing, regulations, promotion, etc.), that should be implemented to meet the objectives. These concrete long-term urban transport policies should be formulated in a strategy including:

1 Chapter 2 taken from Buis (2001) and edited

- Vision statement for the city and its urban transport system
- Objectives and targets for urban transport and the different modes
- An overview of both physical and non-physical measures to meet the objectives and targets

Figure 2 shows how visions, objectives, targets and measures are linked with each other and gives a few examples. Despite the fact that measures have the biggest practical impact, visions, objectives and targets are necessary to develop a strategy which makes it possible to choose the right measures for the right purpose. Objectives, targets and measures form a strategy to establish the desired vision.

2.1 Vision statement

A vision statement can be written for any policy field, but in order to pursue an effective urban transport policy, setting up a vision statement for the whole city is recommended. In short, a vision statement answers the question what kind of city is desirable, and thus guides policies for the city. The vision statement can include a wide variety of statements, but usually includes the following aspects:

- Statements about the desired quality of life in the city: what should life be like in the city?
- Statements about the economic fundaments of the city: how to earn money?
- Statements about equity and equality: how should wealth and access to services be organized?

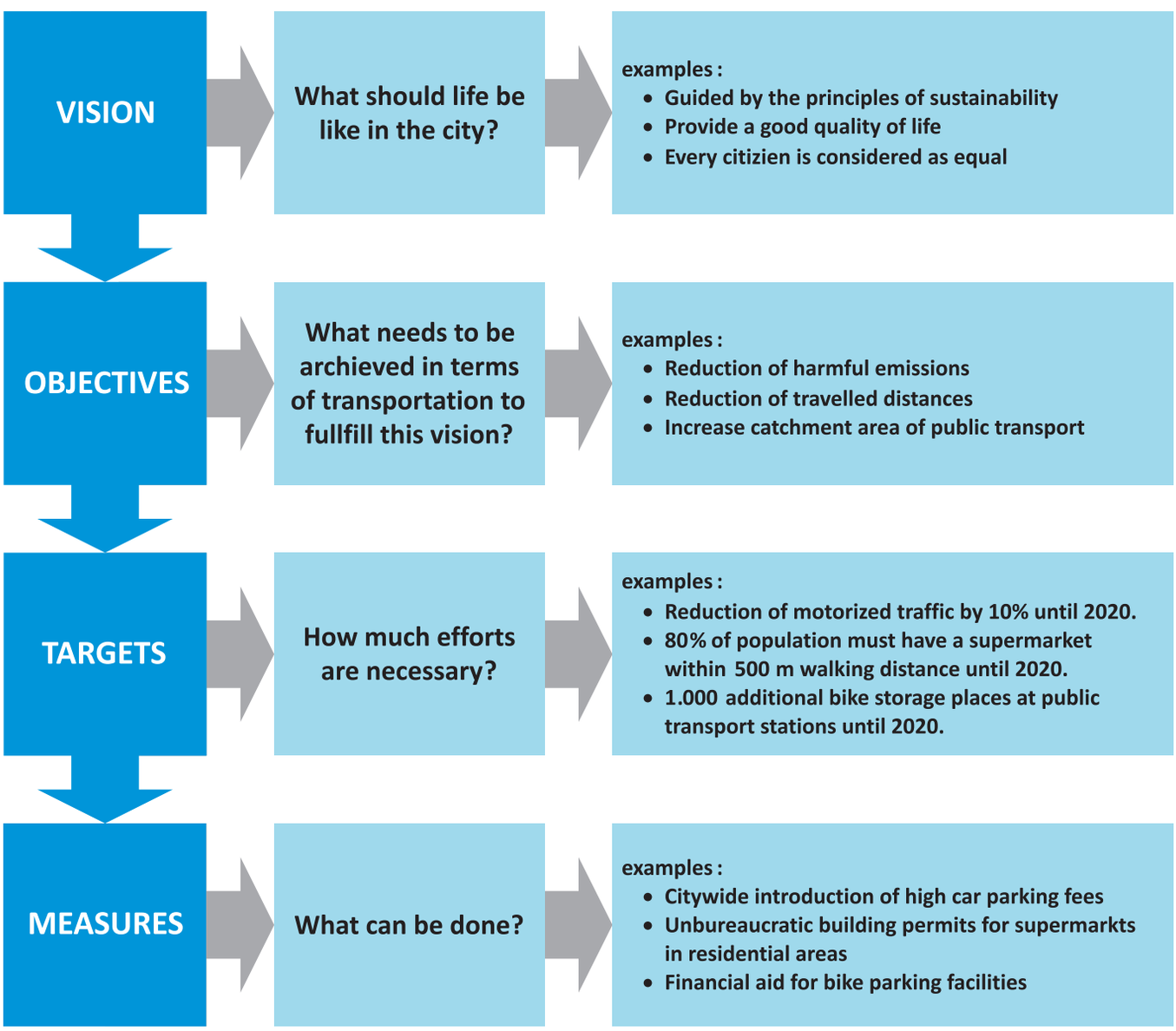

Figure 2: Linkages: from visions to measures (including examples)
Source: Own illustration

Most of these elements have links with transport, quality of life and economy in the first place. But also equity and equality objectives are influenced by aids for different modes of transport, since aids for cyclists and bus transport will benefit other segments of society than aids for car traffic.

A vision statement can be formulated by a small group of elected representatives but ideally the process is open to large parts of the city's population. How the general public can be included is handled in Part IV "Communication".

2.2 Objectives and targets of transport policy

Objectives define what is desired in wider terms. They determine the direction of a policy and have a very close relation with the vision statement, since both express higher-level goals. Targets, on the other hand, are concrete milestones on the road to the desired city or transport system. They can both be intermediate and final goals. As opposed to most objectives, targets can be objectively measured and include a timetable.

For example, an objective of a transport policy can be: a cleaner urban environment or an increase in bicycle traffic. Targets for the reduction of emissions can then be set in order to meet the objective. Usually a whole series of targets need to be set to make sure that the, rather broad, objective can be met. A target could then be, for instance, to reduce the total transport-related emissions of nitrogen-oxide (or fine dust, carbon-monoxide, etc.) by 10 % in 2020 compared to 2010 levels and by 30 % in 2030.

Since setting targets is of no use without first having a clear idea what higher-level objectives should be set for the transport or cycling policy, one starts off with defining objectives for urban policies and urban transport policies.

The general idea of establishing objectives is to formulate desires and once they are written down, communication about the objectives will be much easier. The definition of objectives therefore has a very important role:

- Objectives give planning tasks structure. They give a frame for status-quo analysis and are important for transparency of the planning process – both for experts and lay people (which deficit should be solved with which aim?)
- Objectives, targets and measures (to reach the objectives and targets) are directly connected as only such measures are useful, which help achieving the objectives and targets
- Objectives are fundamental in terms of evaluation, because only defined objectives allow to evaluate the success of measures or to compare the advantages of different strategies
- Objectives are fundamental as common base for discussions between planners, politicians and citizens

The overall objective of transport planning is accessibility of places, whereas quality of life, which includes environment, safety, security and equity, is the other main objective of urban (transport) policies. But also financial and economic balance is an objective. A balanced policy that takes all these high-level objectives into account is the main challenge for any transport policy.

Targets serve many of the same functions as objectives. The difference however is that they are measurable and clearly defined. They might be developed simultaneously with the policy that intends to meet those targets since starting off with targets, before any policy is in place at all, can be risky since it might be impossible to determine what is achievable. It is also possible to start with formulating objectives and after a detailed analysis of the given situation and problems define targets which are more detailed and suitable to the found situation.

Possible functions of targets can be[2]:

- As policy signals that indicate an intent and commitment for change
- As measurements of achievement
- As means of management and control
- As a lobbying device in order to gain greater interest in or resources for a particular issue

Before it is possible to set targets, the following needs to be done:

- The higher-level objectives need to be elaborated or split up into more defined objectives
- Appropriate parameters need to be determined that indicate whether transport in the city develops into the direction desired

Possible lower-level and higher-level objectives for urban transport are listed in Table 1 below:

2 Atkins (1992)

Low-level objectives	High-level objectives
Reduce average travel-time for commuting	Accessibility
Reduce the amount of annual traffic fatalities	Road Safety
Decrease the private car share in the modal split	Several
Reduce emissions from road traffic	Environment
Increase bicycle use	Several

Table 1: Low and high-level objectives for urban transport
Source: Buis 2001

The next step after establishing the lower-level objectives is to set targets for parameters indicating the lower-level objectives. Possible targets for urban transport policy:

For example:

- 50 % more commuter-trips by bicycle in 2020 compared to 2002
- A reduction of the share of local car-trips (modal split) from 50 % in 2002 to 40 % in 2020

When a concrete policy and transport plan is developed more detailed and defined targets can be set. But it is important not to confuse objects and targets with measures. Building infrastructure could be considered a target but it is also a measure to promote cycling. By defining the total amount of kilometres of cycle tracks as a target, the focus is shifted away from the overall objective of increasing bicycle use. This may be a corner stone of a bicycle strategy but it does not guarantee that the objectives will be met if other topics, like safety, are more important.

2.3 Land use planning and urban planning

Land use is the term used for the functions of land areas and the intensity of these functions. Functions can be residential, commercial, employment, recreation, nature, agriculture, etc. In cities the main functions are residential (where people live), employment (where people work) and commercial (where they do their shopping and go out). The intensity of the land-use can be defined as the number of inhabitants or employees per hectare or square kilometre, or for commercial land-use: the number and size of shops, restaurants, pubs, etc. or the number of visitors per hectare/square kilometre.

Land use determines traffic and transport in a city to a large extent, since people make trips to get to work, to visit friends or to go to a shop. Distances between these functions thus determine how far people have to travel and influence their mode of transport choice. If a citizen has his work place across the street, he will probably walk to work. If it is 5 km away, he might cycle, but if he has to cover 15 km or more, he will almost certainly decide to use a car or public transport.

The awareness, that land use planning can and should play a major role in policies that aim to solve the urban traffic problems and to promote walking, cycling and public transport, is relatively new but already state of the practice. A truly integrated transport policy cannot be pursued without paying due attention to land use planning.

The first question of strategic planning to be asked is what the objectives of land use planning should be. Below is a list of possible objectives:

- Reduce traffic by reducing trip lengths through bringing origins and destinations closer
- Reduce motorized transport by increasing walking and cycling through reducing trip lengths
- Reduce traffic by combining functions (e.g. residing, shopping and working) at one location
- Provide an appropriate and attractive environment for cycling and walking
- Increase the catchment-areas for public transport

How can these objectives be met? As function and intensity are the two parameters that determine land use, these are also the keywords when developing a land use plan.

In different countries and through different phases of history there are and have been different attitudes towards urban density. On a global scale population densities vary between cities. Asian and African cities tend to be denser than European cities or cities in North America. For example the cities of Budapest (HU), Houston (USA), Hamburg (DE), Vienna (AU) and Accra (GH) have a population between 1,7 and 2 million. But they differ in population density between 1.399 pop./km² and 10.613 pop/km² (see Table 2).

City	Nation	Popuation	Pop./km²
Budapest	Hungary	2 million	3.301
Houston	USA	2 million	1.399
Hamburg	Germany	1,8 million	2.381
Vienna	Austria	1,7 million	4.132
Prag	Czech Republic	1,3 million	2.534
Accra	Ghana	1,9 million	10.613
Hong Kong	PR China	7 million	6.390
Delhi	India	16,8 million	11.297

Table 2: Population densities in different cities
Source: Wikipedia 2012

Low-density cities cover much bigger land areas for the same amount of people and workplaces than high-density cities and therefore are less suitable for cyclists and pedestrians. Since cars require a lot of space and public transport requires a lot of people living or working near a station, cities with low densities have high car use and low public transport use whereas high-density cities have lower car use and higher public transport use. Newman and Kenworthy[3] found that in less densely populated cities, energy use in transport per inhabitant is higher because of higher car use and longer distances travelled.

The physical separation between work and residence that came up during the industrial revolution, but has increasingly been a tendency in most American and European cities throughout the 20th century, resulted into ever increasing commuter distances (particularly in low density-cities) and more and more car-traffic. Providing mixed-use urban areas with residential, commercial and employment functions, particularly in city centre areas and at public transport nodes, will enable people to live close to work, to walk or cycle to the shop or to use public transport for commuting or other trips.

In the end, in nearly all Western countries, the attitude towards living in the city fostered a suburbanisation process which led people and businesses to leave the highly condensed city centres and to settle outside the centre in the suburbs. The results were longer and more frequent commutes. But because of the reduced density and diffuse distribution of destinations (the city centre was no longer the only destination), public transport was not able to fulfil the mobility needs any more. And as distances became longer and longer, the bicycle as well was not an alternative anymore. The private car became the most important mode of transport. The massive extension of private car use, however, enabled easy and longer travelling but caused more and more congestion in the central parts of the cities in the 50's, 60's and 70's which resulted into more and more employment and commercial activity leaving city centres, to more car-accessible locations. A vicious circle was introduced. The effects of all this were, apart from longer trip distances and increasing car dependence and car-traffic, a decline of the inner-city areas. As the middle classes, businesses and investors left town, inner cities became the home of those unable to flee the city. Poverty, unemployment and a range of other social problems concentrated in these areas. A situation comparable to most Western European cities and, after the fall of the iron curtain, to Eastern European cities as well.

3 Newman and Kenworthy (1999)

2.4 Urban development and planning in historical context

Throughout the middle ages and the renaissance, the foundations on which the modern European cities have been built were established. The pre-industrial city was a small city with mixed land use and based on walking distances. Furthermore, high density was one of the most striking features of these cities as well as the fact that in the pre-industrial city the centre was the place to be and the centre of power and commerce. Therefore, the rich and the powerful lived and worked in the centre of town whereas the poorest people were pushed to the edge of the town. This demand for the best location in the heart of the city increased land values and motivated land-owners to develop sites to their maximum potential; thus leading to very high densities.

During the industrial revolution in Europe, this image changed as the small medieval cities were extended with polluting industrial complexes and cheap housing for their employers. The cities grew rapidly to a size that seemed difficult to control. Overcrowding, limited sanitation, pollution, crime and congestion (not by cars but by carts) made these cities a less-than-desirable place to live. While the wealthy medieval citizens jostled around a central spot in town, the well-to-do citizen of the industrial city fled the city to newly built suburbs, away from the fumes and overcrowding of the city. This development provided the foundations for the attitudes towards cities and urban planning that shaped towns and cities ever since. This summary of the effect of industrialisation and suburbanisation is common for the Western world, especially England and the USA. All over mainland Europe, the industrial revolution led to similar problems and developments as in England. However there are exceptions and cities were the effects were less extreme.

In Paris, the industrialisation led to suburban growth in the beginning of the 19th century. Probably, Paris would have followed the British experience if the urban planner Haussmann had not been charged with the implementation of Napoleon's vision of a great capital for his empire. Haussmann cut great boulevards through the high-density medieval city with six floor (or more) buildings along them. Since the boulevards and the buildings along them were to reflect the greatness of the Napoleonic Empire, they needed to be of high quality. In order to fund these expensive buildings, they needed to be middle class housing. Obviously the development of such large amounts of middle-class housing was inconceivable, if the French middle class continued to leave the city for the suburbs. The vision (Napoleon) and the

urban plan (Haussmann) were therefore backed by a policy to keep the French middle class in town: tax-incentives were introduced which made it very attractive to live in the boulevard-apartments. This was so effective that within a short period of time the French middle class did not aspire a suburban villa, like the English did, but a spacious urban apartment. Until now, it is quite normal for families with children to live in these apartments, while this would be considered eccentric in England.

The example of Paris shows that with a planned approach with the right measures, a counterweight to the forces of the free market can be established. Other European cities realised their own planned approaches which nowadays might not be as powerful as Napoleons plan for Paris but nevertheless result in the suburbanisation in European cities not being as strong as it is in the USA. During the Cold War and the socialistic centrally planned economy, the suburbanisation in most parts of Eastern Europe was quiet less intense than in Western Europe. But with the fall of the Iron Curtain, the East European cities started to catch up. This means that without intervention, the suburbanisation process with its vicious circle of increasing car traffic and declining city centres will continue to shape Eastern European cities as well.

2.5 Cycling-inclusive policy

Particularly during the last two decades many cities all over the world started to facilitate cycling as a mode of urban transport. However, few succeeded to integrate cycling as a full-fledged mode of transport in their urban transport systems. Often, despite bicycle tracks and lanes being constructed, cycling continues to be marginal, mainly for leisure while cycle tracks and lanes are barely used or misused for driving or parking cars. There are many possible explanations. Critics tend to mention the culture, the climate or the fact that the city is too hilly. Although this can be part of the explanation, more often than not, the undertaken projects, and the relative isolation in which they were developed, were to blame.

A common view about promoting cycling is that just adding some bicycle tracks to the urban transport system will do to make cycling succeed as a mode of urban transport. A few routes through some parks, along the beach or simply where space is available to build some tracks, however, will never make cycling big.

The following section aims to explain, how cycling should be looked upon and treated as part of an integrated transport policy and urban planning in order to create the basic conditions for cycling as a fully-fledged mode of transport.

2.5.1 Urban and Transport Planning

Urban and transport planning is basically the design or redesign of urban space. An integrated urban transport policy should determine how and when urban transport plans can be implemented. A sustainable urban mobility plan (SUMP), also known as sustainable urban transport plan (SUTP), thus is the outcome of an urban transport policy.[4]

Only new cities or districts can be designed from scratch, leaving all options open. Most contemporary urban planning and urban traffic planning needs to take the existing built environment as a starting point. This is a much harder task than starting off with a tabula rasa, since most urban space already has a function. So whether we want to provide facilities for cars, plan for better public transport or (better) facilitate walking and cycling, in most cases this means that urban space needs to be given a new function. Be it a green space converted into a road, a road or canal being replaced by a rail-line or car parking being replaced by a cycle track or footpath, in all these cases something must go. It is absolutely essential to be aware of this, since particularly in cycle planning, it can be tempting to see what space is “available” for cycle facilities, implying that all “used” space cannot be used to provide for cycling. An integrated approach to transport and cycle planning, however, takes all modes of transport into account and does not allow for such a kind of isolated planning.

After setting up a vision statement for the city, its traffic and transport system and determining objectives (see chapter 2.2), a policy can be developed to meet the objectives. The vision statement and objectives determine to a large extend what is expected by future measures. A city that has a vision statement saying that the main concern for the city is to maintain and enhance the strength and competitiveness of its port, will take different decisions and set different priorities regarding traffic and transport infrastructure, than a town stating that enhancing its attractiveness as a historical and tourist town is its main objective.

Most cities however will base a transport policy on:

- Mobility objectives stating that people should be able to get to their destination faster, safer and/or more comfortable

4 EU (2012)

- Quality-of-life objectives stating that it should be safe, healthy and attractive to live, work or recreate in the city
- Economic objectives stating that urban traffic and transport should support a healthy economic development

Congestion is often one of the main problems that transport policies have to deal with. Since congestion reduces mobility, negatively affects the quality of life and the environment in the city and harms the urban economy, an effective policy to combat congestion serves many objectives. An easy solution, however, is not available. An integrated approach dealing with all modes of transport is essential. One often applied solution should be viewed with suspicion: the extension of road capacity. This is in very few cases a solution to the problem, since - as has been experienced in cities all over the world - more roads attract more cars and eventually lead to even more congestion.

The most effective policy to combat congestion is an integrated transport policy and plan that makes alternative modes of transport more attractive and car use less attractive. Cities that pursued these kinds of policies face less congestion and shorter travel times. Singapore, which has a very restrictive car use policy, high density and very good public transport, is one of the best examples hereof, with car-speeds in peak hours not falling below 30 km/h in the heart of the city compared to 5 or 10 km/h in many cities that do not restrict car use. Although there is no standard recipe for such a policy, the following approach can be of use.

An urban transport plan for all modes:

- Plan the main routes for public transport, the so-called trunk-lines:
- These should connect residents with the main destinations in the city, like the city centre, the university, etc.
- High quality public transport should provide a high-frequency service (metro, tram, bus on dedicated bus-lanes).
- Plan the principal structure for the road network and assign functions to the roads:
- Design the main urban road network of urban corridors with a traffic function for transit traffic.
- Design areas as environmental traffic cells or pedestrian areas (these are traffic-calmed residential or city centre areas, the traffic function for car traffic here is very limited or zero)
- Assign function of collector road to roads that connect the urban corridors (a.) with the traffic-calmed areas (b)
- Develop a policy and plan for car-parking in the city
- Design a network for cycling that connects residents with all main trip attractors in town and develop a plan for bicycle parking (see chap. 2.6).

2.5.2 Including cycling in an integrated urban transport policy

Since in most cities, car use causes the majority of urban transport problems, a part of the solution for these problems can be found in constraining car use. This does not mean that the car should be considered a “bad” thing that should be combated wherever possible, but rather implies that car use should be discouraged when (time), where (space) and in those cases (trip purpose or distance) where other modes are more appropriate or efficient. This leaves road space for those car trips that cannot easily be substituted by other modes, due to a lack of feasible alternatives. The above implies that really promoting cycling as a fully-fledged mode of transport and realising a modal shift from motorised modes to cycling, requires more than just facilitating cycling. A more integrated transport policy is needed that indeed does include planning for cycling, but only as part of a broader strategy for all modes of transport. Such a strategy does not only intend to make cycling more attractive (pull-policy), but also to make private motorised modes of transport less attractive (push-policy) and of course to improve public transport and walking opportunities.

In several European countries (Germany, Denmark, The Netherlands, Switzerland, France, amongst others) these kinds of policies are pursued in cities to discourage private car use and make cycling, walking and public transport more attractive. The policy-instruments include a wide range of measures that can be subdivided in three categories:

1. Infrastructural measures to discourage car use and enhance alternatives, like:
   - New public transport lines to improve public transport services
   - Car-free streets or zones in city centre areas
   - Traffic calming in residential areas
   - City wide cycle networks with cycle parking facilities
2. Economic measures like:
   - Significant taxes on fuel and car-sales (e.g. Denmark)

- Parking fees in the city centre
- Road pricing and tolling (e.g. Singapore, Oslo, London)
- Subsidised public transport

3. Legal and organisational measures like:

- Time windows for trucks and delivery vans in city centre areas
- Possibility to take bicycles on trains, trams or buses
- Lowered speed limits throughout the city (e.g. Graz)
- Parking regulations for different areas (residential, commercial, city centre, etc.)
- Enforcement of parking regulations
- Mobility management plans for companies

Obviously, more often than not, policies and measures contain infrastructural, economic, legal and organisational aspects. Finally the urban transport policy should be underpinned by land-use policies that reduce trip lengths and provide opportunities for public transport.

The effects of these non-cycling measures and policies on cycling can be significant. In many cases, policies and plans, other than those including cycle facilities have been more effective in shifting the modal split towards cycling and improving the circumstances for cyclists than the provision of bicycle tracks and lanes alone.

In Amsterdam, for instance, bicycle use in the city centre increased in the 90's mainly due to car-restraining policies like the significant rise of the parking fees. Research showed that the provision of new infrastructure for cyclists had only a small stake in this increase of bicycle use.

3. Elements of integrated transport planning in practice

Transportation planning is not only the application of technical aspects but furthermore a compromise between manifold interests. Public space is limited and every interest group wants its own share. Pedestrians, cyclists, car drivers and public transport users are strong interests groups who argue about their space. But there are even more: rental bicycle providers who need space for rental stations, car-sharing companies who need space for their cars, etc. Furthermore, funds and resources are limited and when undertaking measures to promote cycling, efficiency must be kept in mind. Therefore a planned approach is essential.

Experience has shown that a defined superordinate traffic plan presents the best possibility to balance interests in a fair way: "Working according to a plan gives the best chance of protecting the interests of the bicyclist."[5] Strategic plans work on different scales. Basic types are national plans which focus more on visions and objectives at the national level. Local or regional sustainable urban mobility plans (SUMP) are required to formulate ideas concerning all modes of transport and get measures implemented. Derived from both national cycling plans and local SUMPs local cycling strategies incorporate national and local objectives and targets.

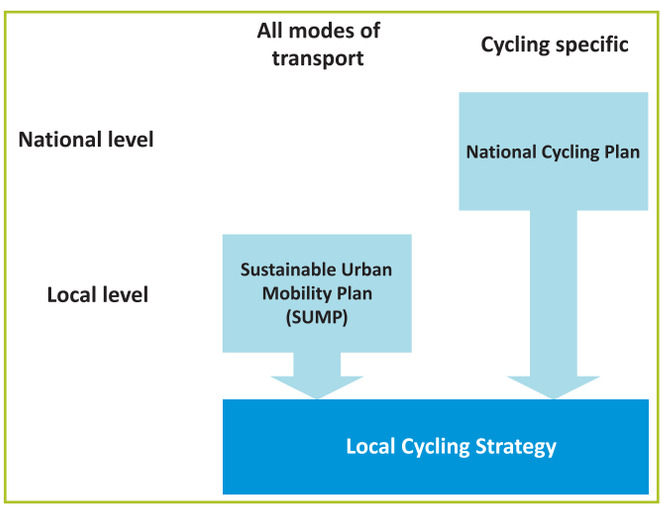

Figure 3: Relationship between plans
Source: Own illustration

"In spite of the benefits of a planned approach, cycling policy is often an ad hoc process. This is largely due to the fact that the bicycle itself causes few problems, only cropping up when problems caused by other road users have to be solved. Furthermore, cycling policy is in itself hardly controversial. Another factor is that people opt for the bicycle for many positive reasons. They enjoy cycling: it is healthy, good for the environment, fast, fun, tried and tested, so permanent attention to policy is only logical. Generally speaking, local traffic and transport policy is embedded in the traffic and transport policy of a regional or provincial authority. The same applies to cycling policy. But in addition to this administrative and policy based co-ordination, co-ordination "on the street" is also vital. Cycling links are usually local links and have to be established on a local scale. They often cross municipal borders as well, so policy co-ordination is inevitable."[6]

Planning often takes place because it is legally regulated and demanded. These plans mostly cover land use purposes to secure an organised settlement development. There is also sectoral planning which covers specific issues, for example: schools, hospitals, highways and railways. All these mandatory plans are called formal plans. They are often implemented in a fixed procedure. On the other hand, informal planning has become more and more diffused. It comprises planning tools and procedures which offer more flexibility because they do not have a regulated form. They are used to assist formal plans or to make plans for topics which are not legally regulated. In practice it is often possible to connect formal and informal plans. Table 3 shows the comparison between formal planning and informal planning.

Whether cycling is part of a formal or informal planning process depends on the situation in each country. The EU recommends the implementation of sustainable urban mobility plans (SUMPs), but they are not mandatory. However, national governments have the possibility to oblige municipalities to draw up SUMPs. If a municipality has to design a SUMP, it is common to integrate cycling into it. But cycling can also be a topic of other formal plans.

As long as no legal regulations are affected, it is possible to develop informal plans for bicycle traffic. However, they will not have the same weight as a formal plan but still can have a political impact. The following chapters present examples of formal and informal plans. Whether they are legally mandatory or not depends on the situation in the respective country. However, a national cycling plan is often an informal plan, whereas sustainable urban mobility plans can be derived from a legal obligation.

5 CROW (2007)

6 CROW (2007)

	Formal planning	Informal planning
Bindingness	Legally binding	Politically binding
Time scale	Medium term	Short to medium term
Spatial scale	Area-wide; large scale	Limited; project-oriented; small scale
Participation	Legal procedure; top-down-input	Cooperative participation; bottom-up-propositions
Priority	Plan-oriented	Action-oriented
Strength	Restrictive; normative; able to decide conflicts and enforce decisions	Proactive; open to the users
Weakness	Hierarchic-centralistic; inflexible	Often limited, if participants are unwilling to compromise

Table 3: Formal and informal planning
Source: Krappweis 2008

3.1 National cycling plan

By presenting a national cycling plan, a government emphasises its political commitment to promote cycling as part of sustainable transport development. The measures, proposals and schemes described within this document are aimed at significantly improving the basic conditions in favour of cycling. It is clear that the promotion of cycling and the increased use of cycles cannot be regulated or enforced by the state. Cycling policy requires persistence and continuity. This involves raising public awareness in a suitable manner and helping to make cycling more popular to change the general public's behaviour when selecting transport systems.[7]

The objective of a national cycling plan is to initiate new methods and implementation strategies for the promotion of cycling, to give recommendations for action and, in general, to make a contribution towards creating a bicycle friendly environment. A national cycling plan can grant financial support for certain measures, like cycle track construction or the development of a local bicycle strategy[8]. However, it most often formulates objectives and defines fields of actions which are to be considered during local planning processes.

3.2 Sustainable urban mobility plan (SUMP)

Settlement planning and traffic planning are closely connected. Making a trip is always related to a purpose, for example commuting to work, shopping or visiting friends and family. Since work, education, supply (e.g. food, services) are more and more geographically separated nowadays, people have to travel to satisfy their needs (see chapter 2.3). So traffic is the outcome of settlement development.

The EU recommends the implementation of sustainable urban mobility plans (SUMPs) to address problems caused by mobility. SUMPs are not mandatory but they assist municipalities by making the best use of all the transport infrastructures, coordinating between the various transport modes and promoting the least polluting modes.[9]

7 BMVBS (Ed.) (2002)
8 BMVBS (Ed.) (2002)
9 EU (2007)

Case Study: Masterplan Fiets –The Dutch Bicycle Strategy

Background:

- Long cycling tradition in the Netherland
- Decrease of bicycle use since the 1950ies
- Strong increase of car use since the 1960ies
- Oil crisis and high number of accidents fostered rethinking of mobility in the 1970ies
- Promotion of cycling in various cities supported by the government in the 1980ies:
  - New infrastructure:
    - 1978: 9.300 km of cycle tracks
    - 1988: 16.100 km of cycle tracks
  - Effect: strong increase of cycle use

Nationwide goals of the Masterplan Fiets:

- Support the shift from car to bicycle
- Support the shift from car to bike&ride
- Increase the safety for cyclists
- Protect from bicycle theft
- Improve bicycle parking
- Promote the bicycle image

112 projects undertaken by the Masterplan Fiets; for example:

- Infrastructure:
  - Building of bicycle boxes and cycle tracks at Schiphol Airport for employees (50 % more cyclists)
  - Network design in various cities
  - Testing of automated bike parking
- Research:
  - Relationship between mode of transport and shopping behavior (cyclists spend less money per visit but come more often; bottom line: mode of transport is irrelevant)
  - Possibilities of supporting cycle use for commuting (changing rooms, bicycle parking, restricted car parking are strong incentives)
  - Comparison of costs and benefits of cycle infrastructure investments for a municipality (investments in cycle infrastructure help save money because less has to be spent on car traffic)
- Cycle promotion:
  - Image campaign at Schiphol Airport
  - Brochures and newsletters about projects
- Results:
  - Increase of (total) cycle use
  - Nonetheless a strong increase of (total) car use
  - Large growth of knowledge about cycling habits
  - Realisation that not every aspect can be influenced by cycle policies
  - Realised importance of an integrated approach of traffic and settlement
  - Strategy supported the meaning of cycle traffic
  - Realisation that social requirements like the increasing need for mobility could not be satisfied by cycles alone[10]

Figure 4: Bicycles in the Netherlands
Source: www.bicy.it

10 DM (Ed.) (1999)

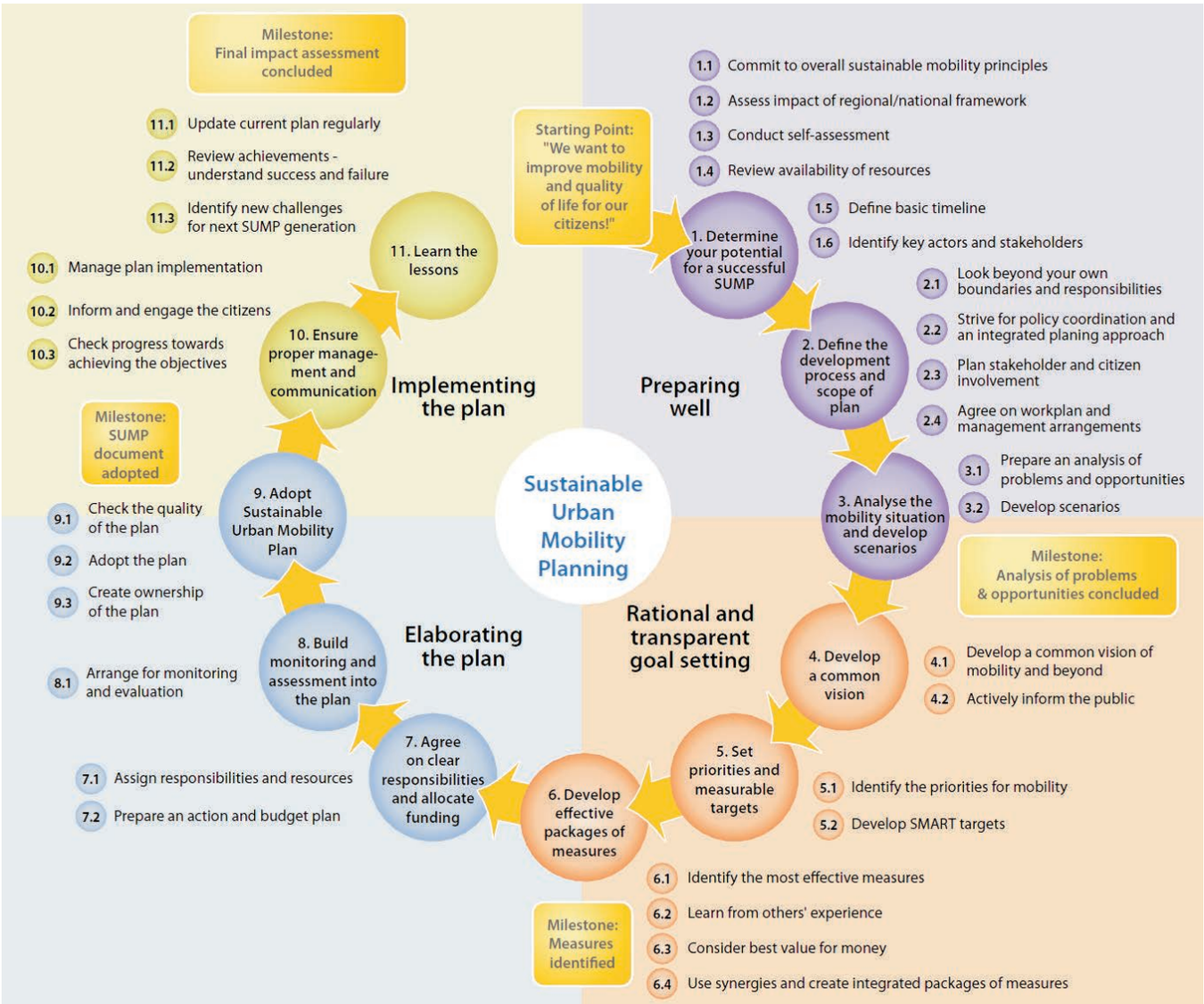

Figure 5: SUMP planning cycle
Source: Bührmann/Wefering 2011

In a SUMP the desired developments of every mean of transport are defined. The plan should be integrative, meaning that all different means of transport should be seen together as a whole transportation system. Every transport mode supplements other modes and offers the best and most efficient transportation. The definition and location of crossovers between different modes of transport are very fundamental, e.g.: location of Park+Ride or Bike+Ride facilities, car-sharing or bike rental stations.

"To set up an integral approach, a plan for a bicycle-friendly infrastructure and additional measures should be based on an integral traffic and transport plan. Only then is it possible to weigh up the interest of various road users and assign the different means of transport to where they can function most effectively."[11]

The SUMP contains future goals and visions for the transportation sector for the next 10 to 15 years. Each goal has to be quantified regarding realisation time and in absolute or relative (percentage) numbers. These goals have to be measured by a certain indicator. This indicator must be expressed in a certain measurement unit which can be monitored and evaluated. The basic concept for sustainable transportation planning from which all goals can be derived is:

- Avoid or minimize motorized traffic
- Shift motorized traffic to sustainable traffic (e.g. public transport and cycling)
- Operate non avoidable traffic in the most acceptable way (most efficient and least harmful)

Typical goals in transportation development plans are:

- "city-compatible" mobility
- capacity extension for public transport, cycling and pedestrian traffic

11 CROW (2007)

- parking management
- traffic control management/ use of telematics
- air quality improvement
- noise reduction
- environmental protection
- accessibility
- gender mainstreaming

Based on these goals suitable measures are formulated. These measures can be smaller or bigger packages which the municipality aims to implement during the next 10 to 15 years. For each mode of transport specific measures have to be defined. Measures can be e.g. the extension of existing tram lines, the construction of cycle infrastructure or the implementation of 30 km/h speed limit zones. Every measure which is agreed on has to be included in the traffic development plan.

Furthermore, experience has shown that the evaluation of such traffic development plans is fundamental. An evaluation always contains a survey about the as-is situation (before implementation). After some years an evaluation should be carried out to examine the progress and the development in the different sectors.

Case study: Transport Master Plan - City of Vienna

The city of Vienna (1,7 million inhabitants) enacted the transport master plan in 2003. An evaluation was carried out in 2008, after 56 % of the projects and measures which were defined in the plan were already realized. The master plan 2003 contained clearly defined goals with measureable indicators and targets for these indicators' development (which percentage in which time span).[12]

Goals (a choice of some goals which refer to bicycle use):

- reducing of the share of car use down to 25 % (long term)
- increasing of bicycle use up to 8 % (short term) increasing of public transport use from 34 % to at least 40 % (medium term)
- reducing of CO_2-emissions per capita by 5 % until 2010
- improving of the bicycle climate in the city (subjective feeling about the conditions to ride a bike)
- closing gaps in the cycle network (vision)
- implementing high quality infrastructure (vision)
- mixing traffic by implementing more 30 km/h speed limit zones
- opening of one-way-roads in both directions for cyclists
- creating secure and comfortable parking facilities
- creating more monitored and roofed BIKE+RIDE facilities in the outskirts
- providing a budget for building bicycle infrastructure between 2003 and 2008 of 30 Mill. EUR

Further reading:

Bührmann, Sebastian; Wefering, Frank (Eds.) (2011): GUIDELINES - Developing and Implementing a Sustainable Urban Mobility Plan (www.mobilityplans.eu).

12 City of Vienna (Ed.) (2005)

3.3 Local cycling strategy

A cycling strategy formulated in a strategic bicycle plan is a useful tool to organise cycling promoting measures. It can be derived from a higher ranking plan, such as a national cycling strategy, as well as a sustainable urban mobility plan (SUMP), an integrated land use plan or any other land use plan. If there are no plans to consider, a cycling strategy needs to be more comprehensive. Other higher ranking plans normally provide visions and objectives to the planning process. If no vision or objectives are given, it is important to develop them within the cycling strategy. However, if superordinate plans exist, the cycling strategy has to be coordinated with their goals and measures. The integration of these plans is very important. Contrasting goals, which would cause discussions and delays during implementation, can be avoided. If the country has a national cycle plan like e.g. Germany (Nationaler Radverkehrsplan) or the Netherlands (Masterplan Fiets), goals and measures have to comply with these superordinate goals of course. Every measure has to be thoroughly checked for negative interferences.

Creating room for cyclists and their specific needs is necessary to improve cycling conditions but has to compete with various other uses of public space for limited space and resources. A strategic plan supports this task by organizing efforts and if it is backed up by local politics and the administration, it is a powerful tool in this competition[13]:

The bicycle development plan contains the cycle strategy of the municipality respectively local authority. Setting up such a plan follows a procedure very similar to other transportation plans. The difference is that only measures about cycling are included and only visions and goals for the bicycle sector are defined. Of course these goals should not oppose the goals of the SUMP since it is a superordinate plan.

To foster and promote cycling, the support of different stakeholders is always necessary as well as the help of other interested groups. Collaborations, partnerships and other types of support are of great importance for any kind of action to be taken, whether by a public administration, cycling association or any other type of public organisation. How to integrate stakeholders and other players is subject of Part IV Communication.

The cycle development plan should be guided by a vision about the future of the city. This vision must be formulated explicitly and comply with the aims of the municipality. If conflicts between a vision, formulated by an interest group and the plans of a municipality occur, it might be useful to work out a new vision together as a common basis.

According to the vision, goals must be identified to define aspects which have to be improved in respect to cycling. Those goals have to correspond with the specific needs of the citizens, the condition of the infrastructure and the current share of bicycle use. The overall goal for a cycling development plan should be:

- Increase the share of bicycle use in reference to other modes of transport

Additionally, further goals should be defined, e.g.:

- Improve the situation for utility cycling
- Improve the local situation of mobility
- Increase traffic safety
- Raise the priority of cycling issues in municipal decision making
- Integrate transport issues better into other planning processes, etc.

As an example for an integrated bicycle development plan, the city of Munich (Germany)[14] defined, besides goals, the following spheres of activities in their cycling strategy:

- Increase the number and quality of bicycle parking facilities.
- Increase the flooring quality of cycle tracks.
- Increase the quality of BIKE + RIDE facilities during all seasons.
- Increase marketing and information.
- Conduct cycle traffic surveys and research.
- Improve the coordination between the city and surrounding municipalities.

The increase of bicycle use will be much higher if there is a long-term master plan. Isolated single measures will have an impact, but results will always be better and more sustainable, if there is a systematic and comprehensive cycle strategy.

Bicycle use as part of close range mobility (short distances) itself contributes to a liveable urban environment by avoiding noise and emissions, requiring less space and having a lower accident risk. Due to low space requirements for driving and parking, the bicycle contributes to preserving a close-to-home supply infrastructure with shops and other services within residential areas. Due to the low speed of bicycle traffic and

13 PRESTO consortium (2010a)

14 City of Munich (2009)

the possibility of direct communication and interaction with the cyclist, the bicycle revitalizes public spaces and increase public security.

The following chapters describe the steps necessary for designing a strategic bicycle plan. They are summarized in Figure 6.

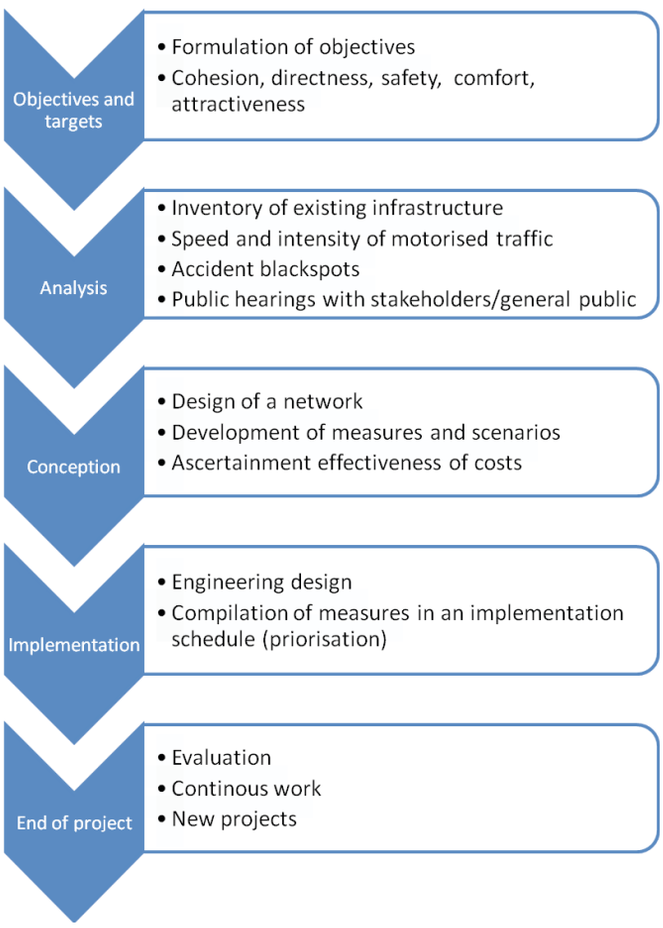

Figure 6: Implementing a bicycle strategy
Source: Own illustration based on CROW 2007

3.3.1 Objectives and targets

The underlying objective of most strategic bicycle plans is to get more people to cycle. But how this can be achieved and what needs to be done differs from town to town. Each cycling strategy begins with the awareness of a certain problem or the occurrence of a certain idea. In the context discussed here, the problem might be that too many cyclists get injured, that some parts of the city do not have an appropriate cycling infrastructure or are not linked with each other. The most important functional objectives for bicycle planning are:

- Cohesion
- Directness
- Safety
- Comfort
- Attractiveness

They are outlined in further detail in chapter 4.1. The objectives formulated at the beginning can be broad or vague because the problems may not be fully analyzed. But as the project proceeds, they should be transformed into clearer and more detailed targets (see also chapter 2.2).

3.3.2 Analysis

After having a vague idea about what to achieve with the strategy, it is necessary to gather as much information about the existing situation as possible. It is important to cover all aspects which are relevant for describing and solving the problem and helping to achieve the goals. It is important to find out what keeps people away from cycling. For the strategic planning of bicycle infrastructure this means that it is necessary to gather as much information about the actual cycling environment. This does not only include infrastructure but also services and important stakeholders. It is necessary to make sure to cover all important issues before organising the process.

This phase is mainly about learning everything there is to know about the given situation and the problems at hand. If deficiencies are found, the next step is to take action and develop a solution. After the analysis is conducted, detailed targets should be formulated. It is important to make target achievements measurable. This can be ensured by defining indicators which represent important influences on the given situation.

Figure 7: Exchange with stakeholders
Source: TUHH 2012

In chapter 5.1 some indicators are presented which help to assess the given situation and monitor progress. There is also a very good tool for a systematic evaluation of existing bicycle policies called BYPAD. It is further outlined in chapter 6.

It is possible to include stakeholders in this early research. It may be useful to consult people who are already cycling to find out about their experiences with the given situation and the difficulties they might see. Other stakeholders can be local authorities. How this is done is covered in Part IV Communication.

3.3.3 Conception phase

Based on the results of the analysis and the set targets, measures to improve the cycling situation according to the objectives of the strategy are developed in this phase. Ideas and solutions have to be developed and summarized in an action plan. Possible measures can be found through a review of existing solutions or, if they are not appropriate, new ones can be developed. Best-practice examples can be found over the internet, within cycling journals or publications from cycling institutions.

Typical problems at the strategic level occur with regard to the requirements of bicycle traffic networks. For example: If the existing network does not cover important origins and destinations for cyclists, a lack of cohesion might be the problem. If the analysis shows deficiencies, a goal for the conception phase would be to improve the cycle network, make it more comprehensive and establish more connections. Depending on the situation, this could mean that for example new infrastructure has to be built between the city centre and important residential areas. This problem is further described in chapter 4.2.

Another problem might be that there are connections but they contain (too) many detours (longer trip) and delays (loss of time). Measures to improve the situation could include opening of one-way streets for better connections or build new links (bridges, tunnels) to shorten trips.

Delays occur very often at traffic lights. It might be possible here to shorten waiting-times for cyclists, build roundabouts or find alternative routes with fewer intersections.

If many people are getting injured while cycling, a “lack of safety” is the problem. Possible measures can aim at defusing critical spots where accidents happen more often than elsewhere. Other measures could imply a city wide safety campaign or cycling lessons for vulnerable groups (for example school children).

After defining measures to improve cycling conditions, the most suitable ones need to be selected. To make this decision, it is possible to work with scenarios. In each scenario different measures are combined and for each scenario effort and outcome have to be estimated and assessed. The measures of the most efficient scenario should be implemented in the next step.

To define scenarios it is possible to hold workshops with interest groups. Different stakeholders and the general public can try to develop their own ideas or work together as accomplices, multipliers and supporters. This is further elaborated in Part IV Communication.

3.3.4 Implementation phase

The implementation phase can start after all the targets are set and measures to achieve these targets are defined. Now the design and the suitable adaption of specified measures are important. Depending on the particular actions planned and the respective feasibilities, it could be useful to work with a stepwise approach. This is especially helpful since not everything can be done at once. For a stepwise approach it is important to identify those aspects of the planned measures which are essential or offer a quick result and those which can be realized later on without threatening the overall goals of the project. For example if plans include rendering intersections to roundabouts because they are safer and reduce delays, it may not be possible to address all intersections of a city at once. The intersections should be analysed thoroughly regarding the number of accidents and the number of cyclist crossing them. Based on this analysis the intersections should be categorized according to their priority.

Now that a solution is found, the adherent measures need to be implemented. Actions need to be monitored. If there are implementation shortfalls, they must be assessed according to whether these are vital to the project and the desired outcome.

3.3.5 Completion and project review phase

When all planned measures have been implemented to achieve a certain target, the implementation phase is finalised. When projects are ending, it is important to identify those elements that need to be continued to guarantee an ongoing success. If further actions are necessary, a suitable structure for these actions has to be found and their funding must be secured. In traffic projects it is very common to transfer continuous work to public administrations for example by creating a new position or adapting existing ones.

Another important step which is regularly carried out at the end of a project is an evaluation. During the evaluation initial goals are compared with the realized

outcome. The comparison of input and outcome makes it possible to determine whether the project can been seen as a success (for monitoring and evaluation please refer to chapter 5). But success is not the only important aspect here. The experience of those involved in the project is also relevant, especially when it comes to new project ideas or important lessons for future projects.

Case Study: Hamburg's Cycling Strategy

Vision

The city of Hamburg (1,8 million inhabitants) has a clear vision of being a "growing city" which aims to be environmentally and family friendly. The program is designed for 15 years. Doubling the share of bicycle use is one of the main goals of Hamburg's strategy.

Goals

The strategy contains in total five major goals:

1. Increasing bicycle use from 9 % in 2002 to 18 % in 2015
   (first evaluation in 2008)
2. Increasing road safety (especially for cyclists)
3. Extending the cycle route network between districts
4. Improving the cycling "climate"
5. Ensuring the budget for cycle infrastructure and measures

Principles

1. Compliance with Hamburg's superior traffic programs
2. Compliance with the national cycling plan
3. Considering cycling as integrated into the transportation system
   (the bicycle is legally a mode of transport)
4. Improvements in infrastructure, services and communication
5. Implementation according to the special needs of each district
   (inner city, outer districts, etc.)
6. Rising the cities potential to more bicycle use

Figure 8: Cycling Strategy for Hamburg (Germany)
Source: City of Hamburg (2005)

7. Efficient coordination between decision makers throughout the city (politicians, municipality and planners)
8. Involvement of external institutions, associations and clubs
9. Regarding planning as a process which must be monitored and
   improved continuously (permanent task for policy)

Case Study: District Cycling Strategy for Hamburg-Bergedorf

According to Hamburg's Cycling Strategy, which was launched in 2005, each planning department of Hamburg's seven districts should develop a cycling strategy specifically for their district.

Starting from April 2008 stakeholders in the district of Bergedorf (120.000 inhabitants) met frequently to set up a strategy for the district which complies with the goals of the cycling strategy of Hamburg. Among others, representatives from authorities of Hamburg and the district Bergedorf, road and traffic authority, police, district council, associations like ADAC, ADFC and VCD, local business people and citizens participated in the meetings. The remarkable thing about the workshop is the extensive participation and the detailed draft strategy which resulted from these meetings.[15]

The participants set up three thematic strands and could agree on basic issues: a strategy for Bergedorf, a concept for a rural and an urban cycle network. The strategy for Bergedorf addresses:

- Everyday cyclists
- Schoolchildren
- Commuters
- Recreational/ leisure cyclists and tourists
- Sporting cyclists

The strategy for Bergedorf contains several strands:

- Attractive and secure cycle infrastructure (includes riding and parking facilities)
- Extensive service for cyclists
- Public relations for a better "cycling climate"
- Construction, operating and maintenance
- Tourism and the construction of more recreational routes
- Parking facilities (providing more high quality parking facilities, especially around public transport stations)

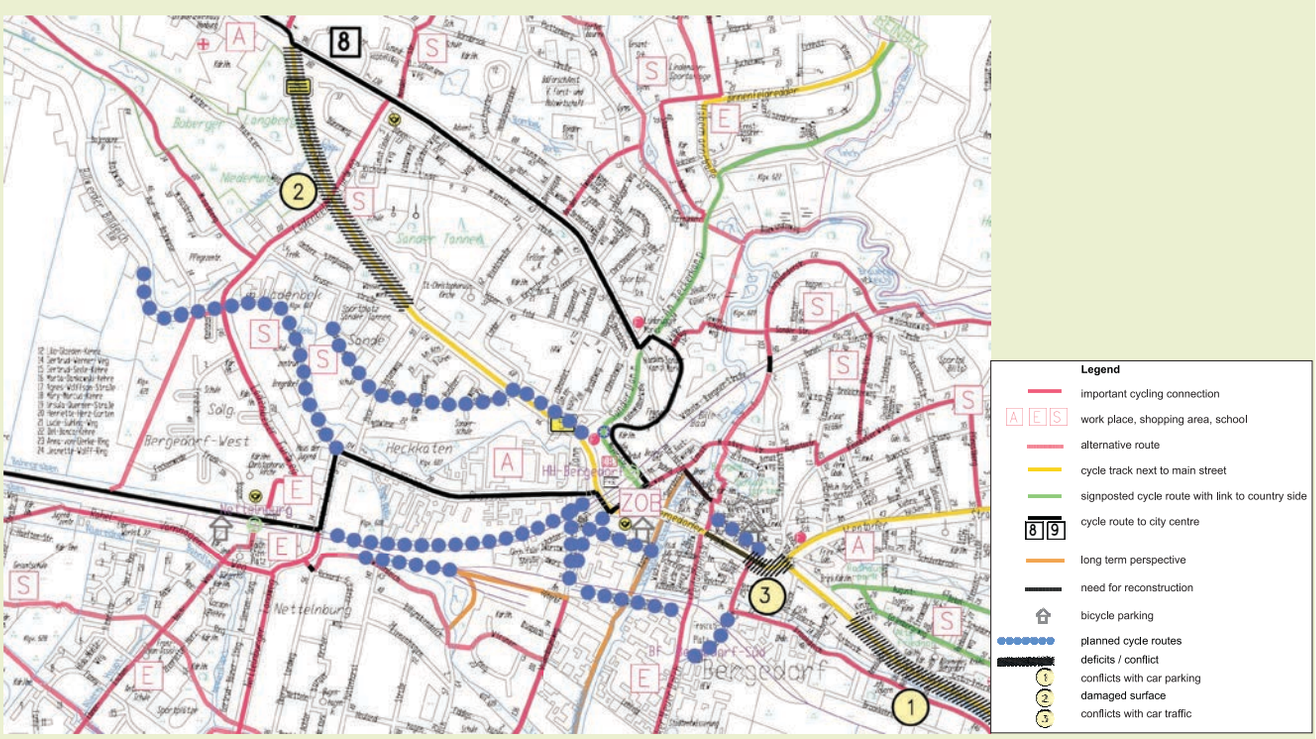

Figure 9: Urban cycle network Bergedorf (Germany)
Source: City of Hamburg 2008b

15 City of Hamburg (2008a)

Further reading:

Federal Ministry of Transport, Building and Housing (Ed.) (2002): German National Cylcing Strategy http://edoc.difu.de/edoc.php?id=YFGDITZ2.

City of Copenhagen (Ed.) (2012): Copenhagen cycling policies.

http://www.kk.dk/sitecore/content/Subsites/CityOfCopenhagen/SubsiteFrontpage/LivingInCopenhagen/CityAndTraffic/CityOfCyclists/CopenhagenCyclePolicy.aspx.

4. Planning a cycle network

One of the most important parts on the strategic level of planning cycling infrastructure is the design of a cohesive network. A cyclist needs to be able to go from his starting point to as many destinations as possible. But being connected to all relevant destinations is not the only requirement. It is important to secure a sufficient quality for the cycle tracks and offer additional services where they are needed.

4.1 Design principles

As shown above, cycling has a great potential to contribute to an effective, sustainable and healthier transport system. To create a cycling-inclusive environment, some basic requirements are important and it is always good to keep them in mind. For cycling, five main requirements are essential:

- Cohesion
- Directness
- Safety
- Comfort
- Attractiveness

Comfort and attractiveness are important goals, but they are less relevant at the network level but more on the level of the specific design of routes and road sections (see Part II “Infrastructure”).

4.1.1 Cohesion

The most elementary network requirement is network cohesion. This means that every cyclist can reach the desired destination by bike. Without cohesion there is no network, only an accumulation of single routes. This is a matter of degree: the more routes interconnect and allow cyclists to freely choose their ways, the stronger the network is. For cyclists, cohesion is a very vital quality: it is the extent to which they can reach their destination via the route of their choice.

To make a network cohesive, a clear understanding of major places of origin and destinations in a special context is important. By picturing connections between those, we can get an idea of potential travel flows. Using computer models to calculate travelling patterns is only feasible for champion cities (see introduction) with sufficiently large numbers of cyclists to provide meaningful data. Apart from major connections, the density of the cycling network (mesh width) is an important factor of cohesion: the smaller the distance between routes, the more cyclists have the choice, for instance between a fast route along a busy road or a slower but quieter one, or between a direct uphill route and a longer one avoiding steep hills. Apart from the internal cohesion of a cycle network, the cohesion with other networks also plays a role. Especially the intermodal connection of the cycle network to public transport stations is very relevant as cycle trips are an important mean of transport to and from public transport.[16]

4.1.2 Directness

Network directness concerns the distance or time you need to cycle between points of departure and destination.

Directness in distance can be determined by calculating the detour factor. The more a route from A to B approaches a straight line, the better for the cyclist. Detours and longer distances do not only extend travel time, they also increase the physical efforts of the cyclists and thus might discourage them.

Directness in time concerns the provision of connections that optimize traffic flow. The fewer stops and delays a cyclist faces on his way, the more direct is the connection. Stopping and starting up is very energy consuming and therefore increases the physical efforts in addition to the resulting time loss. The number of intersections per kilometre at which a cyclist does not have right of way can be used as a criterion. For main cycle routes, this number should be zero or as close to zero as possible. The stopping frequency per kilometre could also serve as an indicator for the directness in time. A survey on cycle networks in different Dutch cities showed a stop frequency of 0,40 to 1,56 stops per kilometre.[17]

In terms of policy, the bicycle should have more direct routes than the car in the built-up area. This way cycling is quicker than taking the car. This can be done for example by opening one-way streets for dual cycle traffic and creating new short cuts.

4.1.3 Safety

The basic requirement of safety is more than a matter of physical design. Much can be done to ensure traffic safety on the network level. Here are some guidelines:

- Avoid conflicts with crossing traffic. Especially in the built-up area this is not easy to accomplish without reducing the quality of traffic flows. In

16 Paragraph taken from PRESTO consortium (2010a) and edited
17 Paragraph taken from PRESTO consortium (2010a) and edited

theory grade-separated crossings (bridge, tunnel) with car roads would be perfect with regard to safety, but in practice traffic lights and traffic calming facilities are often more appropriate to avoid conflicts with crossing traffic.

- Separate different types of road users. When speed differences between motorized traffic and cyclists are too high these road users should be separated from each other and have their 'own' network of connections. A basic rule of thumb is always to separate cyclists from motorized traffic at (car) speeds over 50 km/h.
- Reduce speed at high-risk points. When separating different vehicle types is not possible, the speed differences between motorized traffic and cyclists should be minimized. The speed of the slowest means of transport (the bicycle) is used as the basis. The maximum recommended speed for mixed road use is 50 km/h but 30 km/h is much more preferable, be it only because injuries in case of accidents are significantly less severe then.
- Ensure recognizable road categories. Creating recognizable and comprehensible traffic situations is essential for safety. Consistent design solutions on roads with similar functions (in terms of road hierarchy) makes potential conflict situations more predictable for cyclists and other users, while also encouraging everyone to behave more predictably.[18]
- Design typically uncomfortable situations as transparent as possible. Tunnels tend to frighten people when they are too dark. Make sure that bike users can see the exit and that there are no dark corners.
- Offer alternative routes if the shortest way is deserted or unlit in the dark. The alternative can be a bit longer, if it offers more social safety.

4.1.4 Attractiveness

Attractiveness means that bicycle infrastructure is well integrated into agreeable surroundings. This is a matter of perception and image, which can strongly encourage or discourage cyclists. Since perceptions are highly variable and individual, general rules are hard to give. But appearance should receive full attention in planning and when analyzing usage levels and complaints. Apart from design, landscape qualities and the image of an area, this also includes the factor of actual and perceived „personal security". This is particularly crucial in the evening and at night. Passing traffic is always a source of noise nuisance as well as unhealthy fumes.

18 Paragraph taken from PRESTO consortium (2010a) and edited

If possible, contacts between motorised traffic and cycle traffic should be keep at a minimum. However this might not be possible since major roads regularly offer the most direct and most cohesive connections. But if alternatives are available, they should be considered.

4.1.5 Comfort

Comfort is about creating an enjoyable, smooth and relaxed cycling experience. Physical and mental effort should be minimized as much as possible. For smooth driving, frequent efforts should be avoided: having to stop and start repeatedly is tiresome and stressing. Low quality or lack of maintenance cause rides to be bumpy and inconvenient: this makes cycling a more complex task, requiring more concentration and effort to keep a balance and spot nuisances in advance. Furthermore, finding the right way and the right direction can be a problem. Therefore, a proper signage is needed. Using clearly visible landmarks can also be helpful.

4.1.6 Hierarchy of different transport goals

In practice these requirements may conflict sometimes. Then it becomes a matter of achieving the right balance. Consider the following common situations:

- The most direct route often runs along a busy road and is therefore less safe or attractive. Building segregated cycle lanes can guarantee safety. An alternative route away from traffic may be safer and more attractive, but probably longer and less direct.
- For safety reasons, cyclists are sometimes required to make a detour via a tunnel or a bridge, or to stop frequently at traffic lights. Both reduce directness (detour, waiting time) and comfort (climbing slopes, stopping and starting).
- The most direct route runs through green parks or outside built-up areas. This may be visually attractive, but is often unsafe at night or perceived to be so.

There are no standard solutions for prioritizing objectives. But as a general rule safety must always be the top priority. Routes can also be separated according their purpose into "utility routes" and "recreational routes". Utility routes are used when the cyclist rides to a certain facility (i.e. school, work) where distance and travel time are essential. On recreational routes cycling is a way to relax and to explore the region. Sometimes a clear differentiation cannot be made. The more often a trip is taken, the more relevant travel time and distance become. Fast and easy routes are crucial for daily trips even if they run through less attractive surround-

ings. For recreational routes, attractiveness is a major concern and detours are much less of an issue.[19]

4.2 Network design

The following chapter deals with the design of a cycle network. Recommendations are given on how to set up a cycle network from scratch.

4.2.1 Assigning origins and destinations

Like for any other transportation mode, planning should start with the identification of users' origins and destinations which depend on the study area. Origins are the places where people start their journey. Destinations are places people might want to travel to. Since every origin can be viewed as a destination and every destination can be viewed as an origin, in this context all homes will be viewed as origins and the places travelled to like schools, workplaces or shops will be treated as destinations.[20]

How a destination is characterized depends on the scale you are working on: At the larger scale of the urban region, a city centre can be regarded as a single point, while at the smaller level of the network inside the centre, the various neighbourhoods and districts will be regarded as individual points.

Since all residential neighbourhoods and districts are viewed as origins, they should all have access to as many destinations as possible. Typical main cycling destinations are:

- Schools and universities
- Shopping areas
- Sports facilities
- Employment concentrations, such as large companies and business parks
- Major public transport hubs and interchanges (railways, bus, tram, metro)

All these facilities have their own zone of attraction. This means that an elementary school only needs to be accessible by children and teachers who actually go there and usually live near by. The same applies to small shops which only have a local clientele. On the other hand city centres and large business districts are important destinations with a larger catchment area.

To determine the importance of a destination can be characterized by size (see Table 4) and all facilities of the same kind can be ranked. The larger a facility is, the better and more direct accessibility should be.

Facility	Indicator
School	Number of pupils
University	Number of students
Shop	m^2 shop space
Theater, cinema, stadion	Number of seats
Business district	Number of jobs
Public transport	Number of departures

Table 4: Possible indicators for ranking facilities
Source: Own compilation

After having identified the important destinations, they can now be connected on a map with simple straight lines (see Figure 10). The result is called the preferential (theoretical) network, a set of high-potential links that the network must contain.

Designing the preferential network can be facilitated, if data on (bicycle) traffic volumes is available (see chapter 5). This helps to identify important points of interests.

Since most of the important facilities are in the city centre, this typically leads to a radial network with strong lines towards the centre, especially in small and medium sized towns. But it could be useful to implement circular roads around the centre. This creates shortcuts for everyone travelling to the adjacent neighbourhood without having to go through the centre.

4.2.2 Turning preferential network into real routes

The preferential network created in the last step consists of linear distances and not actual roads and pathways with curves and barriers. So, the origin-destination links should be detailed into routes. They should be drawn on a map, along existing roads and cycle infrastructure (see Figure 11). This will also show missing links and cycling shortcuts which need to be created. The shortest most direct route should be considered first and checked against the other criteria. An important topic in this context is the decision between separating or mixing different modes of transport. The advantages are discussed in chapter 4.3.4.[21]

19 Paragraph taken from PRESTO consortium (2010a) and edited
20 Paragraph taken from PRESTO consortium (2010a) and edited
21 Paragraph taken from PRESTO consortium (2010a) and edited

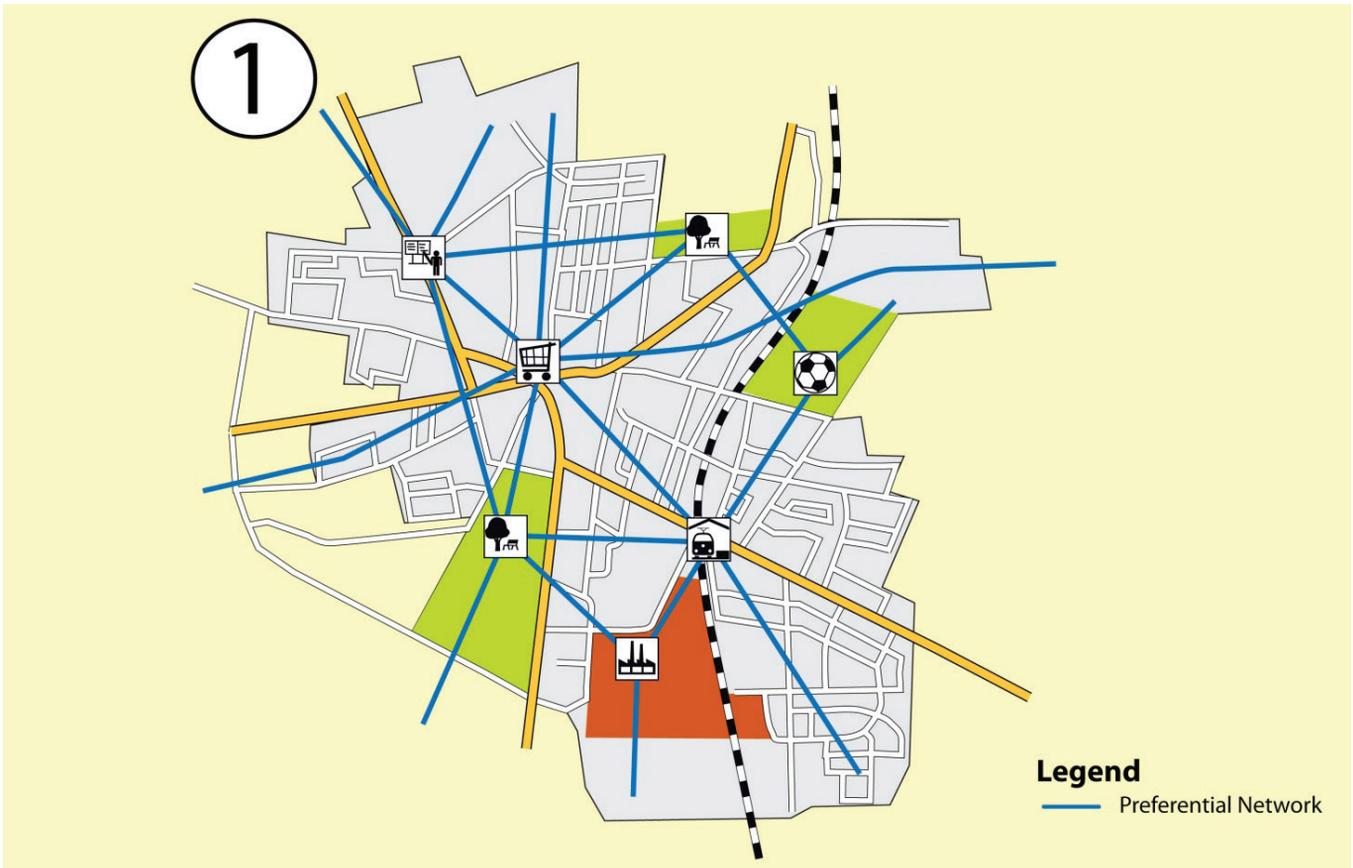

Figure 10: Preferential network
Source: Own illustration

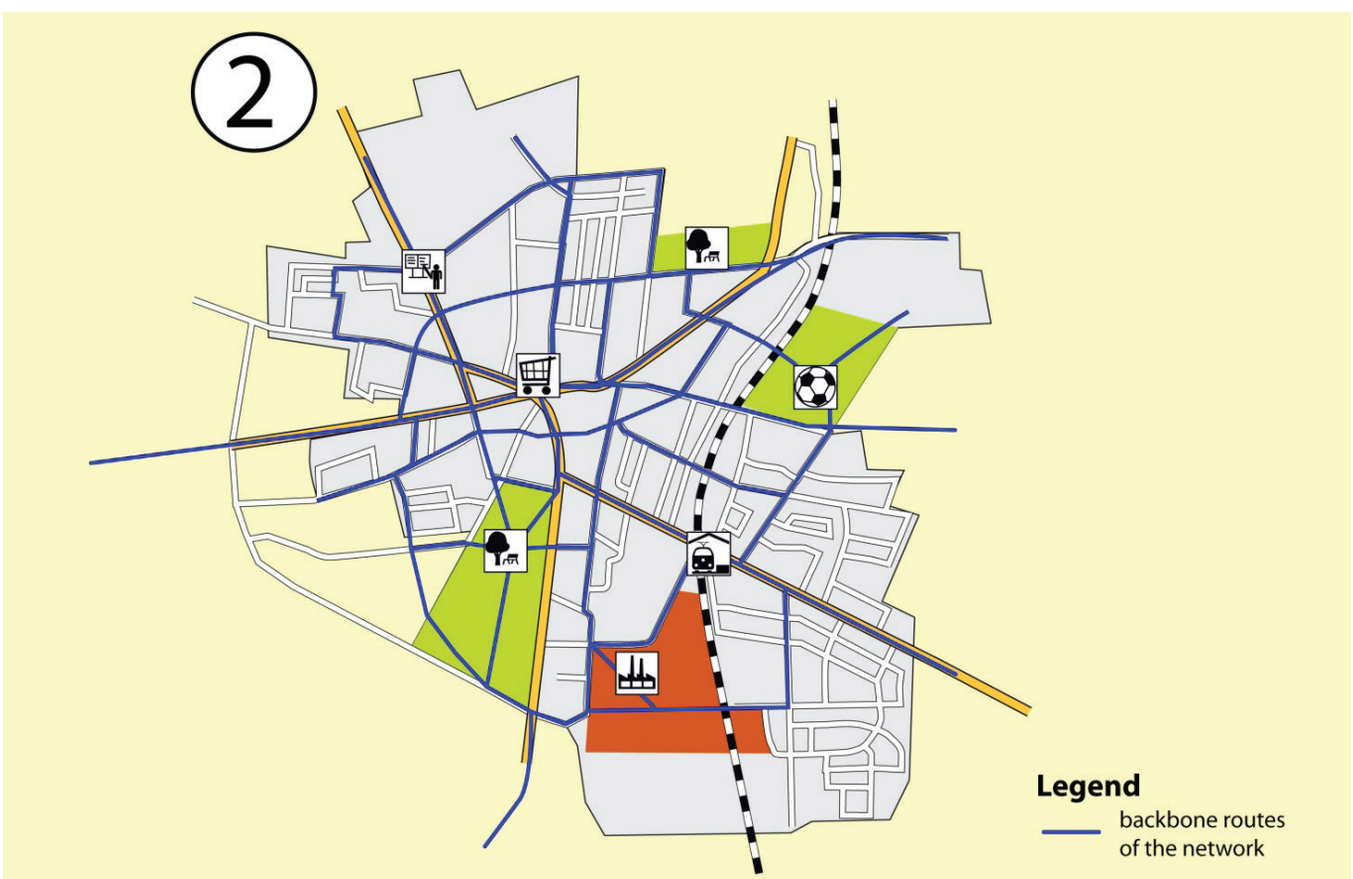

Figure 11: Routes of a network
Source: Own illustration

The right network plan ensures availability of bicycling infrastructure at a convenient and accessible distance from both origin and destination. Usually the origins and destinations of cyclists are spread throughout the city. This implies that the bicycle network has to be citywide and cannot be limited to certain localities.

Defining the routes and their required design qualities will depend on the importance of the link, in other words the numbers of current or expected cyclists. If numbers for current cyclists between areas are available, these can be allocated to the route to be created. Data on travel behaviour or numbers of cycle traffic flows at different points in a city can also help in determining the main cycle routes. Only in cities or areas with high rates of cycling traffic modelling is an option, for instance to determine the potential use of building a cycling bridge as a shortcut.

At the same time some routes will appear to be used more frequently than others as they serve as main cycling connections between the different parts of the city. Thus the cycling network can be divided into hierarchic levels: a network of main cycling routes (used for longer cycling trips) and feeder networks at district and neighbourhood level. It is obvious that the main cycling route network should be designed to accommodate these larger numbers of cyclists.[22]

4.2.3 Creating a hierarchy in the network

The network created in the last step considers only the most important origins and destinations and the main cycle routes (see figure 12). These routes are the backbone of the future network. Since there are more destinations and origins (every house is an origin) the network needs to be without gaps. This is similar to the road network, where a hierarchy is applied to reflect the importance of a connection (see figure 13). A road network varies from motorways to district roads and local roads, the same thing can be done for the cycle network. Across an urban area cycle network users have different priorities at different times: short trips or long trips, utility or recreational purposes, speed or safety. To respond to these different needs, cycle routes can be classified into three levels:

- Main routes have a connecting function at city or intercity level. They connect suburbs and residential areas to the city centres but also villages, towns and cities with each other, outside the built-up area.
- Top local routes have a distributor function at the district level of the built-up area. They provide the main cycling connections between urban districts and major urban areas.
- Local routes have an access function at the neighbourhood level. They include basically every street or track that can be used by cyclists, connecting all buildings and other origins and destinations to higher level routes.[23]

It becomes clear that every road needs a minimum cycling quality in order to make a consistent cycle network. By adding a hierarchy, the whole cycle system becomes more capable to provide fast connections, to accommodate larger amounts of cyclists and to offer more safety.

In practice, the hierarchy between these three categories (main routes, top local routes and local access routes) can be represented by the quality of the structural design but does not have to.

The structural design should be chosen depending on the expected traffic volume. Basic rules for qualities which a route has to offer under given circumstances will be defined in chapter 4.4.

4.3 Important network properties

When designing a network some decisions need to be made. The following properties are not to be seen as universal. They should only apply where they are feasible. This makes it hard to plan a network because it is always necessary to analyse the given situation thoroughly. A good analysis can save a lot of money and effort, if for example ways are found to improve the existing infrastructure instead of building a totally new one.

4.3.1 Dedication – utility and leisure networks

To focus on cycling as a daily transport mode, a utility network must be set up as opposed to a recreational network. The goal of a utility or functional cycle network is to connect destinations for functional trip purposes such as shopping, working, education, sociocultural visits etc. The connections should be as direct as possible. On the other hand, people like to cycle for recreational purposes. For these, the attractiveness and experience offered by the cycle route and its surroundings is more important than direct connections.

22 Clean Air Initiative (2009)

23 PRESTO consortium (2010a)

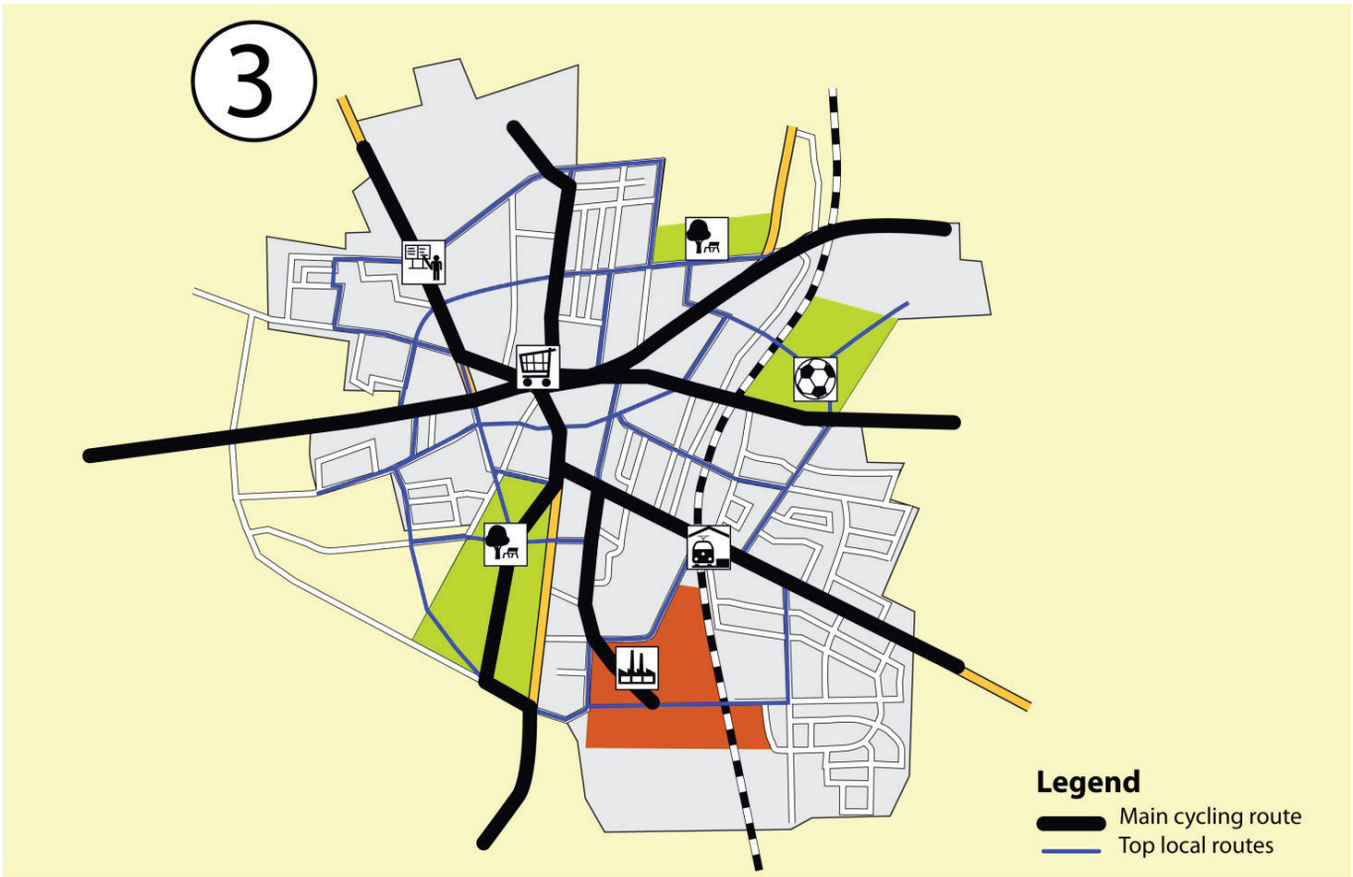

Figure 12: Hierarchy of the main network
Source: Own illustration

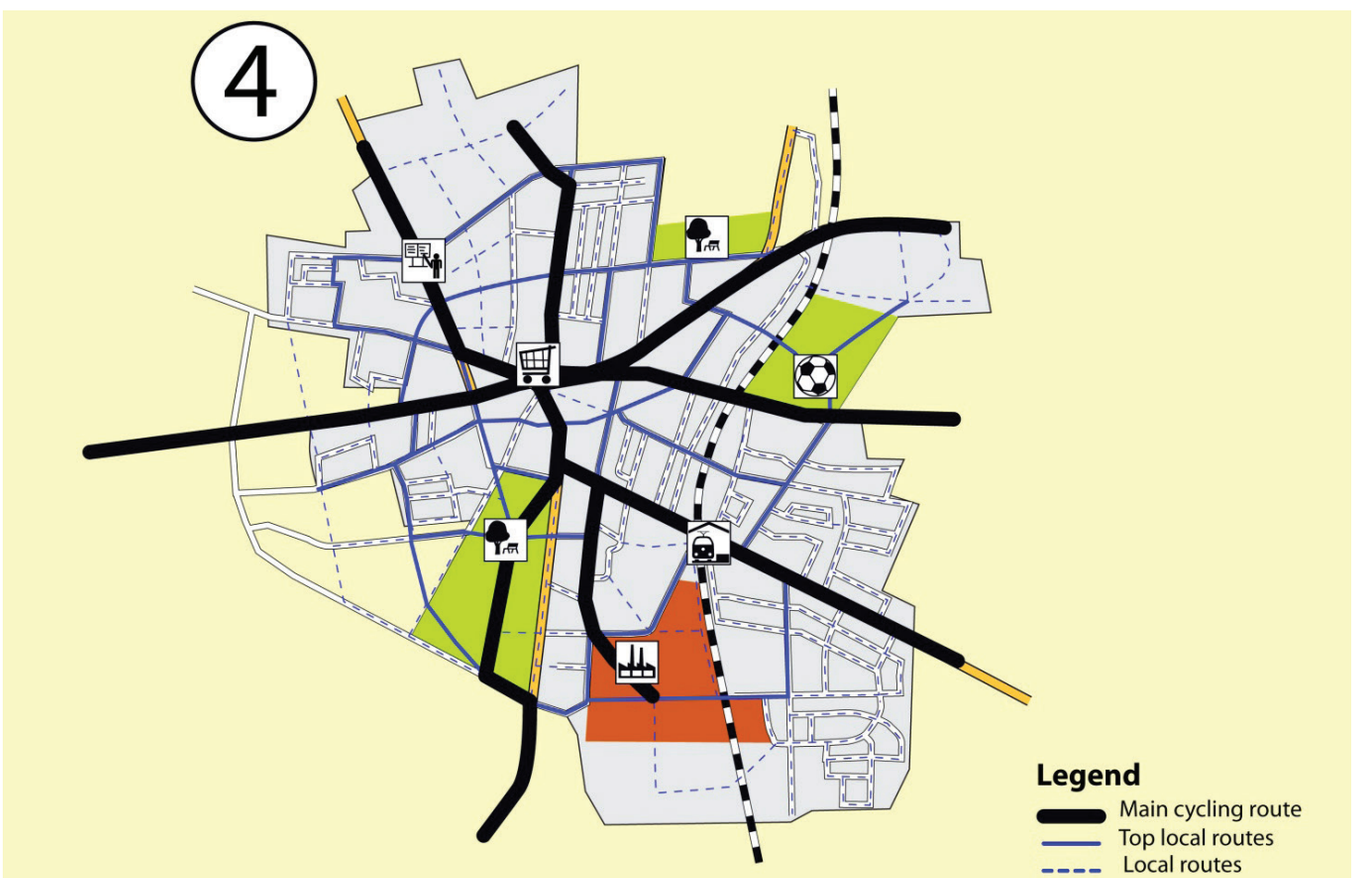

Figure 13: Coherent network with hierarchy
Source: Own illustration

The traditional concepts are the signposted long distance routes and touristic theme routes, which are still attractive. Many of these recreational routes pass trough urban areas and centres. In practice, however, utility and recreational networks tend to overlap and should be integrated. Many recreational destinations are in or near a (city) centre or a (railway) station. At the same time there is also a demand for utility trips along alternative quiet and attractive routes, parallel to busy roads but at a certain distance from them. When designing cycle networks, it makes sense to take both uses into account. This makes it possible to combine efforts and means of the touristic sector and road authorities. This allows for a more solid funding basis to realize more consistent high-quality facilities. Integrating major transport hubs is vital, both for utility and recreational trips, because it provides the potential to combine public transport and cycling within a trip chain[24].

4.3.2 Cross-linking of cycling networks

There are often two kind of cycling networks, the utility network for everyday cycling and the recreational network for leisure trips. When these networks are cross-linked, the first thing to do is to look at the integration of the utility network with the recreational network. To a certain extent, utility and recreational cyclists have the same needs and it would be unwise not to allow both groups to benefit from each other's routes. At the same time, it is particularly important to check if new connections can strengthen the cohesion between both networks. This creates more freedom of choice for the cyclist.[25]

In and around urban areas there is growing user demand for recreational networks. For these, the attractiveness and experience offered by the cycle route and its surroundings is more important than fast and direct connections, offered by a utility cycling network. The traditional concepts are the signalled long distance routes and the signalled touristic theme route, which are still attractive.

They are structured as a number of connected nodes, offering cyclists the freedom to determine their own trip on a network. Exploring a region by bicycle is the goal of these networks. Many of these recreational routes pass through urban areas and centres. Utility and recreational cycle networks definitely respond to widely different user needs: utility cyclists want to get as quickly as possible from A to B whereas the recreational cyclist is looking for a leisurely attractive ride while exploring a region. In practice, however, utility and recreational networks tend to overlap and should be integrated. Many recreational departure points and destinations are in or near a (city) centre or a (railway) station. At the same time there is also a demand for utility trips along alternative quiet and attractive routes, parallel with busy roads but at a distance from them. In designing cycle networks, it makes sense to take both uses into account. This makes it possible to combine efforts and means of the touristic sector and the road authorities. This allows for a more solidly funding basis to realize more consistently high-quality facilities. Integrating major transport hubs is vital, both for utility and recreational trips, because of the potential of combining public transport and cycling in one trip chain.[26]

4.3.3 Networks of other modes of transport

Once utility and recreational routes have been laid out and cross-linked, they are confronted with the networks of other means of transport, and particularly with the network of district access roads and distributor roads for motorized traffic and the network of public transport, whether connective or otherwise. The synergies between bike traffic and public transport are outlined below. At this point the resulting barriers are the issue. Criteria that play a role in the assessment of these kinds of conflict points are:

- the function or planned function in the cycle connection
- the extent to which the proposed facility solves a bottleneck and thus forms a quality improvement for the cycle network
- consequences, if the desired facility is not built at all or if the quality is insufficient

In practice, it appears that relatively little attention is paid to the interferences between the cycle network and networks of other means of transport. However, as this confrontation determines the quality of the cycle network to a certain extent, it should not be forgotten. Statistics show that in municipalities where cyclists often have to cross busy main roads, the risk of being involved in an accident is in average higher than in municipalities where this is not the case.

Coordinating car and cycle networks effectively is an important tool for improving cyclist safety. At network level, the situation for the cycling can be optimized if large-scale residential areas are constructed with a limited number of main roads, preferably situated on

24 Paragraph taken from PRESTO consortium (2010a) and edited
25 Paragraph taken from PRESTO consortium (2010a) and edited
26 PRESTO consortium (2010a)

the periphery, with cycle routes running through the residential areas wherever possible.[27]

4.3.4 Mixing or separating?

One of the basic questions is: Should cyclists share their routes with other users or should they have their own separated track? Bike traffic is often mixed with pedestrians or car traffic but also a mixture with bus lanes has been realized. In dealing with this, over the years two seemingly opposed planning philosophies have developed[28]:

- The network/segregation approach: In this view, cycling infrastructure is to be considered as an additional network in its own right. It consists of separate, dedicated infrastructure with its own technical design norms. The basic assumption is that cycling and road traffic are incompatible, so separate networks are needed for safety and to serve the needs of both. This is a strongly technical, engineering approach.
- The holistic/mixing approach: In this view, the entire existing street and road network needs to be reclaimed for cyclists (and pedestrians) through traffic-calming and sharing space with motorized traffic. The assumption here is that road traffic needs to adapt itself to low-speed users and be slowed down to increase safety. This does comply with an increasing concern for high-quality urban public space shared by all and open to various social uses.

Over the years, experience has made it clear that neither separating nor mixing is the exclusive solution to every occasion[29]. A compromise will be needed. On the one hand, the segregation of networks is clearly not feasible everywhere. The possibility of building cycle tracks next to roads, sidewalks and so on is constrained by space and budgets. On the other hand, mixing bike traffic with motorized traffic is clearly not justified and too dangerous at high traffic intensities and speeds or high shares of trucks and other heavy duty vehicles.

So what is required is the combination of both options in the hierarchical network approach. The leading principle should be: "Mixing if possible and segregating if necessary". In all of this, safety is the overriding concern:

- Mixing where this is safe or can be made safe: Mixing cyclists with general traffic is the default option. Local, fine-meshed cycle links should run through quiet, traffic-calmed areas without any special physical provision for cyclists, except occasional markings or signage. In many cases, the impact of motorised traffic can be reduced in various ways of traffic reduction and traffic calming. Such easy to install infrastructure is likely to have a greater impact on cycling levels than cycling-specific measures. The basic justification is that reducing the volume of motorised traffic and its actual speed to max. 30 km/h is the overall safest option. Traffic-calmed streets are still accessible to cars, but all users, including cyclists and pedestrians, can move about safely and freely. In this way, all local streets become part of the cycle network. Under certain circumstances, it is possible to mix bike and car traffic at speeds up to 50 km/h on advisory cycle lanes. The requirements are listed in Part II "Infrastructure".
- Segregating where safety requires it because of high traffic volumes and speeds: A cycle network cannot cover a city on quiet traffic-calmed streets only. Roads or bridges with major traffic flows are often fast and direct links between major urban destinations. These have a high cycling potential as major routes and often there is no acceptable alternative. Main arteries are furthermore often historic lines connecting landmark areas that make orientation and navigation easy for all, including cyclists. Because of high traffic intensities and speeds (50 km/h or more), segregated cycle tracks will be needed, especially when large numbers of cyclists can be expected to use them. These high-quality routes can become the backbone of the cycling network, interconnecting quieter local areas. Cycling tunnels and bridges can be built to cross barriers such as busy roads, railroads or rivers. These can create high-profile segregated links and direct routes away from motorized traffic. Major routes used by great flows of cyclists can receive preferential treatment at traffic lights or have priority over motor traffic.

4.3.5 Integration with public transport

Local transport enterprises often argue that promoting cycling would keep their customers away since they are likely to switch from public transport to cycling. But more often, public transport and cycling produce a lot of synergies since cycling functions as a feeder for buses and trains because it is mostly a mode of transport for shorter distances (< 5 km)[30]. For longer trips, a combination with public transport is a good and sustainable alternative.

27 CROW (2007)
28 PRESTO consortium (2010a)
29 Paragraph taken from PRESTO consortium (2010a) and edited
30 PRESTO consortium (2010a)

A key obstacle in using public transport is that it is not a door-to-door-mode. A long-distance train journey implies walking or extra bus or tram journeys at the start and the end of the trip chain. Even within urban areas, walking, waiting and changing one or more times can be quite discouraging. Combining the bicycle and public transport in one journey is a high-potential intermodal trip chain. Using the bicycle to drive from home to the station or from the station to the destination can greatly simplify the trip and often saves time. The own bicycle can be used to start from home and park it near the station. Perhaps the bike can be taken along on public transport, ready for use at the other end. If not, there is a bicycle available at the arrival, either the own one, a rented one or one provided by the employer. This also benefits public transport operators: compared to walking, cycling multiplies the catchment area of public transport stops and stations.

Although it is hard to quantify the importance of cycling for public transport, a look at extensively used bike parking facilities shows that public transport and cycling are a popular combination. A good bike parking situation supports the attractiveness of this combination. Since it is not very common to take a bike on trains and buses, especially during rush-hour, it is important to have facilities where a bike can be parked for the whole day. At the strategic level, it is possible to identify suitable transport hubs and include them in the network design[31]. How parking at public transport stops can be organized will be outlined in Part III Services.

4.3.6 Mesh width

Since coherence is an issue when designing a cycle network, the density of the network, called mesh width, is important. A hierarchical network with high quality routes and smaller access roads needs the right balance between having too many high quality roads (expensive) and too few of them (far away). The distance between the quality tracks is called the mesh width. What a good or average mesh width is, depends on the size of the city.

It is useful to estimate the volume of cycle traffic produced at the origins and attracted by the destinations. The more traffic is created the denser the network has to be. Thus the mesh width varies according to the population density. A network is more complex in urban areas since in rural areas it is most important to connect the villages with each other.[32]

31 Paragraph taken from PRESTO consortium (2010a) and edited

32 PRESTO consortium (2010a)

4.4 Types of routes

As mentioned in 4.2.3, there are different levels of local cycling routes within a cycle network: main routes, top local routes and local routes. Since routes on each level have specific functions, logically this leads to specific design requirements. The following recommendations are not meant as strict rules as the local context always needs to be taken into account. Nevertheless, it is useful to keep them in mind as recommended quality standards. These design characteristics will help each route to fully perform its designated function. In addition, consistent design within each level clarifies the network for cyclists. It makes situations and behaviour more predictable for cyclists and other road users, which increases safety and comfort.

4.4.1 Main routes

Main routes are the backbone of a cycle network. They offer the best cycling conditions and the fastest ride. But they need more space than other route types and are more expensive, so they can not be the standard for all cycling tracks.

- High ranking fast long distance cycle routes (cycle „highways")
- Mostly complementary in use
- Connecting centres over 5 to 15 km
- High quality design standards:
  - Maximum separation from pedestrians and motorized traffic
  - Car free routes
  - Minimum number of crossings:
    - Crossings with busy roads: preferable multilevel - conflict free (tunnel, bridge)
    - Crossings with quiet roads: priority for the cyclists
  - Material: asphalt or concrete
  - Minimum 3m width
  - Cycle traffic flow in both directions
  - Limited slope
- Outside urban areas these routes are often towpaths along canals, old railway tracks or cycle tracks parallel to existing railways
- Inside urban areas these main routes are "bicycle corridors" with a high concentration of bicycle flows because of a high density of attraction poles (city centre, dense living areas, office districts)
- The main routes are integrated into the overall cycle network; they do not make up a coherent network on their own.[33]

33 PRESTO consortium (2010a)

4.4.2 Top local routes

Top local routes are important connections between origins and destinations of medium size. They are not as frequented as main routes but are still an important part in the cycling network of a city.

- The most direct (quick) connection between (sub) centres and districts
- Mostly along (busy) roads
- In most cases there is a need for separated cycle lanes because of the intensity and speed of motorized traffic
- If possible, conflict free crossings with busy roads (traffic lights)
- When avoiding conflicts is not possible, a lot of attention should be given to conflict visualisation (making the conflict point visible) and speed reduction (speed tables, roundabouts)
- The top local routes form a coherent cycle network on the regional or urban level[34]

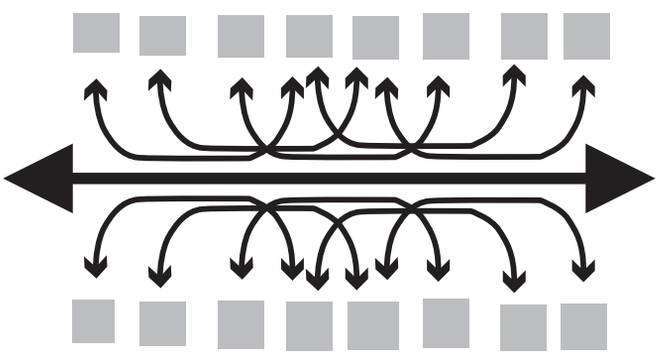

Figure 14: Function of local main routes
Source: PRESTO consortium 2010a

Figure 15: Main routes example, Hamburg (Germany)
Source: Rudolph 2011

Figure 16: Main routes example 2
Source. Rudolph 2011

Figure 17: Local main route, Copenhagen (Denmark)
Source: Müller 2011

Figure 18: Local main route, Munich (Germany)
Source: Rudolph 2011

34 PRESTO consortium (2010a)

4.4.3 Local routes

Local routes are the smallest category of routes. They mostly only have a local meaning and are used as access and distribution paths within a district.

- Routes to provide access to destination in districts and neighbourhoods
- Refine the top local cycle network (minimizing the mesh width and detour factor)
- Mostly in traffic calming zones where separation of car traffic and cyclists is not always necessary and mixing is safe and convenient
- Emphasis lies on creating direct routes on local level: shortcuts, contra-flow cycling, cycling through pedestrian areas, etc.[35]

4.5 Route signalization

The most important function of signposting is to help cyclists unfamiliar with the local area to find their destination. Signage provides visual continuity and helps cyclists understand the geography of a local cycling network, especially on routes with frequent turns. Signage also plays an important role in identifying and advertising the existence and availability of cycle facilities.

Experiences in the Netherlands proof that dedicated signage for cyclists is important because:

- General traffic signage does not always indicate the most appropriate route for cyclists
- Signage primarily intended for motorists is usually positioned to offer maximum visibility for motorists rather than cyclists
- Cyclists have different signage needs because they travel more slowly and over shorter distances than other vehicles[36]

These limitations of general signs can only be solved by introducing a dedicated system of bicycle signs that links up with the cycle route network. A core question in this regard is when a dedicated system of signs is advisable. The basic premises are simple:

- Outside built-up areas, dedicated bicycle signs indicating all relevant cities, towns, villages and residential centres are always advisable. Major facilities and places of interest for cyclists must also be indicated, such as recreational areas, tourist attractions and campsites.

Within built-up areas, signs are advisable when urban districts are clearly recognizable as spatial units. In this situation, signs indicate urban districts, but also stations, recreational and sport facilities, the city centre, museums, the tourist board and other facilities that attract large numbers of cyclists.[37]

Table 5 presents the most important steps for signposting for bicycle routes.

Step		Description
1	Identify important departure and destination locations	Identify locations to consider in signposting including recreational areas, tourist attractions, urban areas, transport interchanges, cycle parking and other destinations likely to attract cyclists.
2	Signpost at decision points	Signage must be placed at decision points to enable cyclists to follow their chosen route. Once a destination has been identified, it must be repeated on subsequent signage so the cyclist can reach the destination.
3	Opt for the most direct route	If different routes are possible from the departure point, signage should always identify the most direct route, except where a less direct route offers a safer route to the destination and is not substantially longer.
4	Indicate the town centre in larger urban areas	All signage should indicate approximate distances to the destinations identified. Where signage directs cyclists to urban areas, signage should identify the town or city centre.
5	Number routes	In urban areas and where there is a greater number of route options, route numbering may make it easier for cyclists to follow a route. Where route numbering is used, it should be included on signage and it may be appropriate to include 'reminder signs' along each route.
6	Provide maps	Road signage for motorists on the edge of built-up areas often includes maps to assist motorists in navigating to their destination. It may be appropriate on some cycle routes, such as when they enter an urban area, to provide cyclists with a map displaying the route, key destinations and salient landmarks. Where such maps are installed, cyclists should be provided with sufficient space to safely dismount in order to consult the map.
7	Provide signage at street corners and intersections	Although the provision of street names does not form part of dedicated signage for cyclists, it is important that streets along which cycle routes run, include clearly legible street signs to help cyclists navigate to their destination.

Table 5: Step-by-step plan for signposting
Source: SEStran 2008

35 PRESTO consortium (2010a)

36 SEStran (2008)

37 CROW (2007)

5. Monitoring and evaluation of important traffic indicators

This chapter outlines indicators which are easy to monitor and assess. They can give significant testimony about current developments in each sector as well as monitor the changes achieved by undertaken measures. Relevant issues are:

- which indicators to consider
- how to collect the data
- frequency of collection

If there is an integrated development plan, continuous monitoring of the indicators which measure the degree of target achievements is required. The indicators must comply with certain criteria to ensure meaningful monitoring. Criteria are as follows:

- Regularity of data collection (surveys)
- Measurability
- Relevance
- Traceability
- Continuity

The process of defining significant indicators underlies an iterative check-up and calibration procedure. Indicator identification has to be performed in close coordination with the municipality since they have the knowledge about continuous surveys and thus data availability. Indicators must allow measuring the defined goals.

The collection of indicators by conducting own surveys is often very expensive and can mainly only be done with great efforts. That´s why it is helpful to use existing data.

Indicators can be divided into priority dimensions which are undeniably necessary for a useful monitoring, and secondary dimension which can be surveyed optionally. This category contains indicators which can only be monitored with very high investments. It should be discussed very thoroughly how much these indicators contribute proportional to the investments.

5.1 Target values

Monitoring data can only be used, if target values are defined before realization of measures. It is essential for the evaluation that at least two surveys are carried out: One survey before the realization, one survey one or two years after the realization. In this way success or failure of the programme can be identified. Without defining target values (level/ percentage of improvement and timeframe) it is not possible to quantify the degree of target achievement. Only qualitative explanations would be possible. The evaluation also shows the effectiveness of the measures. Planners as well as politicians can decide, based on the data, if a target or a measure has to be adjusted. A good example how to set up goals and target values can be seen in the Transportation Master Plan Vienna (s. Case Study: Transport Master Plan Vienna).

5.2 Frequency of evaluation

The frequency of the evaluation depends on the indicator itself and on the frequency of the respective survey. The more frequently indicators are monitored the more often an evaluation can be carried out. As a reasonable guidance value, an evaluation should be carried out every two to five years. Periods which are longer than five years are of little use since reactions to negative developments will be very late and therefore investments might be wasted.

5.3 Indicators

A method to use indicators is outlined in chapter 7 with the BYPAD-approach.

5.3.1 Traffic volumes

The “traffic volume”, which quantifies the number of trips, regardless of the choice of transport mode, is one of the most important indicators to estimate developments in the transportation sector. This indicator is important to design e.g. roads, bicycle and pedestrian infrastructure. Surveys are quite easy to conduct, so monitoring the indicator is uncomplicated. After implementing measures, changes in this indicator can easily be observed.

Survey method:
There are different possibilities to survey the traffic volume. The most flexible one is to count the number of vehicles driving on each lane at a certain road section or intersection. Usually the survey should cover 24 h of an average working day (Tuesday, Wednesday or Thursday, no holiday, no harsh weather conditions like ice, storm or heavy rain). Traffic counting is divided into 15-minutes intervals. Passenger cars and heavy trucks are counted separately. Traffic volume can be divided into originating traffic, terminating traffic, transit traffic and internal traffic in respect to the city limits.

5.3.2 Kilometres travelled

The indicator "kilometres travelled" gives significant information about the distances which are covered by motorized vehicles or by bike within a certain time period. The indicator is used in different studies. It allows better judgement about emissions, energy consumption, use of infrastructure and the situation of road safety.

Survey method:
This indicator is not as easy to survey as the traffic volume. In Germany for example the kilometres travelled are surveyed by different institutions with manual and automatic counting methods. Elsewhere this indicator is estimated with the help of transportation models. To survey the transportation kilometres of cargo, driving protocols of heavy duty trucks are analyzed and with random sampling drivers are interviewed in a standardized survey.

5.3.3 Modal split

Modal split reflects the distribution (in percentages) of traffic volume of passenger and commercial transportation distributed to the different modes of transport. The modes of transport can be differentiated to a varying degree depending on the focus of the survey. The simplest differentiation is between "motorized traffic" on one hand and "non motorized traffic" on the other. This can be further divided:

- Public transport
  - Railway
  - Light Railway
  - Tram
  - Bus
  - Ferry
- Cars
  - Private car as a driver
  - Private car as a passenger
  - Taxi
- Trucks
  - Between 3,5t and 7,5t
  - Between 7,5t and 12t
  - Above 12t

Manifold factors influence the modal split. These factors vary depending on the context and are influenced by each other. General factors are geography, weather conditions, as well as the current economic, societal and political circumstances. More specific factors are distance, quality, purpose, travel time and costs of the different modes of transport. The modal split is the direct result of and influences issues of transportation systems, environment and society. It can be influenced up to a certain level by changing these factors.

Survey method:
The modal split ca be derived from data on traffic volume, separately for each mode of transport.

5.3.4 Number of accidents

An indicator especially to describe safety conditions is the "number of accidents". In respect to the conditions for cyclists of course only accidents with cyclists involved should be considered. Usually there are police statistics about reported accidents. Accidents are divided into accidents with fatal injuries, with severe injuries and minor injuries. Usually police records are available for each year. The availability strongly depends on the cooperation between police and municipality. The better the cooperation between these two entities, the easier it is for the planning department to get the information. The numbers can be interpreted on an absolute and a relative base. For high scale considerations relative numbers are used to compare general issues (for example: number of accidents per 100.000 inhabitants). On the local scale, absolute numbers are more important, for example to determine dangerous intersections. Accidents statistics also show places with a high urgency of action. These can be specific locations (for example: a certain intersection), specific groups of people (for example: children) or general sources of danger (for example roads without cycle tracks).

Survey method:
Police records and interviews with casualties.

5.3.5 Length and quality of cycle tracks

In order to assess the development of the cycle infrastructure (quantity and quality), the indicator "cycle tracks" should include the absolute length (in kilometres) of cycle tracks inside the considered areas, as well as the improvement in comparison to the year before. On the other hand there should also be a survey on the quality of the infrastructure, e.g. quality of pavement. Measures to improve the surface of cycle tracks or cycle lanes can be very effective but they do not contribute to the total number of kilometres and the other way round. Both parameters (quantity and quality) need to be monitored for a reasonable assessment.

Survey method:
Quantity: Length of cycle tracks/ lanes which were newly constructed or existent. Database from construction and/ or planning department of infrastructure.

Quality: Numbers and figures of cycle tracks/ lanes which were renewed or refurbished. Database from construction and/ or planning department of infrastructure.

6. Regional and national cycling routes

Because of the municipal responsibilities for planning cycling infrastructure and the focus on utility purposes, most cycling networks are focused on a more or less local context of a single municipality. But to create a nationwide coherent network of cycling routes, it is necessary to make more far reaching plans. Regional and national networks are quite common. Although these networks mostly focus on recreational purposes, they are also used by long distance commuters. Local, regional and national cycling routes often overlap.

6.1 Regional networks

The superior goal of a regional network is to allow the exploration of a region by bicycle, so it is mostly used by cyclists for recreational trips. For those, attractiveness and experience offered by the cycle route and its surroundings is more important than direct connections. A regional network offers cyclists freedom in determining their own trip within the network. The flexible use allows cyclists to plan regional trips individually and change their route during the trip.[38]

Given the quality requirements set by recreational cyclists, signposted routes should always be on quiet roads where motorised traffic assumes a subordinate position. Studies have shown that during recreational cycling trips, cyclists value quietness above all, with the quality of the surroundings playing an important role at the same time.

Regional networks are signposted in two directions and offer a wide range of route choices. When regional routes meet, they create junction networks, which can form an ideal addition to the network of national cycle routes. Theoretically, regional and national networks are complementary. It is easy for cyclists on a national network to leave the main route. Where junction networks are in place, they are supposed to offer alternatives to existing, signposted local routes. Directions on these routes are then given by junction signposting.[39]

6.2 National and international cycling routes

National cycle routes are long distance routes that connect different local cycle networks and are primarily used by free time cyclist. Long distance cycling is a form of recreational cycling but often the recreational and utility cycle networks overlap. Since long distance trips can take for several days, attractiveness and comfort are more important than directness. National cycle routes run through appealing surroundings. They can have special themes or run along rivers, mountain chains or similar line structures. [40]

The foundations of national cycling routes are regional and local networks. But if gaps between desired connections are spotted during the design of the network, they have to be closed.

The planning process is similar to the planning of a local network but on a higher scale. Now cities and regions are considered and not districts or local points of interests. Route selection is important because attractiveness is curial for recreational cycling trips.

National cycle routes cannot be compared with motor highways! Highways are normally within the responsibility of a federal administration. National cycling routs belong to each municipality and the declaration as a national cycling route is more or less symbolic. Often it does not imply any direct financial benefit for the municipality in charge. In fact, the opposite is often the case since municipalities are encouraged to ensure maintenance of national cycling routes[41].

38 Paragraph taken from PRESTO consortium (2010a) and edited
39 CROW (2007)
40 sustrans (2012)
41 CROW (2007)

Case Study: National Cycle Network United Kingdom

Since 1995 the National Cycle Network is a comprehensive network of safe and attractive routes for cyclists and a major amenity for walkers and people with disabilities throughout the UK.

It opened in June 2000 with 5000 miles of continuous routes, including traffic-free and traffic-calmed sections, and minor roads. The routes run right through urban centres and reach all parts of the UK, providing safe links to work, to schools, to friends and family, to shops and stations. This is the first stage of a larger network which will eventually pass within 2 miles of half the population.

The National Cycle Network is a Millennium Commission project supported by £ 43,5 million from National Lottery funds. It involves over 400 local authorities, as well as businesses, landowners, environmental bodies and others. The Network carries an estimated 100 million cycle trips and 40 million walking trips every year.

Over one third of the Network is entirely traffic-free, built along old railway lines, canal towpaths, forestry tracks, riversides and urban spaces, and in many cases these sections are ideal for pushchairs as well as for cyclists and pedestrians. The rest follows existing roads; town roads may be traffic-calmed or incorporate cycle lanes, quiet minor roads are used for country sections and there are special crossings over busy roads where needed.

The network is signposted using a white bicycle symbol on a blue background, with a white route number in an inset box but no destination names or distances given. National route numbers have a red background; regional route numbers have a blue background.

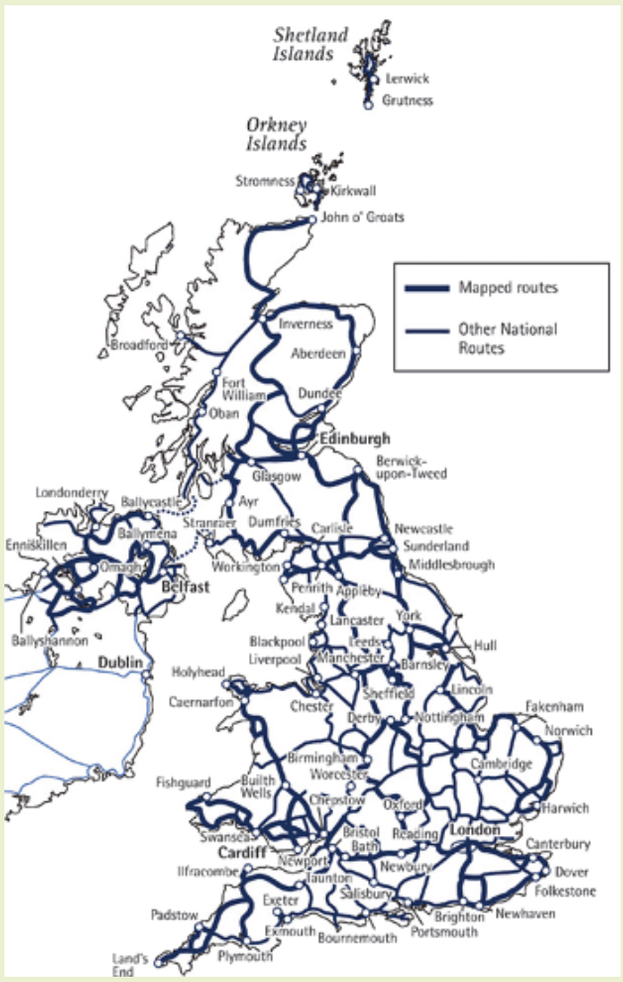

Figure 19: Map of national cycle routes
Source: www.stirlingsurveys.co.uk/

Case Study: EuroVelo - International cycle routes around Europe

The EuroVelo long distance cycle routes were set up by the European Cyclists Federation (ECF), a Brussels-based organisation that brings together the various national cycling organisations that exist throughout Europe. There are currently 14 routes, numbered 1 to 15 (number 14 doesn't exist yet), with each also carrying a more descriptive name such as EuroVelo 12, The North Sea Cycle Route or EuroVelo 2, The Capitals Route from Galway to Moscow.

The extent to which the routes have been mapped and described varies greatly from route to route. With limited resources, the ECF encourages national and regional organisations to promote and develop the infrastructure of the routes. As a result, some of them have an impressive array of support materials available for prospective cyclists – the best example being the Rivers' Route or EuroVelo 6 from Nantes to Constanta.

Figure 20: The European cycle route network
Source: www.ecf.com/projects/eurovelo-2/

North – South Routes:
1 – Atlantic Coast Route: North Cape – Sagres 8.186 km
3 – Pilgrims Route: Trondheim – Santiago de Compostela 5.122 km
5 – Via Romea Francigena: London – Rome and Brindisi 3.900 km
7 – Sun Route: North Cape – Malta 7.409 km
9 – Amber Route: Gdansk – Pula 1.930 km
11 – East Europe Route: North Cape – Athens 5.984 km
13 – Iron Curtain Trail: Barents Sea – Black Sea 9.000 km
15 – Rhine Route: Andermatt – Hoek van Holland 1.320 km

West – East Routes:
2 – Capitals Route: Galway – Moscow 5.500 km
4 – Central Europe Route: Roscoff – Kiev 4.000 km
6 - Atlantic Ocean to Black Sea: Nantes – Constanta 4.448km
8 – Mediterranean Route: Cádiz – Athens and Cyprus 5.888 km

Circuits:
10 – Baltic Sea Cycle Route (Hansa circuit): 7.980 km
12 – North Sea Cycle Route: 5.932 km

7. Institutionalisation of bicycle planning and promotion in municipal administrations

Fostering cycling on local level in cities and towns is depending very much on the political will. But also it is important to know, how administrational structures can help to institutionalise cycling planning and promotion. This institutional basis can be created by continuity and presence in planning processes and in addition by adequate appointment of staff and financial sources. As an endorsement efficient organisational forms of institutionalisation are required as experiences show from Germany, the Netherlands and other countries.[42] To promote cycling as an integral part of transport planning in municipalities it is possible to choose different forms, e.g. establishing a cycling commissioner, a working group, a spokesperson etc.[43]

These institutional forms can act on issues regarding bicycle transport planning and infrastructure, promotion, services or other. They can also be the contact point for the citizens, to enhance participation and exchange of information. Deriving from experiences in municipalities and from research it becomes clear: It does not matter so much where the institution is located within the administration. It is much more important which responsibilities and duties the institution holds. Some general responsibilities and duties should be e.g. (see also Figure 21):

- The commissioner, working group or department should be incorporated in all issues concerning traffic in general, because they are all linked to bicycle use.
- The commissioner, working group or department should have the power of veto concerning all projects that have an impact on cycling issues especially in road planning.
- No professional can handle all issues of cycling promotion on his own. Because of this it is important that other professions are integrated in issues concerning bicycle traffic/use like transport planning, finance planning, PR and marketing, facilitation and mediation.
- The bicycle commissioner, working group or department needs an own budget within the transport budget so that measures to a certain extent can be implemented short-dated.
- A bicycle commissioner is also a person of the public. For that reason the person needs competences to present cycling issues in the local political arena as well as to be able to create a positive public image. This affects both the promotion/publicity of cycling in the city and the external exchange with other cities or institutions.
- Everyone who works in the field of bicycle traffic should also be positive about cycling and use the bicycle in everyday transport.[44]

The listed forms of institutionalisation for fostering cycling in public administration are certainly not the only means and show the idealised set up to establish a more positive cycling culture in a city. Other stakeholders in the administrations and in the society of a city have a role there, too.

The following forms of institutionalisation are discussed in the subsequent sections:

1. Bicycle commissioner as
   - Planner (pref. small cities with a population up to 300.000 inhabitants)
   - Coordinator (preferably in a city > 300.000 inhabitants)
   - Unit or department for cycling issues (pref. city with > 500.000 inhabitants)
   - External commissioner (pref. in small cities)
2. Bicycle working group
3. Spokesperson

7.1 Bicycle commissioner and cycling planning unit

In most cities the bicycle commissioner is subordinated to the department of transport engineering or urban planning. Within this mode of institutionalisation the bicycle commissioners' area of expertise is limited; therefore it makes sense to think about how such professionals should be integrated to be able to work effectively.

42 BMVBS 2012: 57

43 If not mentioned differently the following explanations in the whole chapter are based on: Deffner 1999

44 Umweltbundesamt (ed.) 2000

Bicycle commissioners are key contact persons within a municipality, for citizens as well as for other institutions. They can act predominantly as a coordinator or as a planner. In general, they hold constantly updated know-how concerning bicycle transport planning and preferably also connected services and communication. It is very useful to instruct a bicycle commissioner as well with other issues that are linked to non-motorised traffic, such as pedestrian planning or for touristic offers.[45]

Whether a bicycle commissioner of a city works full-time, or on part-time on cycling issues, depends on the size of a city. A full-time occupation has the advantage of no other duties, e.g. in the planning department. This means more time and empathy for issues concerning bicycle use.

- Part time occupation up to 100.000 inhabitants
- Full-time occupation in a city with a population from 100.000 upwards.
- Two full time professionals from 250.000 to 300.00 inhabitants
- If the cities' population is more than 300.000 it is recommended to have a department or unit for bicycle issues with more than 2 full-time employed bicycle commissioners as examples show from Cologne, Frankfurt/M. (GE) or Zürich (CH).

7.1.1 Bicycle commissioner acting predominantly as a planner

Tasks of a bicycle commissioner as a planner are:

- Infrastructural planning of bicycle networks
- Giving official statements to other planning projects concerning bicycle traffic
- Being a contact person for citizens who have proposals

If working together with other departments, the commissioners' position is equal. The particular departments should incorporate the bicycle commissioner in their decisions but they are not obliged to do so. In case of measures which are not connected with transport planning, the commissioner should cooperate closely with other departments to achieve synergies in coordination and sharing of tasks.

The duties have to be defined clearly and limited. Additionally, it helps if there are clearly defined contact persons in all other departments so that cooperation is defined on an official level and does not depend on personal interest in other departments. The responsibilities concerning bicycle planning measures are shared equally. The several departments have to regard the issues self-responsible and to cooperate with the bicycle commissioner. But the commissioner in this form of institutionalisation has fewer capacities and skills for the implementation of communication and marketing measures.

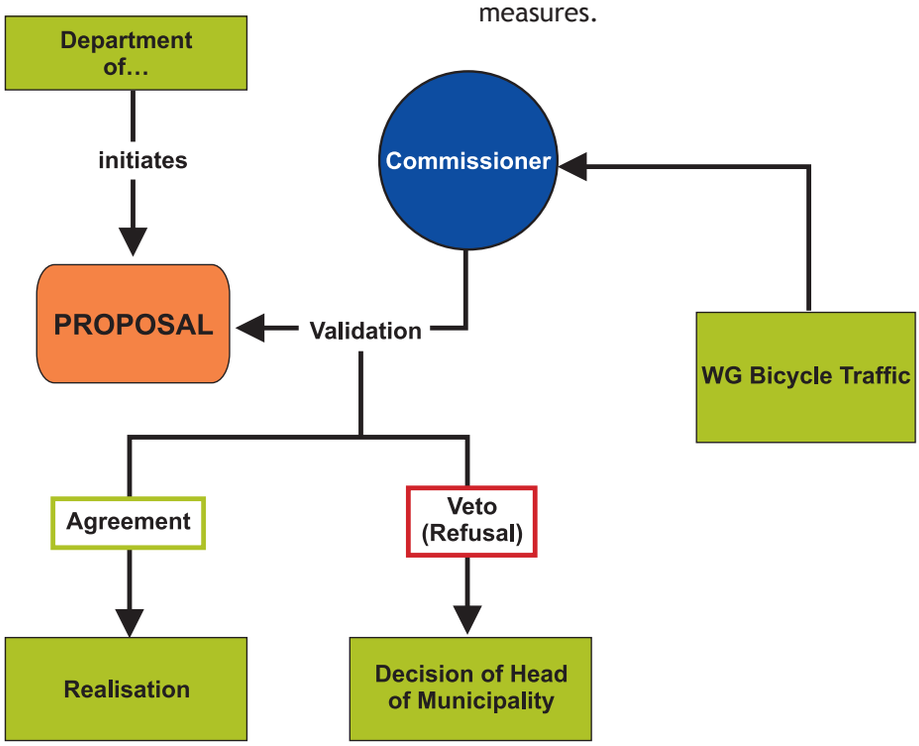

Figure 21: General set up how a cycling commissioner can be integrated in municipal structure
Source: Own compilation adapted from Umweltbundesamt 2000

45 Umweltbundesamt 2001

7.1.2 Bicycle commissioner acting predominantly as a coordinator

Tasks of a bicycle commissioner as a coordinator:

- Coordinate decision processes on bicycle issues
- Meetings (regularly) with head officials to be always up-to-date
- Giving statements to questions concerning bicycle traffic
- Being the specialist contact person for citizens and businesses for all concerns about bicycle promotion in a broad sense
- Working together closely with the PR office or an external media agency to guarantee public relational work steadily

In this model of institutionalisation the bicycle commissioner has a superior position, which guarantees that this one person is able to take stock of the effects for bicycle use of all traffic-projects. The bicycle commissioner also has a superior role concerning communication and agrees upon projects with other commissioners of other departments. Because of that the person is able to stress his/her own issues more than others'. The bicycle commissioners' task description is more focused on organization of services, conceptual profound public relations work, cooperation with businesses and other institutions.

7.1.3 Bicycle unit or department

A bicycle department is only recommendable in a city with a bigger population. Because of the fact that a bicycle department needs more staff, policy and management department will only support this unit if the bicycle situation and modal share have reached already a medium level or the strategic goals are set that high (e.g. in the year 2011/2012 the example of Vienna/(A)).

A bicycle department is most likely allocated to the department of transport engineering or urban planning (see Figure 22). This is advantageous because the bicycle department is to a huge degree responsible for the infrastructural planning of the bicycle network. The staff of the bicycle department is ideally composed of three to four employees, not only being engineers, e.g. also urban planners, draftsmen, project/facilitation managers, or alternatively involving external planning consultants. Additionally, other areas of expertise could be covered such as PR-work, organisation of services, conceptual considerations, etc. It is recommended to design the unit in a way that it is also responsible for pedestrian issues. Further the people working in a bicycle department should be responsible for the spreading of a professional mind set on bicycle issues.[46]

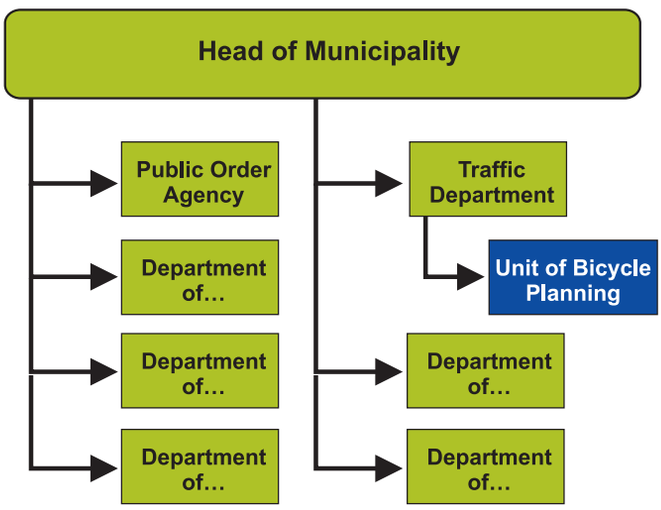

Figure 22: Institutional organization of bicycle unit.
Source: Own compilation based on Umweltbundesamt 2000

7.1.4 External Bicycle Commissioner

In smaller cities or starter cities, the contracting of an external bicycle commissioner could be helpful to overcome the gap of missing staff and necessary efforts to give cycling a push. However, this is only a temporary solution, respectively an initiation of bicycle measures.

The duties of an external bicycle commissioner are practical-oriented, e.g. the implementation of short-term measures e.g. basis work on network planning or bicycle parking measures. Additionally the external planner shall raise awareness for bicycle issues in the planning departments. The aim is to contract the external commissioner as long until administration staff is capable to take over the tasks and establish a full-time or an adjunct appointment on a half-time basis. The external commissioners' competences should include that the person can initiate projects on his/her own and is not only working on topics the administration lays down as tasks. In addition the commissioner should establish an at least consultative working group or round table in cycling.

46 Umweltbundesamt 2001

7.2 Bicycle Working Group

Interdisciplinary working groups (or round tables) are acting as a specialist forum for discussions concerning all issues of bicycle use and traffic. In this organisational form of institutionalisation of bicycle promotion, special questions concerning different topics and planning projects can be the subject. The bicycle working group is a conventional way of institutionalisation in municipalities[47]. The groups are mostly established by the implementation of bicycle ombudsman or an external bicycle commissioner, which are mentioned in section 7.1.4 and 7.3. Members of working groups could come also from non-municipal stakeholders, like NGOs, chamber of commerce, etc. This way it is a good opportunity to involve stakeholders on local level (see also Part IV chapter 3). Working group meetings can also be held as cycling meetings where stakeholders meet on a cycling tour to visit good examples and problematic situations to discuss possibilities of improvement. One example where this has been introduced is the velo picnic of the municipality in Zürich. This meeting involved also politicians. On the other hand it is crucial to design the working group in a manner that it is not just a talking-head-circle but can officially influence planning and decision making processes in a municipality (see Figure 23). Otherwise frustration of the members is predefined.

7.3 Cycling Spokesperson

This organisational form offers a suitable way for an independent and neutral contact person for the citizens on bicycle issues or in case there is no bicycle commissioner yet established in the city. An ombudsman does not belong to the municipality but is a trained professional (e.g. transport planner with specialist knowledge on cycling planning). The ombudspersons' duties are to take the citizens' suggestions and questions on cycling planning, infrastructure situation etc. and pass these to the department of the administration, which is responsible for adapting the citizens' interests.

An ombudsperson can also be seen as a symbol position, because the person guarantees that the issues raised by citizens are taken seriously. This creates positive appreciation as the professional know-how of the ombudsperson and the administrations is complemented with the lay experiences of the bicycle users. The appointment should in every case be linked to an institution of communication. An example for such an institution is the implementation of a helpline for bicycle concerns. A helpline should be organized in a way that phone calls will be captured systematically. Afterwards a local inspection of these concerns is indispensable. As a consequence periodically published reports, which contain

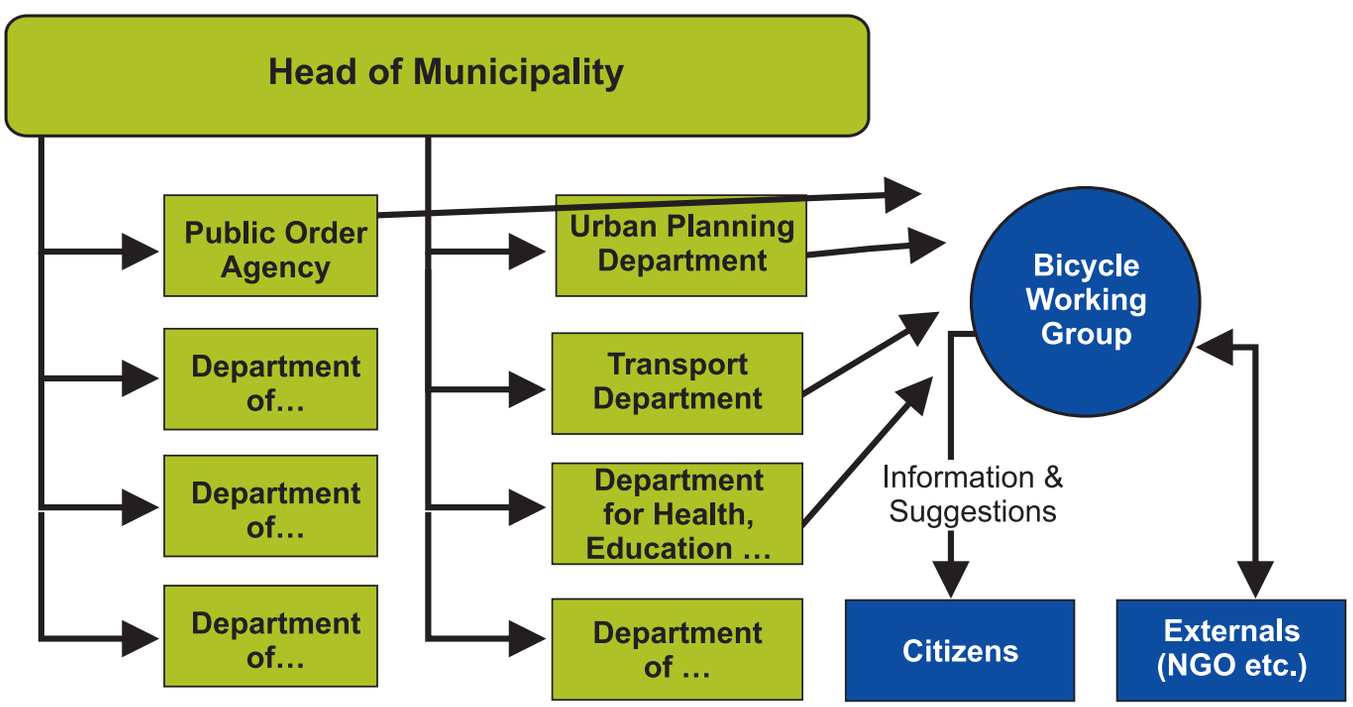

Figure 23: Institutional organisation of a bicycle working group
Source: Own compilation based on Umweltbundesamt 2000

47 Umweltbundesamt 2001

proposals for improvement is recommendable. These reported proposals concerning bicycle traffic and the bicycle network are addressed to the skilled professionals of the particular departments (regulatory agency, department of planning and building, police, etc.). The proposals will be discussed in an appropriate committee, e.g. the working group afterwards.

7.4 Conclusion

Not all organisational forms introduced, are appropriate equally for every stage of cycling development and city size.

In comparing the three main types of institutionalisation it is noticeable that a bicycle working group usually has the lowest power and influence. The advantages of a working group are that it is reachable for stakeholders, that transfer of knowledge to the administration of the municipality happens and traffic consultation may be realised as well as consultation with other departments. A big disadvantage of a workgroup is the bad reachability for citizens so that they cannot make proposals for a better bicycle infrastructure.

Bicycle commissioners are key contact persons for all administrational issues and they are reachable easily for stakeholders. By means of a bicycle commissioner a lot of transfer of knowledge to the administration happens. In this form also the reachability for citizens is ensured in a good way. These advantages show that establishing a bicycle commissioner would be a good practice to institutionalise bicycle promotion within a municipality. The disadvantage of the commissioner is, that the person has limits in working time resources. The risks exists, that a commissioner becomes a lonely fighter if the political level supports cycling not enough. But it is a good starting point. Establishing a unit for bicycle traffic would be the second best form of institutionalisation. The strengths of a department for bicycle traffic are that they can work on bicycle auditing, are reachable for citizens and for stakeholders as well. However, a unit or department for bicycle planning may be isolated; transfer of knowledge may not happen in the same way it would happen when having a commissioner established. Also it is less realistic to start the institutionalisation of cycling planning in a city with an own unit.

The solutions of a ombudsperson or external cycling commissioner fit most in cases of a starter city to give cycling a push and the establishment of new planning structures need to grow.

Criteria	Cycling-	Commissioner	Working Group	Department
Reachability for citizens		+	—	++
Reachability for stakeholders		++	+	++
Contact person for administrational issues		++	o	+
Transfer of knowledge to administration		++	+	—
Consultation …				
… concerning traffic		+/o	+	++
… with other departments		o	+	o

++ extraordinary suitable + very suitable o suitable — less suitable

Table 6: Overview on institutionalisation possibilities of cycling promotion in municipalities
Source: Umweltbundesamt 2000

8. BYPAD and other bicycle policy evaluation methods

BYPAD stands for **B**ic**Y**cle **P**olicy **Au**D**i**t. It is an instrument enabling authorities to evaluate and improve the quality of their cycling policy, based on the methods of total quality management.[48] BYPAD is an **internal evaluation tool** to improve the city's own cycling policy.

It was developed by an international consortium of bicycle experts in 1999 as part of an EU project. In the two follow-up projects, BYPAD+ (2003-2005) and BYPAD-Platform (2006-2008), there have been efforts to extent not only the spatial coverage but also the methodology. Until now more than 100 cities in 20 countries have implemented BYPAD.[49] In Central and Eastern Europe it is applied in cities in Estonia, Poland, Czech Republic, Slovenia, Romania, Kosovo and Albania.[50]

Figure 24: Map of BYPAD application in Europe, status 2008
Source: Vectris et al. 2008a

8.1 The BYPAD approach

BYPAD regards cycling policy as a dynamic process where different components must fit together in order to get a well-balanced sustainable cycling policy. Because each step in this policy process has its own characteristics, BYPAD distinguishes 9 modules (see Figure 25) for which the quality of the cycling policy is determined. Those 9 modules are in permanent development and influence each other. BYPAD not only focuses on the actions in the field (module 5 - 8), but also on the planning and organization of the cycling policy (module 1 - 4) and the monitoring of effects (module 9).[51]

8.1.1 Auditing and benchmarking

For improving products or services of (big) companies, research institutes and governmental organisations, there are all kinds of improvement processes based on sets of criteria and benchmarks that indicate the strengths or weaknesses of an organisation: audit schemes. By using the same audit scheme on a regular basis and in as many different organisations as possible, there is a growing list of criteria which indicate if developments are going well or not. The best examples are benchmarks.[52]

Figure 25: BYPAD Modules
Source: Vectris et al. 2008a

The goal of BYPAD is the same: Defining quality standards by collecting information on all different aspects of cycling policy in a standardised manner. Based on experiences in many cities and regions a set of quality standards is created. It helps cities and regions to adjust their ambitions and goals with regard to becoming a better cycling city. Repeating the same audit process on a regular basis also indicates in which fields progress is made and where improvements are needed. This way an audit is a perfect monitoring tool.

8.1.2 Quality control of dynamic processes

Contrary to static quality control systems, where the existing quality is screened by means of fixed standards, the EFQM-model, which BYPAD is based on, considers quality management as a dynamic process. Quality is never finished. On all levels there is a continuous quality evolution.

48 Total quality management has been standard in the business world for a long time. Different models exist for instance the ISO 9000 series, the EFQM-model, etc.
49 For the latest status see www.bypad.org
50 Paragraph taken from Vectris et al. (2008b) and edited
51 Paragraph taken from Vectris et al. (2008b) and edited
52 Chapters 7.1.1 to 7.1.2 taken from Vectris et al. (2008a) and edited

The EFQM-model is a European audit model for internal quality management. EFQM stands for European Foundation for Quality Management. It clearly stipulates that a policy is only successful if the clients (users), the employees, the management staff and the whole organisation are satisfied. The success factor is dependent on the whole management process. A characteristic of the EFQM-model is that it is a self-evaluation model where the managers, the employees and the users are actively involved.

The following characteristics are relevant for a quality management tool for cycling policy:

- The bicycle policy in a city or town is a dynamic process (e.g. the demands of users will always increase)
- Having good results in cycling policy (high bicycle use, low bicycle accidents) is dependent on both organisational areas as well as results in the field (infrastructure, campaigns, ...)
- An evaluation of the bicycle policy should be done, since it is a self-evaluation, by the actors directly involved: the users, the officials/civil servants and the politicians. Such a self-evaluation process can be guided by an external auditor.

8.2 BYPAD-method

BYPAD is based on the EFQM-approach which is adjusted to the subject of (local) cycling policy. Through BYPAD, municipalities can initiate a process of continuous quality improvement. To achieve this, BYPAD combines cognitive, conversational and learning elements. The quantitative assessment of the individual aspects of a cycling policy helps to convince the rationalists (cognitive element). Discussing the cycling policy within the evaluation group of decision makers, policy makers, executive staff and the user organisations ('clients') strengthens the political will to improve the quality of the cycling policy (conversational element). Assessing the cycling policy in a moderated process supervised by an external auditor strengthens the effect of learning (learning element), as do the regional, international seminars and the best practice database.[53]

8.2.1 BYPAD as a dynamic process

BYPAD regards cycling policy as a dynamic process where different components need to fit together to be successful. BYPAD does not only scrutinise outcomes and effects of the local cycling policy, but also if and how this process is embedded in the political and administrative structures.

- Are there objectives for the cycling policy?
- Is the selected strategy adequate to achieve these objectives? Are the allocated resources in balance with the objectives, and is the continuity of financing safeguarded?
- Is cycling policy restricted to a few infrastructural measures or is a wide range of pro-cycling measures put into effect, including measures to discourage car use?
- Is there cross sectoral co-operation with strategic partners?
- How is safeguarded that the measures taken achieve the objectives strived for?

As mentioned before, BYPAD distinguishes nine modules, whose qualities are determined separately (see Figure 25). For each module, a quality level is assigned on the BYPAD ladder of development which has four levels in total (see Figure 26). The results of all nine modules altogether determine the overall quality level of the cycling policy. On the basis of the results for each module, the municipality can define quality objectives and derive measures separately for each module. Besides that, it is possible to monitor the evolution of the local cycling policy.

Figure 26: BYPAD ladder of development
Source: Vectris et al. 2008a

8.2.2 Ladders of development

The principal item of BYPAD is the questionnaire, which consists of 30/22/18 questions covering all aspects of cycling policy for cities/towns/regions. For each module, it contains a number of questions, whose answers are pre-set. They describe appropriate measures which have successfully been implemented in European cities. A quality level between 1 and 4 is assigned to each answer (see Figure 26). The quality level is zero, if no action is taken. BYPAD is kind of a mirror for the city's cycling policy. It detects the weakest link in the qual-

53 Chapter 7.2 taken from Vectris et al. (2008a) and edited

Level 1: Ad hoc oriented approach Fire brigade principle: Cycling policy is mainly limited to problem solving. Measures are mainly focussed on infrastructure or road safety at specific locations. Cycling policy is on a low quality level which is characterised by low and irregular budgets, few officials with low skills and without competence. Quality is a result of individual efforts only.
Level 2: Isolated approach Robinson Crusoe principle: There already is a cycling policy, but it is neither integrated into the overall transport policy nor in other policy fields such as land use, health and environmental policy. Good infrastructure is the main concern of the policy, although some supplementary activities are undertaken. Cycling policy is characterised by some use of data and a limited knowledge of the users' needs, global agreements with a limited compulsory character and measures which are often counterproductive, because they are not tuned to the needs of other road users or not integrated into the objectives of other policy fields. Continuity isn't safeguarded.
Level 3: System orientated approach We are pulling into the same direction: Cycling is regarded as a system, which is integrated into the overall mobility policy. The political will to support the cycling policy is underlined by a sophisticated local cycling strategy and appropriate budget allocation. The cycling policy comprises a wide range of different measures; different target groups are addressed with tailored measures, partly in co-operation with other public and private partners. Cycling policy is based on good data and the knowledge of user needs, but still on a project basis with limited running time.
Level 4: Integrated approach The winning team: Cycling policy is regarded as a permanent task with strong relationships to other policy fields. Measures to encourage cycle use are complemented by measures to discourage car use. There is strong political support, good leadership, regular budget allocation, enough skilled staff and comprehensive in-house expertise. Systematic networking and regular exchange of information, knowledge and experiences with internal and external actors help to raise and maintain the quality standard. The cycling policy is characterised by the availability of high quality data, regular monitoring and evaluation, strategic partnerships with the aim to win these partners over as allies who contribute their part to the local cycling policy.

Table 7: Characteristics of development levels
Source: Vectris et al. 2008a

ity chain and shows where improvements are necessary and possible. By filling in the questionnaire, the city (town, region) receives direct inspiration of what could be done for climbing up to the next quality level.

8.2.3 BYPAD evaluation group

A key issue in the BYPAD approach is that the whole process of evaluation and quality improvement is carried out by a local evaluation group. This evaluation group consists of politicians responsible for cycling, policy makers and executive staff of the municipality dealing with cycling, and representatives of the local cyclists' organisation(s), who use the 'product' of the local cycling policy. Bringing these three different players together, BYPAD assures that the local cycling policy is examined critically from different perspectives.

The evaluation group looks for strengths and weaknesses of the cycling policy in order to find jointly a consensus on fields where improvements are necessary and possible. The audit process is supervised by an external consultant, who is a certified BYPAD auditor.

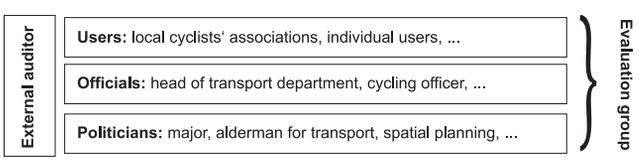

Figure 27: The evaluation group in a BYPAD process
Source: Vectris et al. 2008a

8.2.4 BYPAD process

At the beginning of the evaluation process, each member of the evaluation group fills in the BYPAD questionnaire individually. For each single aspect of the cycling policy, each member of the evaluation group assigns a quality level between 1 and 4. In a following meeting, when the whole evaluation group comes together, they are confronted with the judgements of the other members. It is the objective of this meeting to find a consensus on the strengths and weaknesses of the actual cycling policy and to assign jointly a quality level to each question of the questionnaire. Based on the results of this debate, the evaluation group develops a quality plan for the future cycling policy during a second meeting.

8.2.5 Certifying quality

As a result of a BYPAD audit process, a city/ town/ region gets scores for each of the nine modules and for its cycling policy as a whole. These scores indicate straightaway where the strengths and weaknesses of a city's cycling policy are. The interim and final reports of the audit, written by the auditor, are a detailed inventory of the cycling policy so far and a documentation of the audit process. The quality plan documents the objectives, main fields of action and measures the evaluation group has agreed on.

8.2.6 Recognized method

In the national cycling strategies of Germany, Czech Republic and Austria, BYPAD is recommended to cities and towns as the QM-tool to improve their cycling policy. In the Czech Republic, the awarding of subsidies is coupled with the application of BYPAD. In Nordrhein-Westfalen (Germany), the application of BYPAD can be co-financed by the state government.

8.2.7 BYPAD is no beauty contest

Main goal of BYPAD is to improve the bicycle policy of a city/town/region by this internal evaluation process and by learning from other experiences in European cities/towns/regions. It is however a conscious choice of the city itself to use BYPAD and both the strongest elements as well as the weakest elements of its cycling policy will be detected.

Within the BYPAD-network it is however also attractive for the cities to compare it's BYPAD-scores with other cities. A classical question which every mayor of a city wants to know is: "Are we the best European cycling city" or "Which is the best cycling city?". This is however not the question you can easily answer with BYPAD. Following aspects are inherent to comparing different cities and countries:

- Geography of a city
- Different BYPAD auditors
- Different personal opinions of the people in the evaluation groups
- Different cycling culture

In the first place BYPAD should be used as an internal evaluation tool to improve the own cycling policy. Comparing the BYPAD-results in a city every two or three years is much more interesting than comparing "apples with lemons". Secondly it is nice to see how other cities are scoring, but it always should be taken into account that this comparison is not reliable.

8.3 BYPAD as exchange of cycling expertise

Besides implementing the BYPAD audit and making a cycling quality/action plan for a city/town/ region the second goal of BYPAD is the exchange of cycling expertise in Europe. Following activities are organised to reach this goal:[54]

- National/regional workshops, by language region. On these workshops, the participating cities/town/regions actively play a role and new cities/towns/regions come into contact with the BYPAD-tool (e.g. Recklinghausen, Germany, in German for D-A-CH. Genève, Switzerland, in French for CH-F-B, Hertogenbosch, The Netherlands, in Dutch for NL-B, Lund, Sweden, in Swedish and Danish for S-DK-N).
- International seminars/excursions. International seminars on specific cycling topics and excursions are organised to stimulate the exchange of cycling expertise (e.g. Ceske Budejovice/Czech Republic 2006, Munich/Germany 2007, Tartu/Estonia 2008, …).
- BYPAD-website: www.bypad.org is both an informative medium as well as a working instrument for the BYPAD-auditors and BYPAD-cities/towns/regions. There is a public area (with information on the BYPAD-method, contacts, experiences of cities, best practice database) and a protected area with results of the BYPAD-cities, city reports, BYPAD-questionnaires, city registration etc.
- The best practices database of BYPAD: It gives examples from all BYPAD-cities for all different quality levels in cycling policy.
- Cities/towns/regions that are on a low level also find inspiration what they can do in cycling policy.
- The 3 BYPAD-questionnaires for cities/towns/regions are each available in 15 languages.
- The BYPAD-newsletter, published 3 times a year, is disseminated throughout the BYPAD network and via contacts of the BYPAD auditors and network partners.

8.4 Other evaluation methods

During the last ten years there has been an increasing awareness of the need for a high-quality cycling policy. Looking for manners for assessment and improvement of the quality of local cycling policy, benchmarking instruments and indicator systems have been developed and measures and programmes have been evaluated in several countries:[55]

- United Kingdom: Benchmarking project of the CTC (user organisation);
- Netherlands: Fietsbalans (Cycling Balance) of the Dutch cyclists' association (user organisation);
- Switzerland: Indicators for cycle-friendly cities and towns (research project of the SVI; Vereinigung Schweizer Verkehrsingenieure);

54 Chapters 7.3 taken from Vectris et al. (2008a) and edited

55 Chapters 7.4 taken from Vectris et al. (2008a) and edited

- Germany: Evaluation of the cycling policies of member cities of the city network "Cycle-friendly cities and towns in Nordrhein-Westfalen" (region of North-Rhine-Westphalia)
- Bicycle Account of Copenhagen

Each method has its own approach and the focus is sometimes on different aspects. Also the initiator, who decides to work with the instrument, is very important. For instance, The Cycling Balance in The Netherlands is an initiative of the Dutch cyclists' association which wants to award the best cycling city of the year. At the same time they deliver a status report on the comfort of cycling in that city.

The Dutch cyclists' association is doing a lot of national wide publishing work on the results of the Cycling Balance and thus cities feel a pressure to get cycling policy to a high quality standard. The result of the Cycling Balance represents the opinion of the user group's association.

In BYPAD it is not the user groups who are the initiators of the audit. It is really the city/town/region that decides to improve the bicycle policy, and to use BYPAD to get recommendations on the actual quality level and the necessary improvements. The external pressure to become the best cycling city is not as strong, but applying BYPAD can be considered an ambitious commitment of the city to improve cycling policy.

Table 8 shows an overview of the characteristics of the different evaluation methods for cycling policy.

	BYPAD (Europe)	CTC Benchmarking local cycling policy (UK)	The Cycle Balance (Netherlands)	Benchmarking cycling (Switzerland)	Bike-Friendly cities (Germany)
Initiative	Municipality	Cyclist Union	Cyclist Union	Municipality	Municipality
Parties involved	• politicians • civil servants • users / user group • external supervisor	Facilitator, nominated person authority. At visits also: other officers and users	Users, officials	Evaluation itself: municipality Later: all people who can be a driving force	Ministry, experts, specialists-group, city
What aspects	(0) background information; (1) user needs; (2) policy steering / leadership; (3) strategy & procedure; (4) management means; (5) management personnel; (6) projects & actions; (7) evaluation & monitoring	From promotion to engineering design, from training to maintenance of cycle paths (policy and practice)	Physical aspects	Potent on Construction Practice and use Means	Cycling as a transport system -> broad view
Strengths	• Given answers give inspiration • Comprehensive approach • Profound analysis of how results are obtained • Involvement all actors • External (objective) process supervisor	• In-depth analyses of processes behind best practices • Opportunity to review & update performance indicators & targets • Raised profile of cycling • Increased confidence • Networking	• Bicycle user as perspective • Objective measurement	• Raise awareness of importance bicycle • Give inspiration • Very quick method, not at all time-consuming	• Create a better climate for bikers • 10th anniversary: new guidelines • 7 yearly review, keep the cities alert
Weaknesses	• Formulation different levels of developments not clear enough • Two questions in one • Questions too long/ complex • Answers not always relevant • Information financial means • Collecting quantitative data • Very time-consuming	• Availability of data bottleneck • Limitations of making meaningful comparisons (uniqueness local auth.) • Qualitative data can't be measured directly • Not comprehensive • Very time-consuming	• Technical character, black box for cities • General character, no identification of bottlenecks • Usability relies on Cyclist Union • Initiative outside decision-makers • Very time-consuming	• Not systematically	• Selecting method isn't scientifically sound and not easily comprehend-sible

Table 8: Evaluation aspects of different cycling policy evaluation methods
Source: Vectric et al. 2008a (adapted)

Further reading:

BYPAD. Cycling, the European approach. Total quality management in cycling policy. Results and lessons of the BYPAD-project. EIE/05/016 – Deliverable WP 6 – dissemination. 2008.

BYPAD Manual. Version 3.0: 2006-2008.

BYPAD Website: www.BYPAD.org.

9. References

Atkins, S., Hockaday, S. and Sullivan, E. (1995). Concepts and Strategies for Advanced Travel Management and Information Systems (ATMIS). Report for Office of New Technology and Research, California Department of Transportation.

BMVBS: Federal Ministry of Transport, Building and Housing (Ed.) (2002): National Cycling Plan 2002-2012. Ride your bike! Measures to promote Cycling in Germany. Berlin. URL: http://www.nationaler-radverkehrsplan.de/en/ (12.02.2012).

Buis, Jeroen (2001) Planning for cycling as part of an integrated urban transport policy: reallocating public space. In: Daggers, Ton; Buis, Jeroen; Vogt, Walter; Deffner, Jutta; Ditewig, Ruud; Koehnlein, Claus (2002): Integration of cycling planning in urban and transport planning. Handbook. Urb-Al project. Utrecht.

City of Copenhagen (Ed.) (2012) – Copenhagen cycling policies URL: http://www.kk.dk/sitecore/content/Subsites/CityOfCopenhagen/SubsiteFrontpage/LivingInCopenhagen/CityAndTraffic/CityOfCyclists/CopenhagenCyclePolicy.aspx (29.02.2012).

City of Hamburg (Ed.) (2005) Radverkehrsstrategie für Hamburg URL: http://www.hamburg.de/contentblob/861896/data/anlage-radverkehr-in-hamburg.pdf (17.01.2012).

City of Hamburg (Ed.) (2008a) "Eine Radverkehrsstrategie für Bergedorf" Workshop am 2. April 2008 - Ergebnisdokumentation - URL: http://www.hamburg.de/contentblob/861914/data/ergebnisdokumentation.pdf (17.01.2012).

City of Hamburg (Ed.) (2008b) Bezirksstrategie Bergedorf URL: www.hamburg.de/contentblob/861906/data/anlage-radverkehrskonzept.pdf (17.01.2012).

City of Munich (Ed) (2007) Radverkehr in München/Bicycle traffic in Munich, Rosenheim.

City of Vienna (2005): Transport Master Plan Vienna 2003 URL: http://www.wien.gv.at/stadtentwicklung/shop/broschueren/pdf/mpv2003-kurzfassung-englisch.pdf (18.01.2011).

Clean Air Initiative (Eds.) (2008): Bicycle Infrastructure Design Manual for Indian Sub-continent. URL: http://cleanairinitiative.org/portal/system/files/presentations/Manual_Pt_Anvita_SUMA.pdf (10.01.2012).

CROW (2007): Design manual for bicycle traffic. Record 25. Utrecht, Netherlands.

Deffner, Jutta (2000): Einfluss kooperativer Planungsansätze auf die Fahrradförderung (Influnece of cooperative planning approaches on fostering cycling . Unpublished Master Thesis, Kaiserslautern.

DM: Ministerium für Verkehr, Wasserwirtschaft und Öffentliche Arbeiten - Generaldirektion für Personenverkehr - Direktion Mobilitätsmarkt (Ed) (1999) Der niederländische Masterplan Fiets, Zoetemeer.

GTZ – Deutsche Gesellschaft für technische Zusammenarbeit (Publisher) / Godefrooij, Tom; Pardo, Carlosfelipe; Sagaris, Lake (Editors) (2009): Cycling-Inclusive Policy Development. A Handbook. Eschborn, Utrecht. URL: http://www.sutp.org (23.02.2012).

PRESTO Consortium (2010a): Policy guide infrastructure URL: www.presto-cycling.eu/images/policyguides/presto_cycling%20policy%20guide%20infrastructure_english.pdf (13.01.2012).

EU: European Union (Ed.) (2012) Sustainable urban mobility plans URL: www.mobilityplans.eu (06.03.2012).

Bührmann, Sebastian; Wefering, Frank (Eds.) (2011) Guidelines - Developing and Implementing a Sustainable Urban Mobility Plan URL: http://www.mobilityplans.eu/docs/SUMP_guidelines_web0.pdf (06.03.2012).

Newman, Peter; Kenworthy, Jeff (1999): Sustainability and Cities: overcoming automobile dependence. Washington D.C., Covelo: Island Press.

SEStran South East of Scotland Transport Partnership (Ed.) (2008): Cycling Infrastructure. Design Guidance and Best Practice URL: www.sestran.gov.uk/files/Final%20SEStran%20Cycling%20Design%20Guidance%20Document.pdf (08.09.2011).

Sustrans (2009): BikeBelles project. URL: www.bikebelles.org.uk/ (19.01.2012).

Umweltbundesamt(Ed.) (2000): Chancen des Fuß- und Radverkehrs als Beitrag zur Umweltentlastung. Authors: Planersocietät/ ISUP/ Schriftverkehr, Berlin.

Vectris, Austrian Mobility Research (AMOR), IMOB – Hasselt University, Ligtermoet & Partners, Centrum Dopravniho Vyzkumu CDV, velo:consult (2008a): BYPAD. Cycling, the European approach. Total quality management in cycling policy. Results and lessons of the BYPAD-project. EIE/05/016 – Deliverable WP 6 – dissemination.

Vectris, Austrian Mobility Research (AMOR), IMOB – Hasselt University, Ligtermoet & Partners, Centrum Dopravniho Vyzkumu CDV, velo:consult (2008b): BYPAD Manual. Version 3.0: 2006 – 2008.

Part II:
Cycling Infrastructure

mobile
2020

CONTENTS

1. Cycling infrastructure

The contents of this folder reflect a summary of the state-of-the-art of European knowledge about planning, building and maintaining cycling infrastructure. It contains planning strategies, parameters and helpful advice on how to implement a high quality cycle infrastructure. Information about what has to be considered while planning new infrastructure developments and what can be done to improve cycling infrastructure in existing developments will be described.

The main target groups for this project handbook chapter are multipliers, planners and decision makers in Central and Eastern European cities. For that reason the information presented is not just another set of cycling guideline but a planner's manual that is oriented to the needs of the target groups in respect of regional, infrastructural and political specifics. Nevertheless, this compilation can be useful for planners all over Europe to improve planning skills for cycling infrastructure.

The PRESTO Project (also financed by the Intelligent Energy Europe Programme) delivers outstanding material on which most of the contents of this folder are based. Much of the PRESTO material was used and/or advanced to obtain a variety of samples of state-of-the-art guideline for cycling infrastructure, which can never be complete. The aim of this chapter is to provide an overview of cycling measures, parameters and requirements. For detailed information we strongly recommend further readings, such as the PRESTO factsheet (free download available: http://www.presto-cycling.eu/de/policy-guides-a-fact-sheets), the German Guidelines on Cycling Infrastructure (ERA2010) or the CROW's (Design Manual for Bicycle Traffic) from the Netherlands.

Against the background of a small share of bicycle use in traffic and limited experience of planning processes along with high quality cycling infrastructure requirements in the cities, the mobile2020 approach is to provide readily understandable material visualised with many photos, figures, best and bad practice examples to discuss planning errors and poorly implemented infrastructure elements. Along with the examples the reader will find short descriptions of the pros and cons of the developments shown.

This chapter is based on the first, Strategic Planning of Cycling Infrastructure. After showing the general requirements for a cycling network and the strategic approach to planning cycling infrastructure, it provides an informative outline of constructional aspects.

1.1 Effects of cycle use

The overall aim of promoting bicycle use in Central and Eastern European countries is to reduce the share of car use for short distance-trips (1-10 km). By providing a better cycling infrastructure and promoting bicycle use the share of car use for short trips can be reduced. Motorised trips can serve various purposes: leisure, work, errands. The approach of mobile2020 is to divide trips into two groups: utility cycling and leisure. In this project we define utility cycling as the everyday use of the bike to get to work, to make errands, to go shopping, to meet friends, etc., while leisure cycling describes only activities when the bicycle is used for recreational purpose or sporting activities. The aim of mobile2020 is to increase the share of cycling, especially utility cycling.

Lower car use has several positive aspects for people and the environment, e.g.:

- Less crowded streets and therefore less congestion,
- Higher traffic safety,
- Less pollution,
- Lower CO_2-emissions and
- Physical condition and mental health.

1.2 Design goals

At the beginning of every plan there has to be a clearly defined goal. So before starting to plan cycle networks, cycle tracks, parking facilities etc., planners and decision makers must discuss and agree on an overall goal, that describes what the city should be like in respect of bicycle traffic. There has to be a vision everybody agrees with and everybody has to decide to reach this goal. (For detailed information about design goals please see chapter 1).

Once the vision is defined a good approach to start city planning is to categorise the streets within the city limits. It will become clear which roads are main roads and which are 30 km/h zones. If there are no 30 km/h zones we strongly recommend implementing them to encourage bicycle use. From this point a cycling strategy can be implemented. Implementing 30 km/h zones may be the lowest-cost and most reliable solution to create cycling friendly spaces without major investment. But speed limits should be enforced by the police to achieve this change in behaviour. Otherwise drivers will tend to overrun by up to 10 km/h or even more be-

yond permitted speed limits.[1] The following will show the overall design principles, which must be questioned continuously.

Figure 1: A 30 zone (30 km/h speed limit)
Source: Rudolph 2011

Good cycling infrastructure and daily cycle use are closely linked. The design of a cycling infrastructure should be suited to provide for or to improve the safety and quality of the traffic flow. Apart from daily utility journey, the bicycle also plays a major role in recreational trips[2]. According to these facts "[t]he infrastructure should enable the cyclists to make direct, comfortable bicycle journeys in attractive, safe traffic surroundings. Only then is it possible to compete with the car."[3] Based on these goals, five main design principles for cycle-friendly infrastructure can be defined. They are illustrated in detail in the following chapter 1.3. It will not always or everywhere be possible to meet each requirement. But the point is that the more of them are met, the more people will be attracted to get on their bikes. These requirements must always be kept in mind as objectives to strive for. And they can also be used as criteria to assess the quality and shortcomings of existing infrastructure[4].

Further reading:

ECF Fact Sheet – 30 kph speed limits and cyclists safety.

http://www.ecf.com/wp-content/uploads/ECF_FACTSHEET1_V3_cterree30kph.pdf.

1 ECF Fact Sheet: 30 kph speed limits and cyclists safety (n/a)
2 Paragraph taken from PRESTO consortium (2010a)
3 CROW (2007)
4 Paragraph taken from PRESTO consortium (2010a)

1.3 Design principles

Before planning and building new cycling infrastructure it is necessary to consider the main requirements that a bicycle-friendly infrastructure must meet.[5] These five requirements according to CROW (2007) are:

- Safety,
- Directness,
- Cohesion,
- Attractiveness and
- Comfort.

(For detailed information about design principles please see chapter 1 – Strategic Planning.)

Safety is undeniably the basic requirement and must be the overriding concern. Cyclists cause no significant danger, but they themselves are and feel vulnerable when moving in the same space as motor traffic. Risk results from the major differences in mass and speed. Safety can be provided in three main ways. Reducing traffic intensities and lowering speeds below 30 km/h makes mixing safe. Separating cyclists in space and in time from fast and heavy motor traffic reduces the number of dangerous encounters. Where conflict points between motor traffic and cyclists cannot be avoided (at intersections and crossings), these should be presented as clearly as possible, so that all users, not only cyclists, are aware of the risk and can adapt their behaviour.

The following requirements ensure safety on cycle roads:

- Avoid conflicts with oncoming traffic,
- Avoid conflicts with intersecting and crossing traffic,
- Separate vehicle types,
- Reduce speed at conflict points,
- Avoid cyclists being forced off the road,
- Create and ensure recognisable road categories and
- Ensure unambiguous traffic situations.
- Minimise and bundle sub-conflicts,
- Ensure uniform traffic situations.

Directness can be divided into directness in distance and directness in time. Directness in distance means that cyclists can reach their destination by the shortest route possible. Detours must be kept small. Directness in time means that the overall travel time for cyclists needs to be minimised. This makes cycling highly

5 Paragraph taken from PRESTO consortium (2010a)

competitive over short distances, since travel time will mostly be lower than when travelling by car. All factors with an impact on travel time influence directness: detours, number of stops at crossings, traffic light regulations, slopes etc. Cycling can then be promoted as a smart choice and a fast means of transport into a city center or to local schools, to work or to other amenities.

Cohesion is about the extent to which cyclists can go from any origin to any destination without interruption. This basically means that cyclists will strongly appreciate an area-wide or city-wide network. Black spots and barriers, cycling provision that suddenly stops are strong disincentives to cycle. Cyclists need to be confident that wherever they go, they will easily find a route with a consistently good quality of provision. Every home, every company, every amenity must be accessible by bike and connected to the overall network. Cohesion also means good connections to other networks, mainly public transport stops and hubs.

Attractiveness means that bicycle infrastructure is well integrated into agreeable surroundings. This is a matter of perception and image, which can strongly encourage or discourage cyclists. Since perceptions are highly variable and personal, general rules are hard to give. But perception should receive full attention in planning and when analysing usage levels and complaints. Apart from design and landscape qualities and the image of an area, this also includes the factor of actual and perceived 'personal safety'. This is particularly crucial in the evenings and at night.

Comfort is about creating an enjoyable, smooth and relaxing cycling experience. Physical and mental effort should be minimised as much as possible. For smooth driving irregular efforts should be avoided: having to stop and start repeatedly is tiresome and stressful. Bad material design or maintenance causes annoying vibrations, shocks and obstacles: this makes cycling a more complex task, requiring greater concentration and more effort to control your balance and spot nuisances in advance.[6]

Further reading:

For detailed information about safety requirements please refer to CROW (2007): Design Manual for Bicycle Traffic, pp. 99ff and 185ff.

1.4 Form, function, use

It is very important to balance each road section between the three features function, form and use. Each road section has its own functions. According to these functions the form can be selected. Figure 2 shows the triangle and linkage between these three features.

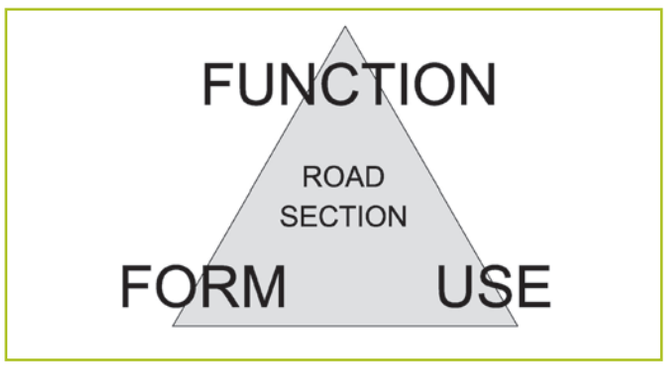

Figure 2: Triangle
Source: Own compilation

Three factors play a significant role in this process:

- Intensity of bicycle traffic,
- Speed of motor traffic and
- Intensity of motor traffic.

Road sections might change the form from intersection to intersection due to the linkage to other roads. Intensity of bicycle traffic or intensity of motor traffic might change also. As long as each section meets the requirements there will be no problem.

On the other hand continuity and recognition are essential, especially for cycle routes that are long (several hundred metres) and have a linking character between districts and/or are frequently used by commuters or for recreational purposes.

The functionality and the three factors determine the form of the cycle infrastructure. In the final analysis use depends on the function and the selected form.

1.5 Design parameters

The following chapter shows the most important design parameters widely used by planners in Western Europe. These parameters represent the state-of-the-art for modern cycling infrastructure planning. They are gathered from different sources and shown in a compilation. The information is intended to be easy to understand for people who are not professional planners. For further details please check the original source.

6 Paragraph taken from PRESTO consortium (2010a) and edited

1.5.1 Required clearance

"The space needed for a cyclist in which the feeling of safety and comfort is appropriate depends on:

- The cyclist's dynamic envelope, i.e. the space needed in motion (stability and zigzagging);
- The clearance when passing fixed objects; and
- The distance from, and speed of other traffic (fear distance from obstacles)."[7]

To achieve a cycle friendly environment it is necessary to keep these factors in mind, because they have a crucial impact on the design process. Cyclists and motori traffic need to be more separated, the more the speed between those two groups differ. This guideline also applies to cyclists and pedestrians sharing space. "If the design allows for relatively high cycling speeds, larger separation distances are beneficial. At very low speeds and on uneven surfaces, cyclists require additional width to maintain balance."[8] The required clearance depends on stability of the cyclist, zigzagging and the fear distance to obstacles.

Stability
Bicycles are unstable vehicles. Crosswinds, lorry slipstreams, bumps and holes in the road surface and involuntary low speeds determine the stability and hence the room required for manoeuvring. To maintain balance, a speed of at least 12 km/h is required. At speeds below that, the bicycle starts to wobble. This happens when pulling away from a stationary position, slowing down in tight bends and riding uphill.[9]

Equilibrium and safe clearance
When riding, cyclists must constantly maintain their balance. That is why they always move slightly from side to side, even when riding fast. This is called zigzagging. Apart from the speed, zigzagging also depends on age, experience, physical capacity, disruptions in the road surface and cross winds. At normal cycling speeds in normal conditions, the zigzagging movement is about 0,20 m. In situations where cyclists are forced to travel at less than 12 km/h, more free space is required. This is the case at traffic lights, for example, where cyclists have to pull away from a stationary position and when cycling uphill. In that kind of situation, zigzagging may require a track width of up to 0,80 m.[10]

Fear distance from obstacles
Designers also have to take the fear of colliding with obstacles or parts of the infrastructure into account: Cyclists will want to keep their distance from kerbs, edges and walls. The Dutch Design Manual[11] indicates the following obstacle distances. Distance from

- Green verges and low kerbstones: 0,25 m,
- Higher kerbstones: 0,50 m and
- Closed walls: 0,625 m.[12]

1.5.2 Curve radius

The consistent interconnection of road sections is created by curves. The radius of a curve has a direct impact on the speed of a cyclist to pass through this curve. The radius of a curve should not go below 5,00 m as the absolute minimum of a curve radius. Below this value, cycling speed is not enough for the cyclist to remain upright. "As the design speed increases, the radius of the curve will have to increase accordingly. Cycle connections that form part of the basic network should have a radius of ≥ 10 m, geared to a design speed of 20 km/h. Cycle routes and main cycle routes should have a radius of ≥ 20 m, geared to a design speed of 30 km/h."[13]

1.5.3 Slope/Inclines

Inclines whether they are driven upwards or downwards are a crucial issue for planners. "Upward inclines require cyclists to make an extra effort and should be avoided where possible in the design of a bicycle friendly infrastructure."[14] A long uphill inclination should be avoided. "If a height over 5,00 m has to be climbed, it is advisable to incorporate a 'resting place' in the form of a horizontal section about 25,0 m in length before cyclists have to climb the next part of the incline […]."[15]

A constant gradient will reduce the cycling speed so it is advisable "[…] to design the lowest section according to the higher percentage on the graph and the highest section according to a lower percentage."[16] On inclines that are designed in this way, the ascent for the cyclists is much easier and an appropriate cycle speed can be maintained.

Every slope can be driven in both directions. The design of an incline should not only be from the point of view of the ascending cyclist but also from that of the descending cyclist.

7 Department for Transport (2008)
8 Department for Transport (2008)
9 Paragraph taken from PRESTO consortium (2010a)
10 Paragraph taken from PRESTO consortium (2010a)
11 CROW (2007)
12 Paragraph taken from PRESTO consortium (2010a)
13 CROW (2007)
14 CROW (2007)
15 CROW (2007)
16 CROW (2007)

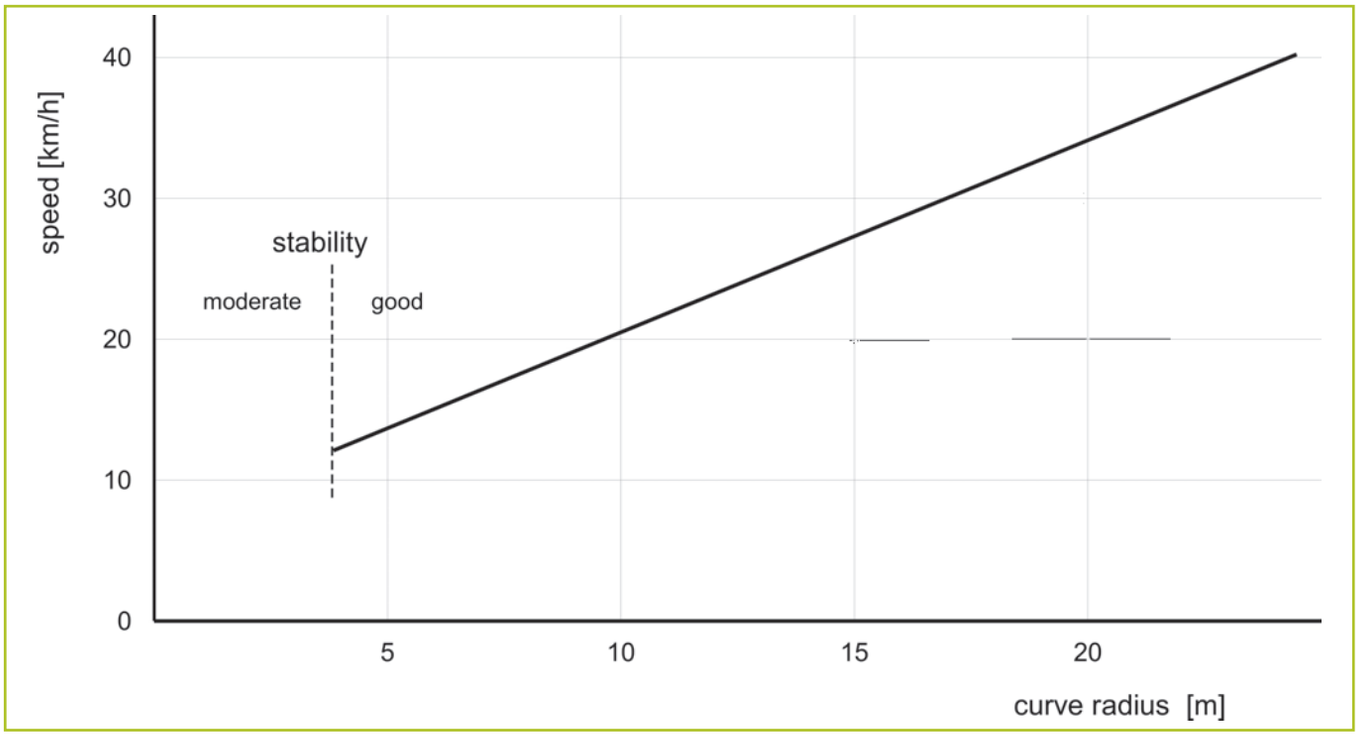

Figure 3: Relationship between curve radius and bicycle speed
Source: CROW 2007

The speed of descending cyclists is crucial since a descending cyclist can easily reach a speed up to 40 km/h and higher. At the bottom of an incline enough deceleration space should be given. Due to the possible high cycle speed there should be no intersection and no sharp bends or obstacles.[17]

1.5.4 Visibility range

Visibility in traffic is essential. It is important to have a wide and open view to see other traffic participants and of course to be seen by other is indispensable for life.

	(Main) Cycle routes	Other routes
Design speed riding visibility for cyclists	30 km/h	20 km/h
Minimum riding visibility required	35-42 m	22-30 m

Table 1: Riding visibility for cyclists
Source: CROW 2007

Visibility can be divided into three categories: riding, braking and approaching visibility.

1. Riding visibility: To ride a bicycle in a safe way at a certain speed it is mandatory to have a good view of the cycle track, the roads and the sidewalks. The view has to be as open as possible and free of obstacles like billboards, signs, trees or any other installation. "Comfortable riding visibility is the distance travelled in 4 to 5 seconds." [18]
2. Braking visibility: The braking visibility describes the distance in which the cyclist can brake safely without hitting an obstacle. It is the distance covers travelled within the two-second reaction time plus the distance which is needed to stop the bicycle. "At a speed of 30 km/h, the braking visibility is 40 metres, at 20 km/h 21 metres (assuming a reaction time of 2,0 seconds and a speed reduction rate of 1,5 m/s^2)" [19]. The braking visibility is important at road sections and intersections.
3. Approaching visibility: Especially at intersections and junctions where the cyclist wants to cross a road the visibility in both directions of the road has to be sufficient. So the cyclist can estimate according to the approaching speed of the cars whether there is enough time to cross the road safely. The required approach visibility is calculated from 1,0 metre from the side of the man carriageway the cyclist is waiting to cross. Approach visibility is determined by:

- The closing speed of crossing traffic,
- The time the cyclist needs to cross safely (crossing distance) and
- The delay time (safety of crossing traffic).[20]

17 CROW (2007)

18 CROW (2007)
19 CROW (2007)
20 CROW (2007)

		Approach visibility required (m) for various closing speeds of motorized traffic			
Crossing distance (m)	Crossing time (s)	30 km/h	50 km/h	70 km/h	80 km/h
4	4,2	45	100	180	205
5	4,5	45	105	185	210
6	4,9	50	110	190	220
7	5,1	50	115	200	225
8	5,5	55	120	205	235

Table 2: Approach visibility required for various road widths and riding speeds
Source: CROW 2007

Table 2 provides a number of guideline values for the approach visibility for cyclists. These are based on an acceleration rate of no more than 0,8 m/s², a reaction time of approximately 1 s and a maximum speed at the crossing of about 10 km/h (= 2,8 m/s). Because approach visibility involves cyclists who want to cross the carriageway from a standstill, the distance does not depend on the functional level of the cycle connection. The delay time depends on the closing speed of the crossing traffic and varies from 1 second at 30 km/h to 5 seconds at 80 km/h.[21]

1.5.5 Surface

When it comes to the construction of roads, whole-life costs are important to decide which surfaces shall be used. On the one hand the pavement has to be even and smooth. On the other hand the surface has to have enough grip for cyclists to be able to keep their equilibrium in curves, even in rainy conditions (adhesion between tyre and pavement).

1.5.6 Surfaces on-road

Widespread visible cycle facilities such as cycle lanes may also have a promotional effect in encouraging cycling and clearly marked cycle lanes may also help minimise intrusion by other road users. However, colouring may be inappropriate in some historic or environmentally sensitive areas. The resources (manpower and costs) to maintain the coloured surface must also be taken into account. The type of additional surfacing, if any, should be chosen with due consideration for:

- Existing standards – ensuring consistency with existing colours schemes such as red and green. Blue is also used in some continental European cities;
- The location of the scheme – avoiding unsympathetic or visually intrusive schemes, although bright colours tend to tone down rapidly once the lane is in use;
- The visual effect – ensuring compatibility with existing road markings and the best us of markings to emphasise the existence of a cycle lane;
- The environmental impact - choice of colour and surfacing should be made with regard to wider environmental considerations;
- The requirements of users – for example: disabled users, recreational cyclists and commuter cyclists, and;
- Maintenance requirements, including ability to maintain colour.

Particular consideration should be given to surfacing where there is a greater need to highlight the existence of a cycle lane to other road users such as where:

- Cycle lanes cross junctions;
- Cycle lanes run adjacent to street car-parking;
- Cycle lanes run between traffic lanes;
- Cycle lanes run through narrowed carriageway;
- Cycle lanes run through junctions;
- Where a cycle lane or facility is not adjacent to a [right]-hand kerb, and;
- Where motor traffic and/or pedestrians frequently move in and out of the cycle facility.

There are two basic methods of achieving a coloured carriageway surface:

- The use of coloured aggregates, fillers and binders in part of the wearing course mix, and;
- Surface application of a coloured material.

The final decision as to which type of coloured surfacing material should be used will depend on its location within the carriageway, the design standards specified for the carriageway and the cost. The most common materials used are:

- Thermoplastic paint;
- Resin based materials with coloured chips;
- Coloured macadam, and
- Slurry seal.

In selecting the most appropriate material for a particular location the following should be assessed:

- Skid resistance;
- Adhesion to existing surface;
- Colour retention;
- Durability requirements;

21 CROW (2007)

- Ride quality, and
- Cost of installation and maintenance
- Level of wear expected.[22]

1.5.7 Surfaces off-road

Smooth, firm and non-slip surfaces are the easiest for all users to navigate. Tarmac (asphalt) or concrete are the usual path surfaces in parks and recreation areas but will detract from the appearance and feel of less intensively managed areas, especially for other users such as pedestrians and horse riders. Various loose surfacing such as hogging, crushed stone, plannings or scalpings (recovered road surfacing) can be used, firmly compacted with a powered roller or vibrating plate. The material should be gently cambered for drainage. If the cycle path is in a wooded area a tree root resistant surface can be considered.

The treatment of the path edges is important. Where the site is suitable and the maintenance funds available, mown grass is the best option. This itself produces a reasonably hard-wearing surface which can be used as an overspill. It also keeps sight lines open. For maintenance reasons shrub, hedge and tree planting should preferably be kept well back from the path, leaving an edge of at least 2 m. The need for adequate drainage should be considered during the design of all cycle tracks, to prevent flooding or erosion due to inclement weather.[23]

1.6 Cycle track types (ERA2010)

The following section deals with different types of cycle infrastructure. The application of the different types depends on traffic volume and the strength of the relation for cyclists. The traffic volume is a crucial factor to decide which type is applicable. Planners must know about the traffic volume (number of cars per hour) of the road where a cycling infrastructure is to be designed. If there is no data available, a survey is essential to establish the traffic volume of cars per day.

The following sections show planning issues, figures and pictures of good practices to illustrate the different existing possibilities. According to the traffic volume an adequate form can be chosen easily.

22 Paragraph taken from SEStran South East of Scotland Transport Partnership (2008)
23 Paragraph taken from SEStran South East of Scotland Transport Partnership (2008)

1.6.1 Cycle lane

A cycle lane is a legally reserved riding space for cyclists on the road, visually separating them from other traffic. It is recommended when significant numbers of cyclists drive along a moderately busy road. Cycle lanes are a visible, fast and flexible solution on existing roads, needing only road markings. A cycle lane can be an alternative to a cycle track when space is lacking, but only when safety can be sufficiently guaranteed.

Figure 4: Symbol for cycle lanes
Source: Rudolph 2011

Figure 5: Cycle lane, Leipzig (Germany)
Source: Rudolph 2011

Cycle lanes are recommended along distributor roads with relatively low traffic intensity, but where motor traffic is too fast to allow mixing cyclists with cars. Cycle lanes can be used as an alternative for a cycle tracks where space is lacking, at least if the speed of motor traffic can be reduced to 50 km/h or less.

Traffic Rules:

Motor traffic is not allowed to use cycle lanes or to cross the white line for driving purpose. According to this rule, cars are not, of course, permitted to park or stop in the area of the cycle lane. For parking purposes they may cross the cycle lane to reach the parking space. While crossing the cycle lane the driver must take extreme caution and look out for cyclists who approach from the rear.

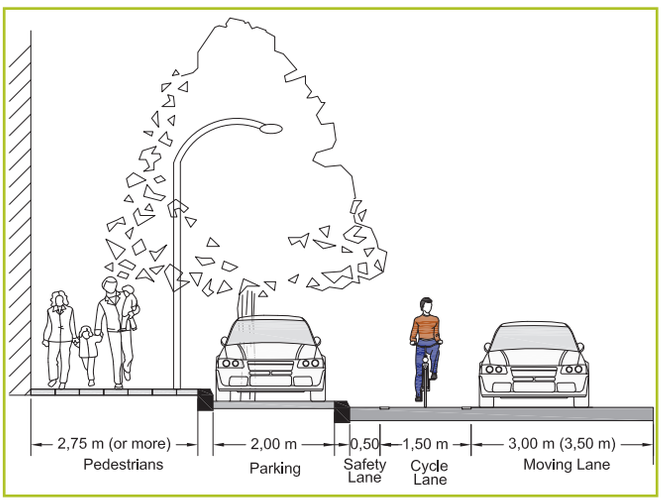

Figure 6: Cycle lane (1,50m)
Source: Own compilation (according to adfc NRW)

Outside of built-up areas, cycle lanes can be considered as an alternative for cycle tracks on basic local network routes, but only at low traffic speeds of 60 km/h or less and relatively low intensities of 2.000 to 3.000 vehicles per day.

At the very lowest intensities, cyclists can mix with traffic and no cycling facilities are needed, except possibly a suggestion lane.

Within built-up areas, cycle lanes are recommended for major routes with a speed limit up to 30 km/h and more than 2.000 cyclists per day. On basic network links with fewer cyclists, mixing traffic should be preferred, possibly with an advisory cycle lane. On faster roads with a speed up to 50km/h, cycle tracks must be given preference. Only when these are quiet links of the basic network with less than 750 cyclists per day in narrow streets (2x1 lanes) should cycle lanes be considered.

A cycle lane, especially on roads with many intersections, is considered the safest way of cycling. But a cycle lane may create a false sense of security and invite cars to speed up and pay less attention to the cyclist.

The risk gets even worse when cycle lanes are dangerously narrowed. When space is limited, the designer may feel that putting in a narrow lane (less than 1,5 m) is better than nothing, even on busy and fast roads. The narrow lane forces motor traffic to drive too close to the cyclist. At the same time, it forces the cyclist to ride too close to the edge of the road or parked cars. As a result, even a slight manoeuvre by the cyclist to avoid an obstacle is more likely to result in a collision and to cause serious injuries. Narrow cycle lanes should always be combined with speed reduction measures.

A cycle lane consists of several components.

- A line marking, usually on both sides, delimiting the cycle lane from the other traffic lines
- A bicycle symbol, indicating the lane at least before and after each intersection. The symbol is preferably repeated at regular intervals for instance 50 to 100 m in the built-up area and 500 to 750 m outside the built-up area.

Figure 7: Cycle lane (intersection area), Stockholm (Sweden)
Source: Müller 2011

Figure 8: Cycle lane (intersection area), Leipzig (Germany)
Source: Rudolph 2011

Figure 9: Cycle lane outside built-up area, bus stop area, Leipzig (Germany)
Source: Rudolph 2011

Figure 10: Cycle lane outside built-up area, Berlin (Germany)
Source: Müller 2011

- A safety buffer zone with markings between the cycle lane and traffic lanes is recommended along roads with relatively intense and fast traffic at speeds of 50 km/h and above.
- A level surface (more in the chapter on stability)
- Strikingly coloured paving, for higher visibility
- A minimum width of 1,5 m, a width between 2,0 m and 2,5 m increases comfort and safety

Ideally, a cycle lane should not be combined with a parking lane or parking bays. Opening car doors are a serious safety hazard for cyclists. The cyclist may hit the door or try to avoid it by making a sudden swerving movement onto the carriageway, risking being hit by a car coming from behind (dooring). When a parking lane needs to be combined with a cycle lane, it is recommended to add a critical reaction strip (0,5 to 0,7 m wide) to the parking lane as a buffer space, reducing the risks of hitting an open door or of evasive manoeuvres (see Figure 5).

1.6.2 Advisory cycle lane

Advisory lanes should only be implemented if there is a lack of space. This might happen if a redesign of a road is done within an existing infrastructure. The traffic volume of passenger cars must not be too high.

The marking for that lane is a dotted marking. In contrast to cycle lanes mixed traffic use the lane. Motor traffic is also allowed to use the lane. The main advantage of the advisory lane is to raise awareness of cyclists. While overriding the dotted line the car driver has to be extremely careful about cyclists using the advisory cycle lane. Advisory lanes should only be implemented where other solutions are not applicable. Figure 12 shows a general profile of a road with an advisory cycle lane.

The advantage is to raise visibility of cyclists and to give some protection and a comfortable surface and a higher safety if there are many right-turning actions.

Figure 11: Advisory cycle lane, Hamburg (Germany)
Source: Rudolph 2011

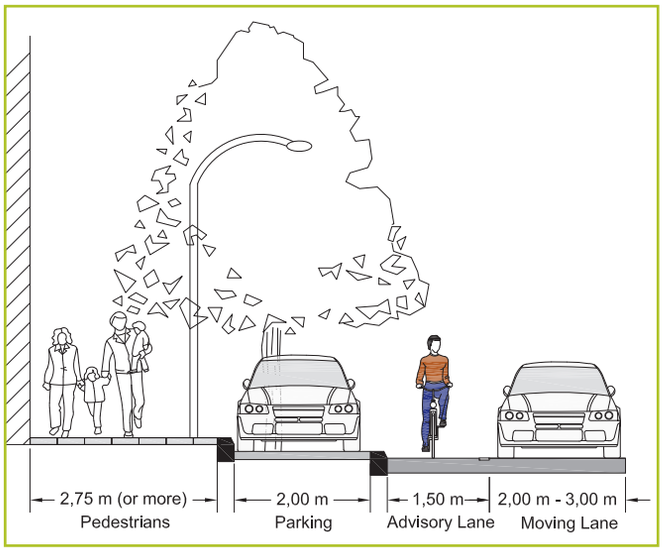

Figure 12: Advisory cycle lane (1,50 m)
Source: Own compilation (according to adfc NRW)

1.6.3 Cycle track

A cycle track is a part of the road exclusively reserved for cyclists. It is compulsory for cyclists if the blue cycle track sign is used (Figure 13).

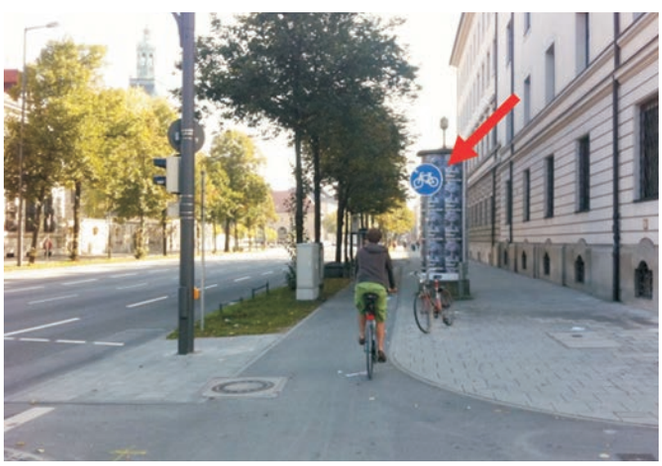

Figure 13: Cycle track inside built-up area
Source: Rudolph 2011

Cars are not allowed to drive or park on it. It runs along a road but is physically separated from it, at a horizontal distance or vertically on a higher level. 'Because cyclists are separated from motorized traffic, the risk of (passing) conflicts between both groups is kept to a minimum.'[24]

Figure 14: Cycle track in residential area, Hamburg (Germany)
Source: Müller 2011

In built-up areas, cycle tracks are recommended at traffic speeds from 50 km/h upwards. They should also be considered at lower speeds from 30 km/h and upwards when traffic intensity is over 4.000 vehicles per hour. They are best restricted to fairly long uninterrupted stretches, with few intersections. The physical separation of driving lane and cycle track and the fact that parked cars between driving and cycle lane obstruct the motorists' view of cyclists are disadvantages. So each intersection can be considered as a peril point. Right turning actions are especially dangerous for cyclists, who can hardly be seen by the drivers.

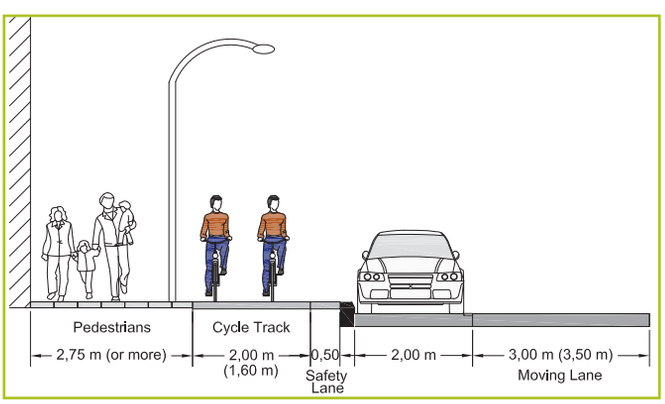

Figure 15: Cycle track (2,00 m)
Source: Own compilation (according to adfc NRW)

Outside built-up areas, cycle tracks are recommended along roads with speeds of 60 km/h upwards and if traffic intensities are over 2.000 passenger car units per day (pcu/day).

Cycle tracks separate the cyclist from motor traffic physically and offer therefore a certain degree of safety. Due to the fact that parking lots are usually located between cycle tracks and the road, cyclists are often overseen by drivers turning right. The driver's view of the track is mostly blocked by parked cars.

24 CROW (2007)

Figure 16: Parallel cycle track, Copenhagen (Denmark)
Source: Müller 2011

Figure 17: Parallel cycle track, Copenhagen (Denmark)
Source: Müller 2011

Figure 18: Parallel cycle track, intersection area, Leipzig (Germany)
Source: Rudolph 2011

Figure 19: Two-way cycle track in industrial area, Hamburg (Germany)
Source: Müller 2011

Cycle tracks have another disadvantage. They are elevated to the same level as sidewalks. At intersections the cyclist has to overcome the level difference. The kerb is lowered, but usually there is a level difference of some centimetres. This fact is a discomfort for cyclists since bicycle suspension (even if it exists) is very poor compared with that of a car. Multiplying such occasions is dangerous, even with carefully designed intersections.[25]

1.6.4 Cycle street

A cycle street is a high-quality cycle connection also used by low-intensity motor traffic. It can be considered for a major route running through a residential area on estate access roads.

It is a road designed in a way that cyclists dominate physically and visually, expressing visually that motor traffic is tolerated as a guest. In practice they generally look like street-wide cycle tracks on which cars are permitted.

Actually, cycle streets are a form of mixed traffic without a specific legal status. Legally, cars are allowed as in an ordinary street, but the design strongly favours cyclists. Only in Germany do cycle streets have a legal status in the traffic code as a street dedicated for cyclists on which cars are permitted. Cycle streets are used in urban areas on routes with high intensities of cyclists where motor traffic still needs to have access. They should have a speed limit of 30 km/h and can be used in residential streets with only local traffic. To improve speed and comfort, cycle streets should have right of way at intersections.

25 Paragraph taken from PRESTO consortium (2011f)

In built-up areas, cycle streets should only be considered for main cycling routes with more than 2.000 cyclists per day and with low traffic speeds with a maximum of 30 km/h. Outside the built-up area, they can be considered with speeds up to 60 km/h, but at very low traffic intensities (below 500 vehicles per day). In a cycle street, cyclists should perceptibly dominate the streetscape and traffic. A rule of thumb is that there should be at least twice as many cyclists as cars on the road.

Figure 20: Bicycle streets, Zwolle (Netherlands)
Source: Bosch 2011

Figure 21: Bicycle streets, Zwolle (Netherlands)
Source: Bosch 2011

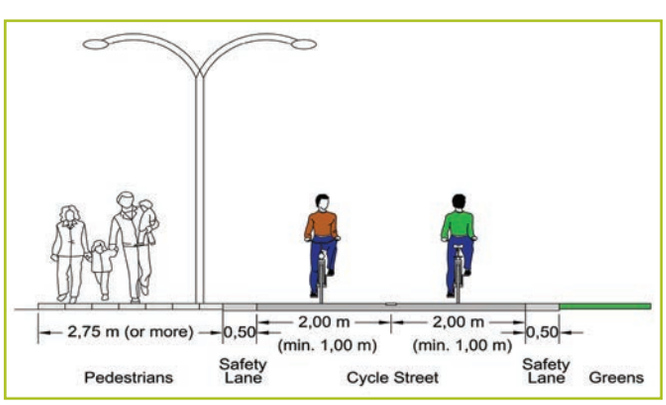

Figure 22: Cycle street (4,0 m (min. 2,0 m)
Source: Own compilation (according to adfc NRW)

1.6.5 Independent cycle tracks

Independent cycle tracks probably offer the safest cycle route of all, whether they run parallel to the road or are totally independent.

Figure 23: Independent cycle track, Basel (Switzerland)
Source: Rudolph 2011

Figure 24: Independent cycle track physically separated from motor traffic, Bolzano (Italy)
Source: Rudolph 2011

An independent cycle track can be considered as a proper road only for cyclists. Another advantage of independent cycle tracks is that they can be located between points of interest directly, where is not enough space for roads but sufficient demand.

Despite all advantages, independent cycle tracks are rare in build-up areas since space is scarce and independent tracks need their own space. Examples can be seen in the following figures.

1.6.6 Selection of cycle track types

To decide which type of cycle infrastructure is adequate the following table 3 is given. It shows the different types according to the number of passenger car units per day (pcu/day) and the planned location of the cycle infrastructure as well as the traffic load of predicted bicycles per day.

Figure 25: Independent cycle track, Hamburg (Germany)
Source: Müller 2011

Figure 26: Independent cycle track, Bolzano (Italy)
Source: Rudolph 2011

			Cycle Lane	Cycle Track	Cycle Street
Width	(one-way)	minimum	1,5 m	2,0 m	
		recommended	2,0 m	3,0 m	
	(two-way)	minimum	no two-way traffic allowed!	2,5 m	3,0 m
		recommended		4,0 m	4,0 m
Strenghts			• low costs • requires little space • increasing visibility • best solution on urban streets • easy and fast to implement on existing roads	• physical separation from the main carriageway • highest safety • high comfort • strong incentive to cycling	• mixed traffic is possible
Weaknesses			• no physical separation • attracts illegal parking • gives motorists the impression to pay no longer attention to cyclists	• inflexible crossing • high risks at junctions • network fragmentation • high space consuming	• high space comsuming • not always feasible
Design recommendations			• line marking • bicycle symbol • safety buffer zone • level surface	• closed surface paving • colored paving • center line (in case of two-way traffic)	
Main application range			urban areas	roads with adequate space	residential areas or low traffic intensities
Possibility of mixed traffic	Within built-up areas	traffic speed	50 km/h or less	physically separation of motorized traffic	
		traffic intensities			
	Outside built-up areas	traffic speed	60 km/h or less		under 30 km/h
		traffic intensities	2.000 to 3.000 pcu/day		below 3.000 cpu/day
Route type			basic local route	local route, main route, national cycling route	main route, national cycling route

Table 3: Comparison of cycle track types
Source: Own compilation based on PRESTO consortium

1.6.7 Planning of intersections

Intersections are a crucial issue in cycling infrastructure and require detailed planning. Accident statistics show that intersections are places with a higher potential for danger. According to CROW "over half of these accidents occur at intersections in built-up areas (58 %) and of these particularly at intersections with 50 km/h roads (95 %)"[26].

At intersections different road users (cars, cyclists, pedestrians, trucks, buses or even trams) come together and have to mix safely in one point. The remarkable point is that the different means of transport differ in speed, required space and safety requirements. The interweaving action of the different traffic members has to be guided by the infrastructure in the safest way possible.

Planning principles

Also at intersections the triangle of Function, Form and Use should be applied:

Function: Interchange; the design must support the function of interchange; the design must be comprehensible for all road users

Form: depends on road hierarchies and traffic volumes; the road hierarchy should be easily recognisable; uniformity is also required to understand the intersection.

Use: the speed should be at a minimum speed of each participant during the interchange.

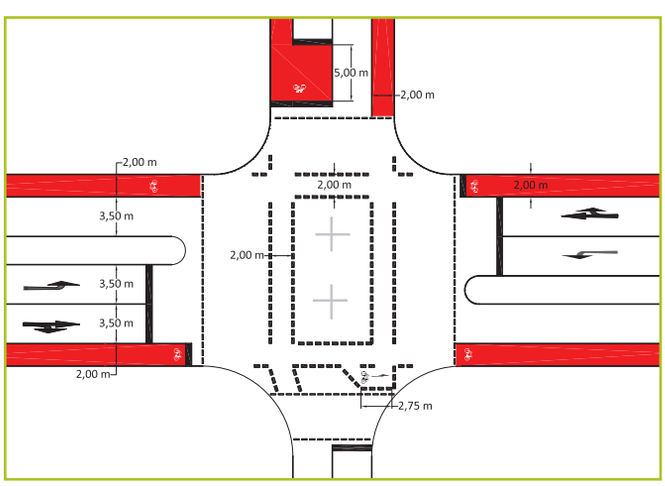

Figure 27: Sketch of an intersection with different cycling measures
Source: Own compilation, based on ERA 2010

Figure 27 contains some specific markings to facilitate a safe crossing of the intersection by bicycle. Cycle lanes are implemented on the western and the eastern road (main roads) and the northern road, which have a high traffic volume. The southern road is a minor road. The following features at that intersection are:

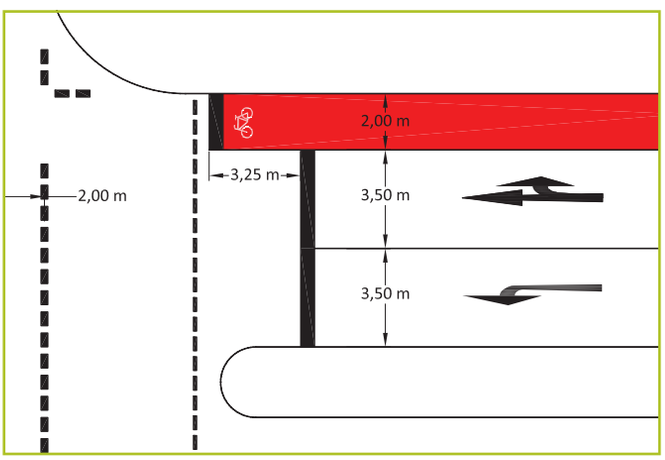

Figure 28: Advanced stop line
Source: Own compilation, based on ERA 2010

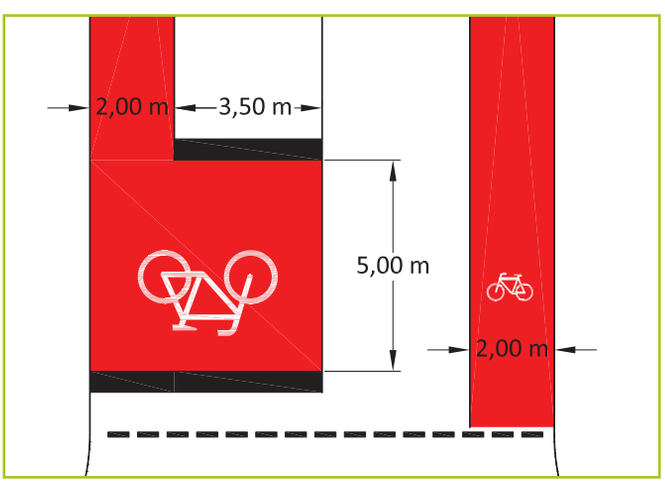

Figure 29: Advanced stop line (stop box in front of cars)
Source: Own compilation, based on ERA 2010

Figure 28 shows an advanced stop line at an intersection with traffic lights at the end of the cycle lane. The cyclist stops in front of stationary vehicles. The cyclist can be seen by the driver easily. Attention to the cyclist is given. Figure 29 shows a stopping area for cyclists that offers even more space and attention to the cyclist. The box is at least 5,0 m long and occupies the whole space in front of the driving lane. This kind of advanced stop line should be implemented if a high volume of left turning bicycles is expected.

26 CROW (2007)

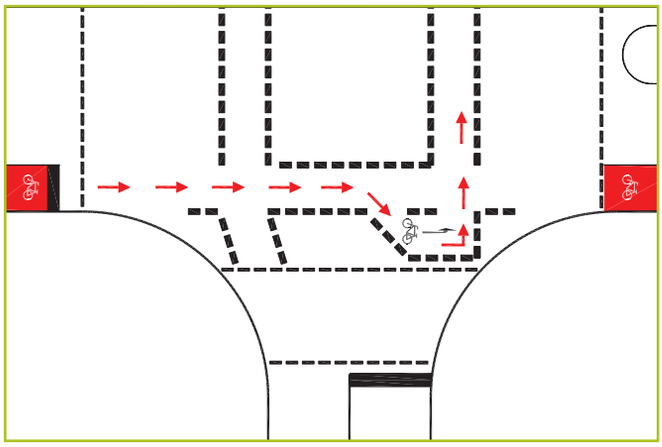

Figure 30: Advanced stop line
Source: Own compilation, based on ERA 2010

If the volume of cyclists crossing the intersection from west to east is high and there is a significant number of cyclists turning left (north) a waiting box for left turning cyclists can be marked on the pavement (see Figure 30). This solution has the advantage that following cyclists do not have to wait until the left turning cyclist finds a time gap in the contrary traffic stream, which might cause delays for the following cyclists. The following cyclists who drive straight on can pass and the left turning cyclist can wait patiently in his box for the next gap to cross the road. The path is shown by the red arrows.

Figure 31 shows similar solutions when there are cycle tracks parallel to the roads. In the area of the intersection the cycle track should be set off from the road to give enough space for waiting pedestrians who want to cross the road at the lights. The bicycle passage should be coloured with signal colours. Intersections are the most dangerous places for cyclists due to turning actions of cars and bicycles and the two different means of transport have to interweave at intersections. Additionally there are pedestrians, buses, trucks or even trams which have to be considered. The traffic situation at intersections can be quite complex, especially when different means of transport approach the crossing at a high speed. The planner has to create an easy-to-understand system of turning relations.

1.6.8 Planning of crossings

Crossings are implemented design elements (see Figure 32 for pedestrians) or markings on the pavement (see Figure 33 for cyclists and pedestrians) which facilitate the crossing of a road for pedestrians and cyclists. Only the option to cross the road is given.

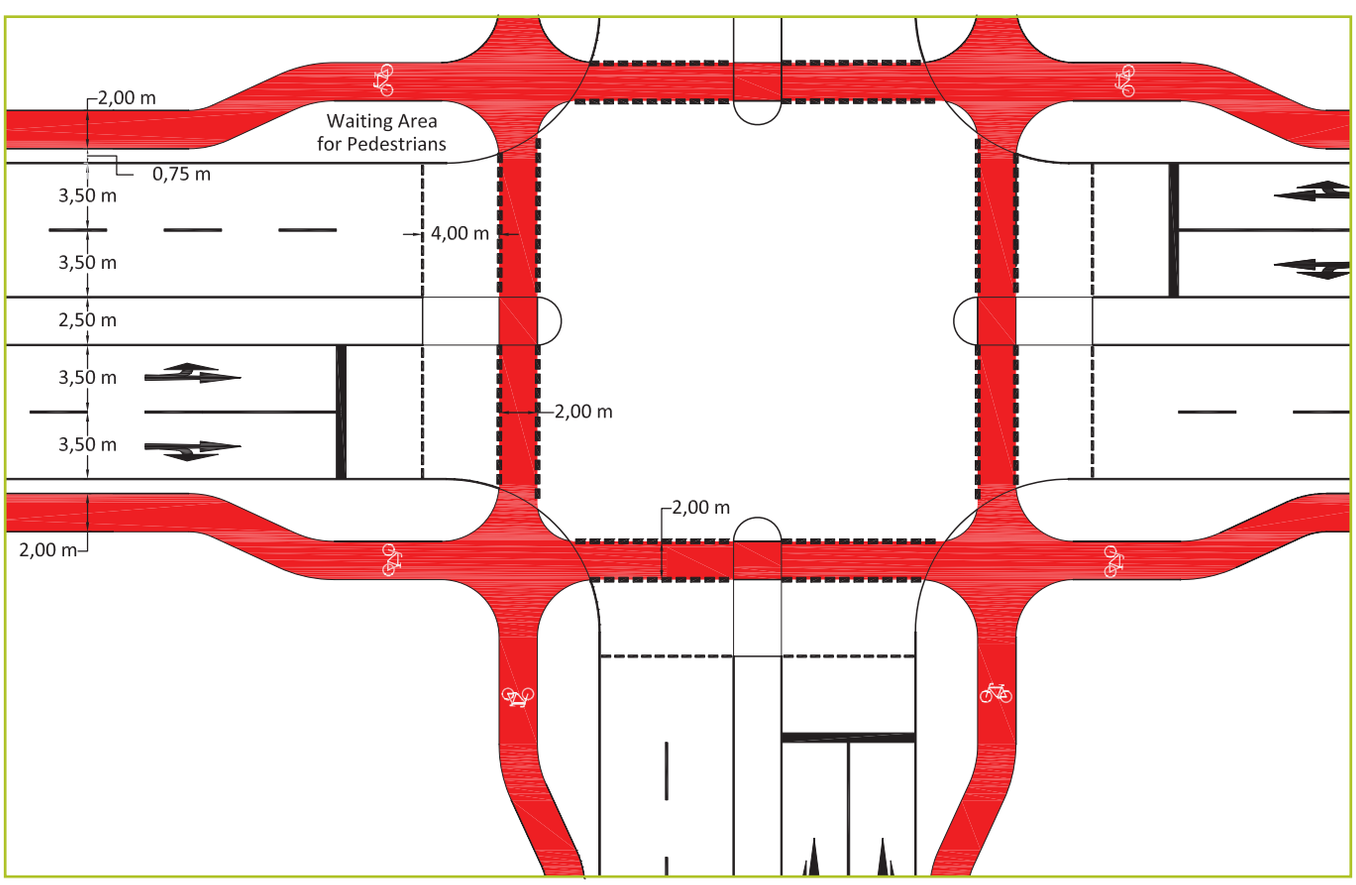

Figure 31: Detailed map of intersection with parallel cycle tracks
Source: Own compilation

Figure 32: Pedestrians crossing cycle track, Copenhagen (Denmark)
Source: Müller 2011

Figure 33: Cycle track crossing road, Hamburg (Germany)
Source: Rudolph 2011

Cycle tracks could be provided with priority crossings across roads where the average driving speed is less than 50 km/h, where total traffic flows do not exceed 4.000 vehicles per day and where the crossing is sited on a flat-topped road hump.

For signal crossings, a lane for the cyclist adjacent to the pedestrian crossing can be provided. The width of the cycle lane should ideally be 3,0-3,5 m to allow cyclists going in opposite directions to cross simultaneously.

An alternative to this approach is to provide a combined crossing to allow both pedestrian and mounted cyclist signal crossing. Combined crossings are typically 4,0 m wide, rather than the 2,8 m of a pedestrian crossing. A 'green bicycle' is usually displayed next to the 'green man' when cyclists and pedestrians are permitted to cross. Combined crossings also typically differ from pedestrian crossings by displaying a continous yellow light instead of the flashing one seen on pedestrian crossings. Whenever possible, crossings should be as close to 90 degrees as possible, to minimise the risk of bicycle wheels becoming trapped.[27]

1.6.9 Planning of secondary roads

Combined traffic of bicycles and motor vehicles on the road is one of the most widely used designs in built-up areas. With regard to costs, safety and utility it is the best alternative, if (the) speeds of bicycles and cars are at the same level. Also traffic intensities should be below 5.000 pcu/day.

Areas without heavy traffic, such as restricted speed zones, are ideal for implementing combined traffic. At low speed-levels bicycles are almost as fast as motor vehicles, so conflicts can be avoided. At higher speed-levels (30 to 50 km/h) drivers tend to get ahead of cyclists causing dangerous conflicts. To ensure safe bicycle use, it is necessary to mind the profile of the road.[28]

If intensities of motor and bicycle traffic are low, a narrow profile is the point of departure. This contributes to the intended low speed, but is not by definition sufficient; a narrow profile may also require additional speed reduction measures. A narrow profile means that a motorist is forced to remain behind a cyclist if there is oncoming traffic.

A wider lane width (profile) enables a safe overtaking with a minimum risk of conflicts. If designers opt for a wide profile, they must bear in mind that this will induce motorists to drive at higher speeds. Accordingly, the need for speed reduction measures to ensure the safety and comfort of cyclists is higher on wide profiles than on narrow profiles.

Further reading:

For possible solutions how to chose the right profile for combined bicycle and motor traffic please see CROW (2007): Design Manual for Bicycle Traffic.

27 Paragraph taken from SEStran South East of Scotland Transport Partnership (2008)

28 Meschik Planungshandbuch Radverkehr (2008)

1.6.10 Planning of one-way roads

Contra-flow cycling in one-way streets offers cyclists on-street shortcut links not available to motorized traffic. This mostly allows them to avoid heavy-traffic roads. Allowing cyclists to use one-way streets in both directions is a very powerful way to increase the directness of cycle routes. One-way-routes create significant detours for cyclists and a contra-flow street is in effect a shortcut. The measure is widely used, and in some cases systematically applied. So in Belgium it has legally become the default option, except when the road profile is too narrow like in the oldest central parts of Brussels.[29]

At first sight, contra-flow cycling looks risky. Over the years, however, experiences in various cities and countries have been consistently positive and have proven the overall safety gains of contra-flow cycling. Nowhere has contra-flow cycling led to a rise in accidents, on the contrary. In many cities where contra-flow cycling was implemented, road managers and police started with very stringent safety criteria, but they mostly relaxed them as time went by.

Contra-flow cycling has proven to be particularly safe along road sections, even safer than cycling with the flow in one-way streets.

- The cyclist and the motorist have visual contact. Both estimate the ease with which they can cross, both slow down and adapt their behaviour.
- When cycling with the flow, only the motorist makes such judgments, and the cyclist cannot see or predict what the car coming from behind will do. In general, overtaking cars are an important cause of cycling accidents.

In addition, we should take into account the risk avoided because cyclists are no longer using other, more hazardous routes.

Nevertheless, as traffic increases (cars, cyclists or both) the number of encounters rises as well: this may lead to irritation and more careless behaviour.

1.6.11 Shared Space

The Shared Space concept is not primarily concerned with cycle traffic. However it arguably clearly opposes the very tenets of the cycling segregation paradigm: the belief that urban space can be compartmentalised in such a way that cycle users and car drivers can go about their business paying minimal attention to each other, provided they pay attention to the special cycling signs (pavement colours and markings, vertical signals, etc.) and follow a specifically designed set of rules. Some divergences between segregation and shared space paradigms are noted in table 4.

The Shared Space framework, in its most radical form, may appear to have limited application in large, modern cities. However, looked at strictly from an urban cycling point of view, Shared Space principles not only make a strong case for shifting from cycling segregation to integration-based policies in urban areas but also offer valuable criteria on how the new kind of integrated cycling structures can be built and what kind of obstacles will need to be overcome.

The application of the Shared Space concept to urban cycling immediately rules out the idea that cyclists have some kind of exclusive right to a portion of the public space: the bike lanes. Other arrangements need then to be sought. Unless taken to its radical extremes, the talk about “shared space for cycling” begs the question: Shared space with whom? After decades of segregated cycling being the accepted model in most of Europe, the answer in large parts of the cycling and non-cycling population is likely to be: “Cyclists are to share space with pedestrians”. It is not hard to see that this path is bound to be a source of conflict and will eventually put the lid on growth in bicycle use.

So, for policy makers, the immediate challenge is to create an environment and a culture in which cyclists and drivers can and are expected to safely share traffic space: the road. This requires as much of a cultural as an engineering shift, with some outstanding points already apparent:

- Education (for both bicycle and motor vehicle users) is paramount, and needs much more attention and funding than it has traditionally received.
- The rules of driving behaviour must be uniform for all vehicle drivers. The status of the bicycle as a full-rights-and-duties vehicle needs to be underlined for both cyclists and motor vehicle drivers alike.
- Less is more: all else being equal, good general infrastructure for cycling (pavement width, design and maintenance criteria, traffic light vehicle sensors, adequate turning lanes, etc) is preferable to specific cycling facilities[30]

29 Paragraphs taken from PRESTO consortium (2010a)

30 Paragraph taken from VeloCity (2009)

1.6.12 Cycling in pedestrian precincts

Cyclists and pedestrians mix easily. Their speeds are not so different and cyclists adapt their behaviour. Cycling should be allowed in car-free zones. Mostly, this can be fully mixed, but a soft physical separation is preferred when there are many pedestrians. Allowing cyclists to share space with pedestrians in car-free zones avoids detours (network directness) and makes destinations more accessible to cyclists (network cohesion).

However, if pedestrian densities are too high, sharing becomes ineffective, for both cyclists and pedestrians. It is generally recommended to consider sharing at values not above 200 pedestrians per hour per metre of available profile width. Cyclist access to car-free zones only requires additional signage exempting cyclists from the restriction for vehicles. At higher densities, some kind of visual or level separation is used.

Most cities now have one or several, small or extended car-free zones. These are mainly in shopping streets in the historic city centre or in secondary centres. Motor traffic is banned to reduce risk, noise and pollution and to upgrade public space. The main objective is to create a pleasant shopping atmosphere and to highlight the historic, aesthetic and cultural values on display. Mostly, these areas are defined as pedestrian-only areas. Usually, there are time windows when some vehicles are allowed in for local access and deliveries. It is generally recommended to give cyclists access to car-free zones at all times for a number of reasons.

- Cyclists are not the target of the traffic ban. The objective of a car-free zone is to eliminate the negative effects of motor traffic.
- For cycling through-traffic, car-free zones are often direct, safe and attractive short cuts.
- For cycling destination traffic, car-free zones offer safe, direct and comfortable access to destination points.

When mixing with pedestrians, it is the cyclist who is faster and a potential source of danger, possibly surprising and stressing pedestrians. However, cyclists and pedestrians generally mix well and fears of nuisances for pedestrians are unfounded and exaggerated.

Legally, cyclists can be given access simply by adding a sign exempting them from the restriction, in the same way that residents or delivery vehicles can be exempted. In addition to signage, it is recommended to provide proper design solutions in proportion to pedestrian densities. At low pedestrian densities, full sharing is perfectly possible. At higher pedestrian densities, a form of separation is recommended.

This is not a legal separation: cyclists are legally allowed across the entire width of the area. The objective is more psychological. A recognisable cycle path in the middle encourages both pedestrians and cyclists to remain in the space set aside for them.[31]

Cycling segregation	Shared Space
Signalling overload	Minimises signalling
Extra set of rules and regulations	Minimises rules and regulations
The rules must be heeded	The rules must be heeded
Barriers between users	No barriers between users
Minimises interaction and attention paid by users to other users	Guarantees continuous interaction and attention paid to other users
“Subjective safety” at the expense of real safety	Real safety at the expense of “subjective safety”
Tries to eliminate or reduce anxiety and uncertainty	Uncertainty as a way to raise users' alertness and increase safety
Infrastructure limits / dictates users’ behaviour	Maximum flexibility for users
Takes judgement and responsibility away from users	Puts the onus of judgement and responsibility on the users
Safety confided in infrastructure	Safety is users’ responsibility
Expected to serve users with no knowledge or skill	Users expected to have knowledge and skill
Undermines traffic culture and courtesy	Needs and promotes traffic culture and courtesy
Distrusts users' judgement	Treats users as adults

Table 4: Comparison between cycling segregation and Shared Space
Source: VeloCity 2009

31 Paragraph taken from PRESTO consortium (2011g)

1.7 Traffic calming to improve cycling conditions

The major objectives of traffic calming are the increase of road safety and the improvement of the local environment in respect of living, working or visiting conditions. Successful measures are generally reducing the speed of motorised vehicles and redirecting through traffic. This directly lowers air and noise pollution. Also the likeliness and severity of accidents is decreased. Traffic calming supports a safer cycling environment because the reduced speed and traffic volumes allow cyclists to use the road.

There are three „E"s that traffic engineers refer to when discussing traffic calming:

- engineering,
- education and
- enforcement.

Neighbourhood traffic management studies have shown that residents themselves contribute to perceived speeding problem within a neighbourhood. Therefore, traffic calming is most effective when all three components are considered. Engineering measures alone will not produce satisfying results[32].

The measures listed below often combine approaches of engineering, education and enforcement. The aim is to make motorists feel like a guest on the road and communicate to them, that other traffic participants are present and have the same rights.[33]

1.7.1 Legislation and enforcement

These measures comprise restrictions on movement and parking like speed reductions, parking restrictions, banned turns and one-way streets. Streets can be turned into a dead end with the possibility for pedestrians and cyclists to continue through.

This is the easiest way to reduce the speed of car traffic but relies on traffic participants to follow the rules. One possibility is the strict enforcement by regular police controls and automatic surveillance e.g. by speed traps. But this is not applicable for all areas.

Enforcing traffic regulations is a good measure for promoting cycling since speeding and parking violations (e.g. on cycle tracks) have a negative effect on cycling conditions.

Figure 34: 30km/h Zone
Source: www.wikipedia.de 2012

Figure 35: Sign for dead end where pedestrians and cyclists may continue through
Source: www.wikipedia.de 2012

32 Hass-Klau et al., 1992
33 Slinn (2005)

1.7.2 Signing and gateway treatment

Signs are necessary to give authority to traffic orders. But they are also used to emphasise the speed reduction e.g. when entering a town or speed limited areas by making artificial gateways.

Special radar speed signs educate motorists about their actual speed by confronting them with their speeding. Since these radar speed signs record the measured speed, information about speeding behaviour is collected. The information collected includes the number of cars, minimum, maximum and average speed as well as the number of speed violations.

It is also possible to colour the carriageway or paint additional signs on the road to increase visibility.

These measures have no negative effect for cyclists. The positive effect for cyclists relies on the achieved traffic calming: the lower the actual speed of the surrounding motorised traffic the more safe cyclists feel. However, the collected data might lead to a stricter enforcement of speed limits which will have a positive effect on cycling safety. Signing alone cannot produce the calming effects, so that further measures are required.

Figure 36: Radar speed sign
Source: Fricke 2012

Figure 37: Gateway to a 30 km/h-Zone
Source: Fricke 2012

1.7.3 Surface treatment

Using blockwork paved roads instead of asphalt roads is a very effective way to slow down car traffic. This is mostly done in residential areas. The change of surface communicates to drivers that they are not the only one´s on the street and have to share the road with other road users with the same rights.

But using blockwork instead of asphalt may lower the comfort for cyclists as well as it does for motorists. This measure might not be a suitable solution for highly frequented cycle routes. One solution can be to build the cycle lane with asphalt, while the moving lane for cars is built with blockworks. This issue is further discussed in Part II Chapter 1.8.

Figure 38: Blockwork paved road in residential area
Source: Maaß 2012

Figure 39: Cobble stones in city centre
Source: Ziel 2012

1.7.4 Vertical deflection

Vertical deflections are the most common traffic calming measures. Very common are so called speed humps, speed bumps and speed cushions. They differ in design, size and material but the effect is mostly the same. The speed reduction is achieved when drivers have to slow down to avoid a discomfort when passer over the obstacle.

Critics however emphasise the negative effect vertical deflections have on emergency vehicles. Ambulances are slowed down and the shock created by the vertical deflections may disturb the work of the paramedics. Therefore, vertical deflections are not used on main roads. In some countries speed cushions are used to solve the conflict. Emergency vehicles in some countries have wider axle base and can pass the narrow obstacles while slimmer cars still have to slow down.

Figure 40: Figure: Speed hump in Odense
Source: Rudolph 2012

Figure 41: Figure: Speed bump in Odense
Source: Gostic 2012

1.7.5 Horizontal deflection

Another way to slow down traffic is the instalment of horizontal deflections like chicanes or similar objects. A priority “give-way” design, where one lane is eliminated and vehicles entering an area are forced to yield is very effective. This is often combined with signs at gateways to residential areas. Another possibility is to use curves so cars can go straight only for a limited distance. These deflections can easily be designed in a way that does not disturb cyclists.

Figure 42: Horizontal deflection forcing cars to yield
Source: Fricke 2012

Figure 43: Street design with extra curves
Source: Maaß 2012

1.7.6 30 km/h-Zones and Living Streets

Where different users share the road space, special effort is needed to keep everybody safe. Therefore the speed limit within a whole area is often limited to 30 km/h or even below (20km/h or walking speed). The main benefit is an improved street environment and social perception.

Signing alone will not bring acceptance for speed limits. Therefore gateways and sometimes deflections are installed at the entrance to these calmed areas. Also the centre line in the middle of the street is often removed and streets are more narrow than usual. Also giving priority to the right slows down traffic, because drivers have to stop at intersections. In calmed streets chicanes, parking spaces or curves are often used so that cars cannot drive in a straight line for a significant distance.

The next step is the introduction of Living Streets. Here, car users have to give priority to other road users like cyclists, pedestrians and e.g. playing children. The speed limit is usually defined to the speed of pedestrians. The design of the streets should reduce both speed and dominance of motorised traffic. This is not only done by gateway treatment and signing but also often with blockwork paved roads without curbs, so that cars, cyclists and pedestrians share the same road space. These Living Streets are quite common in various countries, e.g. the Netherlands ("woonerf"), Germany ("Verkehrsberuhigter Bereich"), the UK ("home zone"), USA ("complete street"). Also Shared Space (s. Part II Chapter 1.6.11) can be viewed as a special kind of Living Street but has a more overall approach.

The instalment of living streets and similar measures is very easy if it is considered when developing a new area. But it is quite expensive when streets of an existing area have to be redesigned.

For cyclists living streets offer good cycling conditions since traffic volumes and speeds are generally low. Also these areas are normally more attractive and comfortable since they offer more safety and less noise and pollution.

Figure 44: Sign for Living Street in Sweden
Source: www.wikipedia.de 2012

Figure 45: Design of a Living Street in Germany
Source: Fricke 2012

1.7.7 Lorry control schemes

Lorry control schemes can ban through traffic of heavy lorries and force them to use a single route for passing through an area. This keeps the rest of the area free of heavy trucks.

Other control schemes force trucks heading to a destination within a controlled are to use designated roads for as long as possible. This is often used for traffic approaching a traffic intensive business within or close to a residential area. In London[34] fleet operators have to get a permit with a designated route before driving a 18+ t lorry into the City of London.

The traffic laws have to define the condition (e.g. weight of the trucks) when trucks fall under the regulations. Not all national traffic or planning regulations offer the possibility to implement such control schemes. However, reducing the number of heavy trucks greatly increases cycling conditions as well as general living conditions.

34 http://www.londonlorrycontrol.com/

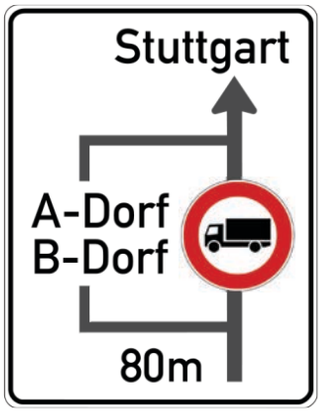

Figure 46: Detour for trucks
Source: www.wikipedia.de 2012

Further reading:

Shared Space: Department of Transport (2011) Local Transport Note 1/11 on Shared Space URL http://www.dft.gov.uk/publications/ltn-01-11/

1.7.8 Pedestrians zones

Pedestrian zones and other car free zones are good measures to increase the habitation quality of an area. This is often done in city centres were a lot of shops are and a lot of pedestrian traffic is happening. Car traffic is guided to paid parking lots on the edges of the pedestrian zone. In some cases, bicycle traffic is prohibited or limited to times with fewer pedestrians, e.g. after shop hours. If or if not bicycle traffic can be allowed or should be banned demands on the local conditions (see Part II Chapter 1.16.12). But for bicycle traffic is of course best, if they are not banned from pedestrian zones.

Figure 47: Pedestrian zone in Odense
Source: Petrova 2012

1.8 Choice of adequate infrastructure type

As shown in the previous chapters there are different cycle track types (forms) and possibilities to construct a cycle path. The questions are:

- How to choose the adequate form?
- Which criteria can be used to decide if a chosen form fulfills the requirements?

The following criteria shall help to give estimation about the usability of each form dependent from various circumstances.

Criterion traffic volume

Traffic volume (passenger cars per hour) along the road where a bicycle track is planned as well as the design speed[35] of these vehicles are important criteria for choosing an adequate form. The borders are fluid, which means there is mostly not only one possibility. Figure 48 and Figure 49 show which form should be chosen dependent on design speed and traffic volume. It is recommended to choose cycle tracks if the driving speed and/or the traffic volume are high.

Criterion traffic volume of heavy duty

This criterion takes into account that the risk for cyclists to be in an accident increases with the increase of the share of heavy duty, especially in actions of bending or overtaking. It is recommended to choose cycle tracks the higher the share of heavy duty of the total traffic volume is.

Criterion availability of space

The availability of space takes into account whether a form can be used safely. It is important to check if the security clearances are kept and if there are obstacles which can be removed or make a narrowing necessary. Space required and available space must compared and assessed.

If the planner comes to the conclusion that the form chosen cannot be used safely then another form has to be chosen. Of course, the same check has to be undertaken again.

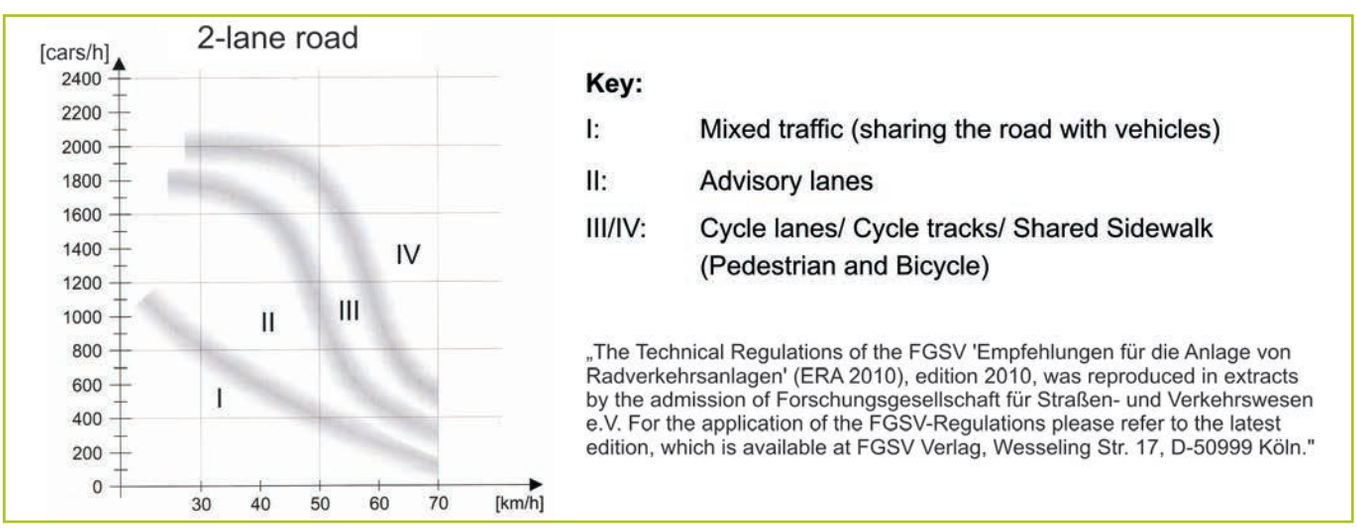

Figure 48: Choice of infrastructure type dependent on traffic volume and design speed for 2-lane roads
Source: ERA 2010

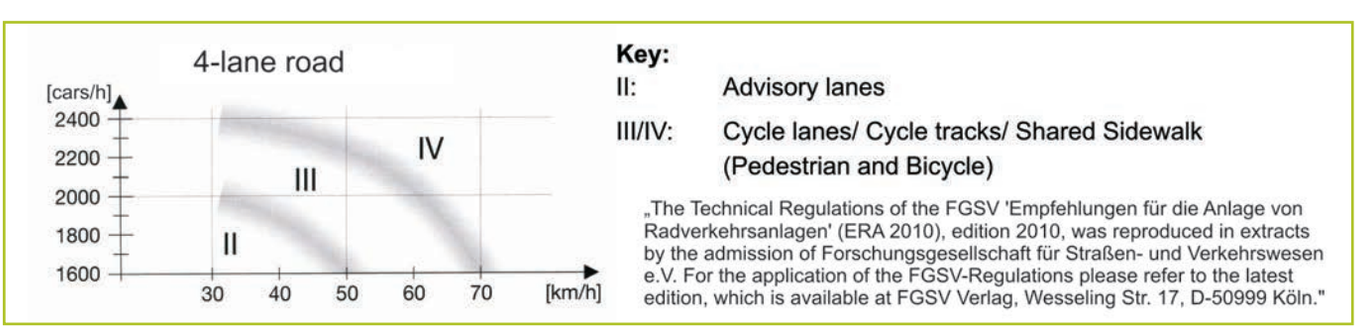

Figure 49: Choice of infrastructure type dependent on traffic volume and design speed for 4-lane roads
Source: ERA 2010

35 V_{85}: Describes the car driving speed (V=velocity) which is not exceeded by 85 % of all drivers in rainy conditions

Criterion parking

This criterion considers the risk to be in an accident caused by parking cars. This contains the parking actions pulling in and pulling out as well as dooring (sudden car door opening with subsequent crash into the door). With an increase of short time parking, the risk to be in an accident rises. It is recommend to choose cycle tracks if there are a lot of parking actions.

Criterion intersections and access to real estate

This criterion considers turning vehicles that cross cycling infrastructure. It can be expressed by the number of intersections and accesses to real estate per kilometre along a road section. Accesses to real estate are only considered if there is a crucial volume of turning cars (access to car parking, garages, business or industry)

The higher the number of intersections or the volume of turning cars, the more it is recommended to choose cycle tracks.

Criterion longitudinal inclination

With this criterion the higher velocity of a bicycle driving down a slope as well as the required broader path for driving uphill based on unsteady driving can be considered. Both ways uphill and downhill - have to be assessed separately.

It is recommended to choose a cycle track if the incline is very steep.

If the incline is very long a cycle lane should be applied. High velocities are not compatible with pedestrians and higher velocities require more visibility range. Therefore cycle lanes are to be preferred.[36]

1.9 Construction

The following chapter deals with constructive aspects of cycle infrastructure.

1.9.1 Pavement - Type of surface

The pavement of the cycling infrastructure is another crucial issue. Due to the lack of suspension an even and smooth surface with a minimum of obstacles, gaps or bumps is the start of a good infrastructure. Every bump in the surface will be transferred from the wheels via the frame directly to the spinal cord and the wrist joints of the cyclist, which can mean uncomfortable impacts on the body. An ordinary city bike normally has no suspension. Many modern city bikes usually have a suspension (at least at the fork) but suspension is very limited in comparison to a passenger car. Cyclists are exposed to a lot of shaking and tossing. Since an uneven surface implies a high discomfort planners should avoid any gaps or bumps at joints within the pavement.

Most of the bicycle interest groups and clubs (e.g. ADFC Germany) demand that pavements for cycle tracks and lanes should be built with asphalt (see Figure 50). This surface offers the highest comfort for cyclists and markings can be made easily on asphalt. Concrete has nearly the same advantages as asphalt, but concrete requires a joint every few metres, which in contrast to asphalt offers some discomfort.

The use of concrete tiles should be considered in detail. Tiles seem to be attractive, especially if tiles with none or a micro phase are used (none graded edge; see Figure 51 and Figure 52). Coloured tile (e.g. red, yellow or green) can be implemented easily to raise attention.

Figure 50: Pavement asphalt, Bolzano (Italy)
Source: Rudolph 2011

Figure 51: Red concrete tiles, without graded edge, Hamburg (Germany)
Source: Rudolph 2011

36 ERA (2010)

But tiles have the disadvantage that after a while the surface becomes uneven, since the tiles are not pointed. Melting ice, roots or just subsidence of soil can cause an uneven surface (see Figure 54).

Small tiles with graded edge were used a lot in the past (see Figure 52). But actually the comfort is much lower in comparison to bigger tiles without graded edges or even asphalt. It is recommended to avoid small tiles.

Cobbles should be avoided generally since the surface is very uneven and the joints are too wide for bikes with slender tires like racing bikes (see Figure 53). In addition, cobbles get very slippery during rain and snow due to the smooth surface and are a cause of risk.

Figure 52: Red concrete tile with graded edge, Hamburg (Germany)
Source: Rudolph 2011

Figure 53: Cobbles, Hamburg (Germany)
Source: Rudolph 2011

Figure 54: Poorly installed tiles, Hamburg (Germany)
Source: Rudolph 2011

Infobox: concrete tiles

pros
- Easy to remove/ to reinstall
- Different colors available
- Picturesque
- Easy to adjust at level differences
- Can be repaired partially at low costs

cons
- Problem with markings (joints)
- Poor installment = uneven surface (see Figure 54)
- Discomfort for cyclists (joints)
- Plants can grow in joints (discomfort)
- Plant roots can cause uneven surface

1.9.2 Pavement - colour of surface/road markings

The cyclist on the bike has no protection. In the case of an accident, the cyclist is exposed to risk and might easily be injured. So the cyclist has to be protected by the infrastructure in the best way possible. One effective measure is to colour the pavement in signal colours.

Coloured surfaces have no legal meaning. There is no obligation to use them. They can be useful for emphasising cycle lane markings and to help remind motorists that the surface is either primarily or exclusively for the use of cyclists. They can also help cyclists to follow a route or position themselves in the appropriate part of a carriageway.

Coloured surfaces are relatively expensive to implement. If used to excess, they can be visually intrusive and lose their highlighting effect where they are needed most. For best effect they should be used sparingly. For example, rather than using colour for the whole length

of a cycle lane, consideration could be given to reserving it for specific locations where it would be most beneficial, such as where the cycle lane passes side-road entrances. Coloured surfaces are especially useful for cycle lanes away from the kerb, such as a non-nearside cycle feeder lane for an advanced stop line layout, or where a cycle lane runs along the offside of a dedicated left-turn lane.

Colour may be appropriate:

- In the lead-in lane and cycle reservoir at an advanced stop line arrangement;
- In non-nearside and right-turn cycle lanes;
- In contra flow cycle lanes;
- In cycle lanes beside parking bays;
- In cycle lanes alongside narrow all-purpose lanes;
- At junctions where certain manoeuvres are limited to cyclists;
- At locations where the lane highlights a potential risk, e.g. cycle lanes through pinch points;
- In two-way cycle lanes.

Selection of appropriate colour is a matter for the relevant highway authority but, in the interest of consistency and simplicity of maintenance, it is recommended that one colour is used for cycle infrastructure within a highway authority's area. Green and red surfaces are most commonly used. Compared with road markings, the durability of such a surface can be poor, and it varies depending on the materials, colour and the method of application. This needs to be taken into account when deciding if coloured surfaces are necessary because they add to the costs of maintenance.[37]

Especially at crossings where cyclists have to face motor traffic, attention has to be directed to the cyclist. Different colours are established meanwhile. Red, green, blue and yellow are colours that can be found all around Europe. The aim of coloured pavement is to raise attention and improve the visibility of cyclists. Figure 55 shows a blue paved cycle crossing in Copenhagen. Figure 56 shows a red paved crossing in Hamburg, where the traffic volume of cars is high.

Figure 55: Blue paved crossing, Copenhagen (Denmark)
Source: Müller 20111

Figure 56: Red pavement, Hamburg (Germany)
Source: Rudolph 2011

37 Paragraph taken from Department for Transport (2008)

Case study: Barclays Super Cycle Highways London (England)

Barclays Cycle Superhighways (BCS) are in total 12 cycle routes running from outer London into central London and are named by codes (letter and cipher) for easier understanding. The Superhighways are realized in a Public Private Partnership (PPP) between the City of London and Barclays Bank PLC.
They provide a safer, faster and more direct journey into the city.
The first 4 Cycle Superhighways have launched in 2010. The remaining eight will be introduced by 2015.

Design principles:

Direct and continuous

The new routes are clearly marked and easy to follow. There are new signs and road markings, as well as information about journey times and links to other cycle routes.

Comfortable and convenient

Improved road surfaces and minimized obstructions for higher pedal comfort. London also introduced around 2000 new cycle parking spaces along or near the route.

Safer

The Superhighway lanes are at least 1,5 m wide and will continue through junctions. Advanced stop boxes are provided at traffic lights to help cyclists to get ahead of traffic. Numerous junction where changed in layout to give cyclists more space and a better feeling of safety. Advanced stop lines at least 5,0 m deep at junctions, providing a space for cyclists to wait ahead of queuing traffic were marked. Cycle safety ('Trixi') mirrors at junctions were installed to give drivers of large vehicles better visibility of cyclists when preparing to turn left.

Impacts

The first evaluation (1 year after implementation) shows the number of cyclists has grown by a significant 46 % along Highway 7 and even 83 % along Highway 3. At smaller sections a growth up to 200 % could be observed.
8 to 14 % of the cyclists report that they changed to bicycle from another means of transport after the introduction of the highways. Cyclists report that the average journey time could be reduced by approx. 5 minutes. During the first year there were no fatal accidents with pedal cyclists.

Figure 57: Some impressions of the super cycle highway in London
Source: tfl.gov.uk and bbcimg.co.uk 2011

Further reading:

Transport of London

http://www.tfl.gov.uk/roadusers/cycling/11901.aspx.

1.9.3 Kerbs

The implementation of kerbs and choice of kerb stones is a crucial element in the cycling infrastructure. Kerbs are used as a physical separator between road pavement and cycle tracks or sidewalks. There are mainly two different materials for kerb stones: concrete and granite. While granite is more resistant and longer lasting, concrete is cheaper and different shapes are available.

At intersections and crossing the kerb stone has to be lowered down to the level of the road pavement (see Figure 58). In former times the lowering was realised in the way that a minor level difference should be perceived. That means there was a level difference of about 2-3 cm. As shown in Figure 59 (granite) and Figure 60 (concrete) this mode of implementation means an inconvenient impact to the cyclist due to limited suspension of bicycles. Crossing this difference with cruising speed means a strong impact to the spinal cord of the cyclist. Kerbs at intersections which are not lowered to the level of the road are not acceptable.

Figure 58: Kerb stone granite with even transition between cycle track and road pavement, Hamburg (Germany)
Source: Rudolph 2011

Figure 59: Kerb stone granite showing impact to wheel, Hamburg (Germany)
Source: Rudolph 2011

Figure 60: Kerb stone concrete showing impact to wheel even with rounded edge, Hamburg (Germany)
Source: Rudolph 2011

The result is that damage to the wheels might occur easily and discomfort for the cyclist due to impacts is caused by the level difference. Also the cyclist has to slow down at each crossing, even when he has the right of way. For utility cycling (commuting, shopping, errands etc.) the precondition is that the cyclist can maintain a certain cruising speed to overcome a couple of kilometers within an acceptable time span. Therefore it is necessary to implement kerb stones as shown in Figure 58.

1.9.4 Lighting

The main functions of lighting are:

- To increase traffic safety,
- To improve traffic flow,
- To increase (cycling) comfort,
- To improve social safety,
- To make the area visible.

(Main) cycle routes are used most intensively in the network of connections between villages, districts, neighbourhoods and urban districts. This is the reason why these connections are subject to strict requirements in terms of traffic. Lighting always has been provided for main cycle routes. The higher the design speed, the greater the sight distance required, which may, in turn, influence the level of lighting.

1.9.5 Lighting and road category

Inner city roads can be categorized by their function. With three types of road one would cover the comprehensive road layout of any city. In general there are arterial, access and distributor roads.

An arterial road is a high capacity urban road. They many serve to connect to highways.

An access road is a non-limited access road running parallel to a higher-speed road feeding it at appropriate points of access (interchanges).

A distributor road is a low- to moderate-capacity road that serves to move traffic from local streets to arterial roads.

Therefore, the provision of lighting conducive to the requirements of cyclists would easily suffice and complete the requirement of bicycle infrastructure to be used by all.

Figure 61: Special lighting for separated cycle track in Stockholm (Sweden)
Source: Müller 2011

The higher the design speed, the greater the sight distance required, which may, in turn influence the level of lighting. Table 5 lists the requirements by type of road.

Type of road	Lighting Level
Roads	30 lux
Pedestrian crossings	50 lux
Residential street lighting	1 -10 lux

Table 5: Required illumination levels for different types of roads
Source: Bicycle Infrastructure Design Manual for Indian Sub-continent

Facilitation of the above-mentioned lighting levels would be done with the use of the luminaire mounted at the correct height and the right horizontal distance. The location of poles is decided by the category of road. It could be the central verge at the side where a segregated cycle facility is available. Two luminaires can be mounted on a pole located between the carriageway and the cycle track at different height to light the required area with the required lux levels. This would also reduce the number of poles required and the vertical clutter on any given road. The visibility of the course of a cycle track is determined not so much by the amount of light that falls on it but by the amount of light that is reflected by the road surface (luminance). Keeping in mind the luminance, the use of concrete is the preferred choice. The disadvantage of using concrete paving is the glare it would produce during rainy days when the sun is low. Special treatment should be done that would help cyclists to use a segregated cycle facility. These treatments could include plantations providing shade and also helping to reduce glare. This is a level of service (LOS) prerequisite for a cycling comfort.

1.9.6 Colour of light

Street lighting should produce enough intensity required for face recognition and objects from a particular sight distance. Especially for the purpose of social safety, women and children are a special group for whom the colour of light is of added importance. White light is a preferred choice. The advantages of white light are as follows:

- In a segregated facility, it easily distinguishes between the fast and slow moving zone.
- It easily creates contrast for pedestrians
- It increases annual savings.[38]

1.9.7 Maintenance

Maintenance of the entire cycling infrastructure is very important. Due to use by cyclists and heavy vehicles, especially at intersections, the infrastructure is stressed strongly. Weather conditions like changes from winter to summer, intruding and freezing water destroy surfaces and markings. Openings in the surface by construction issues to maintain cable network, water supply, etc. mostly have the strongest negative impact on the quality of cycle infrastructure as shown in Figure 62. There has to be someone from the municipality who check the cycling infrastructure on a regular basis (e.g. every two years) to know about the quality of the infrastructure. Damage after winter or constructions work has to be repaired as soon as possible.

38 Paragraph taken from Bicycle Infrastructure Design Manual for Indian Sub-continent (n/a)

Figure 62: Poorly maintained markings and surface, Hamburg (Germany)
Source: Rudolph 2011

1.9.8 Operating

Cycling facilities not only require good design but also effective management and maintenance. Poor surfaces, overhanging vegetation, ponding, worn markings, broken glass, poor lighting, etc. all affect cyclists more quickly and more seriously than motorists and are a continual source of complaint. It is therefore essential that cycle tracks, both on and off road, are inspected and maintained on a similar basis to the rest of the road network.

All new cycling infrastructures should be delivered in a manner that will minimise whole-life costs, including ongoing revenue maintenance costs.

To maintain on-road conditions for cyclists, attention should be focused on the condition of the strip of carriageway within 1,5 – 2,0 m of the kerb. Off-road, both construction and landscaping should aim to minimise maintenance costs. Off-road paths may be particularly susceptible to fly-tipping and can be rendered impassable to cyclists by broken glass.

The relevant authority should put a monitoring and maintenance procedure for each segment of the cycle network in place and specific infrastructure such as shared pedestrian and cyclist foot bridges, subways and rest areas, etc. should be checked regularly.

It should be as straightforward as possible for members of the public to report maintenance issues and they should be dealt with as quickly as possible (see chapter 3).

After any prolonged period of inclement weather such as heavy rain, strong wind and snow, etc. extra maintenance may be required.[39]

To guarantee a safe trip by bicycle, year-round infrastructure maintenance is essential. Plants, bushes and trees have to be cut when they grow into the clearance of the cycle infrastructure. Tiles that have become uneven have to be repaired and smoothened. In winter, snow must be cleared from the cycling infrastructure. The city of Copenhagen is a good example, since maintenance workers remove the snow from the cycling infrastructure first and look after the roads afterwards.

Figure 63: Removing grit after winter service, Hamburg (Germany)
Source: Rudolph 2011

Figure 64: Continuous leaves and greenery removal in Autumn, Hamburg (Germany)
Source: Rudolph 2011

39 Paragraph taken from SEStran South East of Scotland Transport Partnership (2008)

Figure 65: Cycle lane after extra maintenance in winter, Stockholm (Sweden)
Source: Müller 2011

Figure 66: Cycle lane after extra maintenance in winter (detail), Stockholm (Sweden)
Source: Müller 2011

1.9.9 Removing barriers and inconveniences

The cyclist is usually confronted with many barriers. When planning cycle infrastructure the planner should always consider that cyclists are on the one hand very sensitive road users in respect of safety and on the other hand to quality of surface, obstacles and detours. Due to the fact that bicycles lack suspension compared with motor vehicles, cyclists are very sensitive to changes in surfaces, holes etc.

In recent decades suspension has entered the bicycle market. Suspension forks have become very popular for city bikes in particular. Nevertheless the difference in comfort between cars and bicycles is extreme. Due to the higher volume of traffic and higher sped of cars the infrastructure for cars is free of barriers, has mainly a smooth surface and the whole infrastructure including signal lights is designed to achieve the most efficient traffic flow with maximum comfort for drivers.

Only a high-quality cycling infrastructure will attract cyclists to use it. Success in attracting cyclists is mainly dependent on a barrier-free infrastructure. To sensitize the planners for what are barriers and what not, the following figures show some mistakes that are repeatedly made:

- Uneven implementation of kerb stones (see chapter 1.8.3),
- Obstacles on the cycle track like trash bins (see Figure 68), electricity facilities for traffic lights or residential supply, drains, gullies, and manholes, inspection chambers, bus stops and signs, lanterns, charging points for e-cars (see Figure 68) etc.
- Pedestrians walking across and parallel to cycle tracks causing delays (see Figure 68),
- Intersections
- No cohesion (see Figure 69) and changing qualities of surface (see Figure 70).

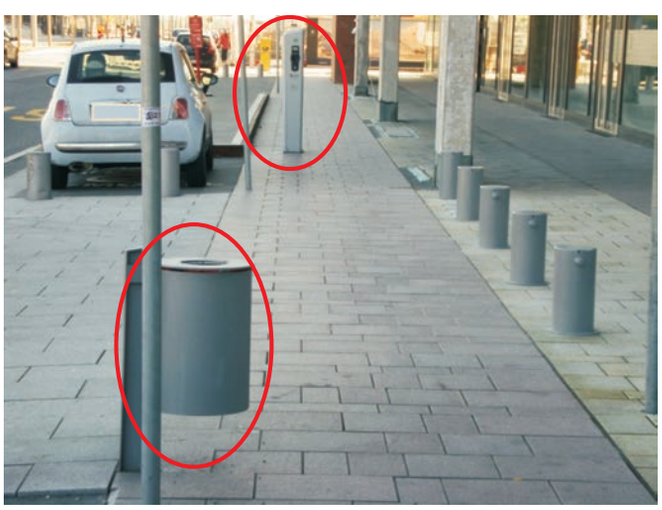

Figure 67: Trash bin and recharging point for e-cars realised on the cycle track, Hamburg (Germany)
Source: Rudolph 2011

Figure 68: People crossing a cycle track, Copenhagen (Denmark)
Source: Rudolph 20111

Figure 69: Unexpected end of track, Hamburg (Germany)
Source: Rudolph 2011

Figure 70: Changing qualities of road surface, Hamburg (Germany)
Source: Rudolph 2011

Figure 71: Manhole with edge elevated up to 2,5 cm above pavement, Hamburg (Germany)
Source: Rudolph 2011

Figure 72: Parked car on advisory cycle lane, Hamburg (Germany)
Source: Rudolph 2011

1.10 Light Signals

Traffic-light intersections are inherently dangerous for cyclists. However, they are indispensable when cyclists cross heavy traffic flows. Cycle-friendly design must make cyclists clearly visible, allow short and easy manoeuvres and reduce waiting time, such as a right-turn bypass or an advanced stop-line. On main cycle links, separate cycle traffic light and cycle-friendly light regulation can give cycle flows advantages over motor traffic.

Traffic-light intersections are always a second-best solution for cyclists, in terms of safety. Actually, traffic light intersections with four branches are very dangerous and should be avoided in general. Dutch guidance states that roundabouts are significantly safer than traffic lights for four-branch intersections of 10.000 to 20.000 passenger car units per day (pcu).

In practice, traffic lights are used when an intersection needs to handle large flows of motor traffic fast. They can handle up to 30.000 pcu/day, more than is possible with a roundabout. These will typically include at least one very busy distributor road with multiple traffic lanes (50 km/h in the built-up area, higher outside built-up areas).

Often, these busy roads are also of great interest as cycle links. Many of them correspond to historic routes, and connect important destinations, typically the city centre, in fairly straight lines. In these cases, it is only logical to have major local cycling routes or even main cycling links following the same paths. Cycling provision is needed to improve the situation for cyclists. There are some situations when traffic lights are recommended in a cycling network.

- A top local or main cycling route along a busy distributor road crosses another busy distributor road (both roads approx. above 1.000 pcu/h).
- A lower level of cycle link crosses an extremely busy distributor road (approx. 1.500 pcu/h). The link may be on a solitary track, a local access road or a distributor road.

- With intensities over 1,500 pcu/h a cycle tunnel is recommended. In principle, on distributor roads, cyclists are on separated tracks or cycle lanes at the least.

1.10.1 Traffic lights - general requirements

Because of the large numbers of motor vehicles involved, intersection design needs to increase the visibility and safety of cyclists.

A simple and powerful provision is to allow cyclists a right-turn past red.

- A separate right-turning cycle bypass before the traffic light allows cyclists to turn right without stopping. To merge safely into traffic, cyclists must arrive on a cycle lane or track or an otherwise protected area. This gives the cyclist significant advantage over motor traffic.
- In some countries, such as the Netherlands, traffic regulations make it possible to exempt right-turning cyclists from the traffic light, even without a physical path.
- In both cases, there is a possible conflict with crossing pedestrians. This is best restricted to situations where few pedestrians cross.

Another simple and very effective provision is an advanced stop line for cyclists.

- The stop line for motor traffic is moved back and a cyclist stop-line drawn 4 to 5 m in front of it. This creates an advanced waiting area across the entire carriageway for cyclists in front of all motorized traffic lanes. This should be marked with a bicycle symbol. A coloured surface may be considered.
- A feeder cycle lane is recommended. This allows cyclists to bypass waiting traffic and leads them to the advanced area. The length of the lane should correspond to the maximum length of the traffic queue. The lane is mostly on the edge of the carriageway, but sometimes also between traffic lanes. The feeder lane may be a bus/bike lane.
- The advanced area allows all cyclists (left-turning, right-turning, moving straight ahead) to position themselves with maximum visibility in front of motorized traffic. In addition, they get a head start when the light turns green.
- This measure can become a popular generalised provision at all traffic light intersections, creating a citywide, uniform and easily recognisable benefit.

An alternative is to insert cycle stacking lanes between the stacking lanes for cars. This can be done for left turning, right turning as well as for continuing straight ahead. This reserved space for cyclists makes them more visible. A cycle stacking lane should be approx. 10,0 m long and 1,5 m wide (the adjacent car stacking lane should be at least 2,75 m wide).

This can be combined with an advanced stop line. The right-turning traffic lane can be inserted to the right of a cycle lane. When the road is widened with a right-turning lane for traffic, the cycle lane can be simply continued straight ahead. This way, right-turning traffic must cross the visibly marked cycle lane when weaving to its right turning lane before it actually turns right.

Figure 73: Bicycle traffic light, left turn, Leipzig (Germany)
Source: Rudolph 2011

Figure 74: Bicycle traffic light, only straight, Basel (Switzerland)
Source: Rudolph 2011

The same solution also applies to a cycle track: the cycle track continues straight ahead and the right-turning traffic lane is inserted to its right. A crossable in-line speed hump between the cycle track and the turning lane can be considered.

Turning left is a difficult, oblique weaving movement at traffic lights. To avoid this, cyclists are often first led slightly to the right, before crossing the flow in a straight line. There are two ways of doing this:

- A two-step left-turn was traditionally imposed. When the light turns green, the cyclist on a lane or track first crosses the side road and then needs to wait for the green light in the other direction to cross the second side road. This is not only indirect but very time consuming.
- The same manoeuvre can be done in one step, by marking out a left-turning cycle stacking area in front of the traffic lights. At the green light, the cyclist first moves slightly to the right into the waiting area. This area is in front of the red traffic light on the right. As soon as there is a gap in traffic, the cyclist can cross. The disadvantage is that this manoeuvre may seem illogical and surprising to other road users: the cyclist crosses the intersection in a direction that has the red light.[40]

1.10.2 "Green wave" for bicycles

Traditionally, traffic lights are regulated to digest large flows of motor vehicles. Time for cyclists and pedestrians is often kept short and waiting times long. Cyclists' queues and saturation are not a problem, since these are very unlikely (only when there is on average more than one cyclist per second on a cycle track). The real issue is waiting time and delay. Travel speed and journey time are crucial for the network quality, especially on the most important links. The less delay for the cyclist, the more competitive cycling becomes compared to other modes of transport. A key measure is to reduce the overall cycle duration as much as possible.

An average waiting time for cyclists of 15 seconds is considered good, one over 20 seconds is poor (average waiting time corresponds to half the red light time). When crossing a main road without traffic lights, the average waiting time may be shorter than this, but at peak times the cyclist may have to wait four times as long.

The recommended maximum waiting time for cyclists is 90 seconds inside the built-up area and 100 seconds outside the built-up area (maximum waiting corresponds to the red light time).

Often traffic phase duration is set unnecessarily high, at 120 seconds, as a precaution. In many cases, reducing this time not only favours cyclists but also improves general traffic flow. The duration recommended by the German FGSV[41] is 90 seconds.

- Separate cyclist traffic lights can be used in various ways to give cyclists more green time.
- Cyclists can receive an early start. This allows them to move onto the intersection safely in front of motor traffic and in a highly visible way. This is especially useful when many cyclists turn left or many cars turn right. The effect is similar to advanced stop lines (see above).
- Cyclists may be allowed to move on together with non-conflicting streams. This can be built into the system as a standard.
- Cyclists may receive a separate phase of green light for all directions. Cyclists can cross, turn right and turn left from all directions at the same time, while all motor traffic is stopped. All conflicts between cyclists and cars are eliminated, but there is the risk of bicycle-bicycle collisions, which are however much less serious. The disadvantage is that this increases the waiting time for motor traffic.
- Alternatively, button-activated cycle lights can be used when a solitary track crosses a main route. This is recommended for safety reasons when the right of way is not likely to be respected, or when the traffic flow is too high. In this case the waiting time for cyclists should be as short as possible (directness of time)
- Cyclists can be favoured by using dynamic traffic detection systems. For instance, the green light for cyclists can be held on green as long as there is no other traffic (detection of motor traffic). Alternatively, motor traffic may be refused the green phase as long as there is cycle traffic (detection of bicycles). The disadvantage of the second solution is that waiting times may become longer and unpredictable for motorists, who may be confused, suspect a malfunction and drive on anyway.
- Cycling traffic lights may be fitted with a countdown indication before the light turns green. Experience in the Netherlands shows that cyclists perceive waiting time as 50 % shorter. Cyclists also ignore red lights less often. The disadvantage is that the countdown is only trustworthy with static light regulation. With dynamic traffic lights, dependent on detection of vehicles, countdown speed would become irregular and useless.

40 Paragraph taken from PRESTO consortium (2011h)

41 FGSV, RiLSA (2010)

Figure 75: Waiting time predictor, Hamburg (Germany)
Source: Fricke 2012

Lights can be regulated in favour of cyclists without separate lights as well. When left turns are frequent, a light phase can group all left-turning traffic, including:

- Bicycles: Only left-turning traffic gets the green light, while traffic moving straight ahead is made to wait. This creates a smooth left-turning movement without conflicts. There is no more need for the two-step manoeuvre when left-turning and moving ahead are allowed at the same time. Cyclist flows may be concentrated in one direction. In this case, giving the major cycling direction a green light twice in one cycle may be considered. In this way, waiting time is halved. The disadvantage is that this lengthens the cycle as a whole and increases waiting time in the other directions.
- Traffic lights can be coordinated across intersections to create a cycling "green wave". The approach is well-known for motor traffic, but can be applied to cyclists as well. It can be considered on routes with a high flow of cyclists, either on a cycle lane or a segregated cycle track. This is only recommended when intersections are not too far apart (approx. 100 m); otherwise cycling groups become stretched out because of differing speeds. This can be combined with a detection signal, so that the green wave is interrupted when the cycling flow is too small. The cycling green wave may lead to longer waiting times in the other directions.[42]

1.10.3 Strengths of traffic light intersections

- Road markings can be a cost-effective provision, improving cyclists' visibility, safety and comfort: advance stop-line, turning lanes, left-turn stacking areas. They can be easily applied at the majority of existing traffic-light intersections.
- Physical design can provide cycling bypasses, eliminating waiting time.
- Regulation of traffic lights favouring cyclists, with or without specific cycling traffic lights, can create major benefits for important flows of cyclists.[43]

1.10.4 Weakness of traffic light intersections

- Traffic-light intersections handling large masses of traffic are inherently dangerous for cyclists and unattractive because of waiting times.
- Road markings will support fairly confident cyclists, but are insufficient for less experienced cyclists and unaccompanied children. Alternative routes will have to be found.
- Some regulation solutions in favor of cyclists will increase waiting times for motor traffic, and can only be justified when (current or expected) cyclist flows are significant.

An alternative option is to replace traffic lights with a roundabout when traffic intensity is not too high or when policy is to reduce traffic intensity. When traffic intensities are too high for cyclists' safety, grade separations are recommended.[44]

1.10.5 Use of bus and taxi lanes

Below 30 km/h, cyclists and buses can mix. At higher speeds, however, they should be separated: the differences in mass, speed and braking distance make mixing unsafe. Ideally, cycle routes should be created away from bus routes. However, in cities with dense bus networks, this is not always possible. Moreover, buses are often held up in traffic and to increase their flow and reduce their travel time, special bus lanes have become widespread.

In recent years, bus/bike lanes have become more widespread. They are attractive for cyclists, because they create the same shortcuts for cyclists and allow

42 Paragraph taken from PRESTO consortium (2011h)
43 Paragraph taken from PRESTO consortium (2011h)
44 Paragraph taken from PRESTO consortium (2011h)

them to jump the car queue. Safety, however, must be guaranteed. Buses should drive at less than 30 km/h and the lane should be wide enough for buses to overtake the cyclist.

Figure 76: Cycling on shared bus lane with space for overhauling, Paris (France)
Source: web.pdx.edu

On longer stretches, buses will simply drive too fast for the cyclist's safety and comfort. Bus/bike lanes should not be used as a way to avoid tough choices: cycle lanes or tracks are always safer and more comfortable, and can often be provided by taking out a traffic lane or a parking lane.[45]

To accommodate cyclists on a bus lane and allow room for buses to overtake cyclists, the preferred width for the bus lane is 4,6 m and the minimum desirable width is 4,25 m. 3,0 m is the absolute minimum width and should only be used for short distances and where installation of a wider lane is not possible.

Figure 77: Cycling and bus, No safe space for cyclists, London (UK)
Source: IBC, Daggers 2010

For safety reasons, cyclists should be separated from buses, except on the slowest roads. Ideally, cycle routes are created away from bus routes. If they are on the same roads, then cyclists should be on their own cycle lane or track. This may require taking out a traffic lane or a parking lane or reducing pavement width. Cyclists should be allowed to use shortcuts or contraflow stretches reserved for buses, but again ideally on a separate lane or track. This is standard practice in experienced cities, assuring maximum safety and comfort.

However, many "starter cycling cities" have to deal with narrow streets and dense bus networks, especially in their central city areas. They increasingly use bus/bike lanes as a compromise solution, allowing cyclists to ride on bus lanes.

Apart from the safety risk for the cyclist, there is also the issue of delay for buses. If buses are slowed down by cyclists, this defeats the purpose of the bus lane to some extent. It also means that the benefits for cyclists are limited: they have to wait behind buses at stops, or step aside to let a bus overtake them. However, on balance, buses and cyclists may be better off than being held up in traffic with no provision at all.

In practice, experiences are mainly positive. Most trail schemes are continued and multiplied. Initially stringent width requirements are progressively relaxed or abandoned. Recent UK research has concluded that delays and risks seem minimal. Delay mostly took the form of a bus briefly slowing down behind a cyclist on approaching a bus stop. Slower cyclists avoid delaying buses by accelerating or stepping aside to allow buses to pass. With an open profile, buses overtake by moving out of the lane on to the carriageway.

However, we must realize that bus/bike lanes have limited appeal. Fairly experienced cyclists will appreciate the improvement and be happy to use them, for instance to jump the traffic queue. But less experienced cyclists are likely to feel uncomfortable or stressed sharing space with buses and to feel the need to step down when a bus overtakes. Parents will probably be reluctant to let small children be unaccompanied on bus/bike lanes. This means that bus/bike lanes are a step forward from no cycling provision at all, but are unlikely to appeal to significant numbers of new cyclists.

But there is a real risk that bus/bike lanes may be overused as a quick fix to avoid difficult choices about space allocation. The default option should be to separate cyclists and buses: this is always safer and more comfortable, and will attract more cyclists. But it may require

45 Paragraph taken from PRESTO consortium (2010a)

taking out a traffic lane or a parking lane or reducing the pavement width.[46]

1.10.6 Cycle track layout at bus stops

New bus stops should be audited to ensure that they do not compromise cyclists' needs or safety. In rural areas where the distance to the nearest bus stop is likely to be greater, provision of cycle parking should be considered to increase integration between the modes.[47]

Figure 78: Combined bus and cycle lane, Hamburg (Germany)
Source: Rudolph 2011

1.10.7 Cycle track design bridges and tunnels

There are two major kinds of barriers for cyclists: dangerous road crossings and intersections (even with roundabouts or traffic lights), and physical obstacles such as rivers, canals and railways.

Grade-separated solutions should be considered on any level of the cycling network, inside and outside built-up areas, for two key reasons, related to two cycle network quality requirements:

To improve directness: avoiding the barrier would impose an unacceptable detour, considerably lengthen cycling journeys and compromise the attractiveness of the network;

To improve safety: there is no at-grade solution that sufficiently guarantees cyclists' safety when crossing the barrier.

They are recommended at the busiest intersections with fast and heavy-traffic distributor roads. Some typical situations: e.g.:

- A cycle link crosses a very fast distributor road (speed over 70 km/h).
- A cycle link on a busy local access road (over 500 pcu/h) intersects with a very busy distributor road (over 1.500 pcu/h), especially in case of a highly used local or main cycle route.
- A cycle link on a busy distributor road (over 1.000 pcu/h) intersects with a very busy distributor road (over 1.500 pcu/h).

Tunnels can be used to cross a busy road section or a busy two-lane roundabout.

Urban areas often contain major linear barriers for cyclists: major roads, rivers, canals, railways. In most cases, crossing points are provided, but typically at great distances from each other. This creates a physical barrier for cyclists, imposing unattractive detours and considerably raising the network mesh width. In other cases, crossing points are more frequent, but may be a psychological barrier, such as at extremely busy road intersections. Cities should particularly be aware of cycling barriers created by infrastructure projects. Often existing roads are truncated and become dead ends: construction of motorways, ring roads and railway tracks; removing intersections to upgrade roads; closing level railway crossings for safety reasons. Removing the barrier is mostly not an option. But with a clear view of the cycling network, it is possible to design in or add on grade-separated crossings.

Once the decision has been made to provide grade-separation, there are two options: a cycling bridge or a cycling tunnel. Both have their advantages and disadvantages, summed up in the table below. The weight of each factor depends on the situation. For instance, the social safety argument will be less important in a busy urban area than in an isolated location outside the built-up area. Generally speaking,

- Tunnels are the most comfortable solution for the cyclist, but they feel unsafe when they are poorly designed and are usually more expensive to build;
- Bridges are mostly less expensive, can be a potentially strong visual statement and make cyclists feel safe and respected, but they are usually harder to climb.

Whenever possible, we recommend raising or lowering the carriageway level, to reduce slopes for cyclists. Ideally, cyclists should keep riding on ground level. Raising the carriageway requires a less deep tunnel. Lower-

46 Paragraph taken from PRESTO consortium (2011i)
47 Paragraph taken from SEStran (2008)

ing the carriageway keeps the bridge lower. On major roundabouts, a grade-separated cycling tunnel network can be created by raising the carriageway level. Tunnels converge in the open central space, where cyclists can change directions. An advantage is that tunnels are kept short between open spaces, taking away the major disadvantage.

Of course, creating a full-fledged tunnel or fly-over for motor traffic keeps cyclists comfortably riding on the ground level. These costly, complex and space-consuming solutions can hardly be justified by the needs of cyclists alone, although cyclists' interests should be taken into account.[48]

1.10.8 Designing cycling tunnels

When designing cycling tunnels, it is essential to provide generous dimensions and to create a sense of space and openness. A narrow, bendy, dark and hidden tunnel will simply not be used. The following recommendations should be kept in mind.

- Keep cyclists at ground level preferably. If this is not possible, raise the carriageway level by approximately 2,0 m to reduce the depth of the tunnel. This also avoids groundwater problems.
- Use sufficiently comfortable dimensions. The tunnel should be at least 2,5 m high and 3,5 m wide (3,0 m if there is a footpath), the same as the approaching cycle path. The gradient should be 1 in 20 at most.

Figure 79: Tunnel not attractive: dark, end of tunnel not visible, relatively small (Netherlands)
Source: Noordholland Dagblad

Figure 80: Bridge as attractive passage, Veenendaal (Netherlands)
Source: Veenendaal municipality (Nederland in beeld)

Aspect		Bridge		Tunnel
Comfort	-	Starts riding uphill	+	Starts riding downhill
	-	Higher and stepper slopes, to go over trucks or trains	+	Lower and less steep slopes, because of the limited headroom needed for cyclists
	-	Exposed to wind and rain	+	Sheltered from wind and rain
	-	May induce fear if heights on long and narrow bridges	-	May induce fear of closed spaces in long, narrow and bendy tunnels
Personal security	+	Feels safe in open space, visible from afar	-	Feels unsafe in an enclosed space, out of sight and with no social control
			-	May attract loiterers and graffiti
Urban lanscape	-	Strong visual impact, above ground and with long inclines	+	Limited visual impact, below ground and with short inclines
		Strong achtitectural and landmark potential	-	Limited achitectural and landmark potential
Costs	+	Generall cheaper	-	Generally more expensive, especially taking into groundwater measures

Table 6: Comparison of planning aspects for bridge and tunnel planning
Source: PRESTO consortium Grade Separation

48 Paragraph taken and adapted from: PRESTO consortium (2011g)

- Keep the approach to entrances open and unobstructed. Avoid high vegetation, corners or anything that obstructs the view and create opportunities for concealment. Make the exit visible on entering the tunnel. Provide a straight path and avoid bends and corners. This increases riding comfort and allows the cyclist to keep up speed with a good view of oncoming cyclists. It also opens up space and improves social safety.
- Make sure walls recede towards the top to create a feeling of open space. Avoid straight vertical walls.
- Create daylight gaps in the tunnel roof. Separating the traffic lanes makes it possible to create a daylight gap for the tunnel in between. The central traffic island of a roundabout should be opened up when a cycling tunnel passes below.
- Install high-quality and vandal-proof lighting, preferably lights sunk into ceiling or walls. Faces need to be clearly recognisable.
- When co-used with pedestrians, proved a separate pedestrian footpath on one side (1,0 m minimum).
- Provide multiple approaches when useful. Cyclists may approach from different directions. Stairs with a cycle channel allow cyclists to interchange with the road above.[49]

Figure 81: Bicycle tunnel, Zwolle (Netherlands)
Source: ten Klooster

1.10.9 Designing cycling bridges

When designing a bridge, it is essential to reduce the height differences as much as possible and give the cyclist a feeling of confidence and safety.

The following recommendations should be kept in mind.

- Keep cyclists as close to ground level as possible. Lower the carriageway level to decrease the height to ascend.
- Use sufficiently comfortable dimensions. The bridge should be at least 3,5 m wide (3,0 m if there is a footpath), the same as the approaching cycle path. The incline should be 1 in 20 at most.
- Provide at least 4,5 m headroom.
- Consider covering the bridge as a protection from wind and rain.
- Provide a handrail or parapet of at least 1,2 m in height.
- When space is lacking, a phased ramp can be considered. The cyclist scales the height in phases with a brief horizontal space in between. This may be a way to reduce inclines and provide brief resting points. However, bends or spirals should be designed to allow cyclists to keep riding.
- If there is no room for a ramp, consider designing stairs with a bicycle channel. This is a second-best solution, since cyclists must get down and walk, pushing the bicycle. Channels should be high quality for maximum comfort and minimum effort, so that they can be widely used.
- Put in channels on both sides of the stairs.
- Use channels preferably made of concrete. On existing stairs, metal channels can be installed, using the same quality criteria.
- The channel incline should be no more than 25 % for comfort.
- The channel should be 0,08 m to 0,12 m wide and 0,03 m to 0,05 m from the side of the stairs.

Figure 82: Cycling bridge over railroad, Stuttgart (Germany)
Source: IBC, Daggers 2012

49 Paragraph taken from PRESTO consortium (2011g)

- Set the handrail close to the wall to avoid contact with the handlebars.
- Make the top level with the top stair for easy entering and exiting. Mechanical devices such as lifts or escalators can provide assistance.

Figure 83: Bicycle bridge, Hamburg (Germany)
Source: Müller 2011

However, many users are not comfortable with these solutions. They can therefore only be recommended as an additional solution, not as the only option to scale a difference in height.[50]

1.11 Advanced stop lines for cyclists

At intersections with traffic lights, an advanced stop line with a left-turning cycle stacking area in front of the traffic lights in front of cars is applicable. The area should be at least 5,0 m deep. In this way, cyclists are highly visible and can safely turn left at the green light ahead of traffic. In addition, a lead-in cycle lane towards the advanced stop line allows them to jump the queue. This measure is useful where the speed difference between cars and cyclists is not too high (< 50 km/h). At complex and busy intersections, it is safer to separate cyclists from road traffic and do the left turn in two steps.[51]

Figure 84: Advanced stop line, Hamburg (Germany)
Source: Rudolph 2011

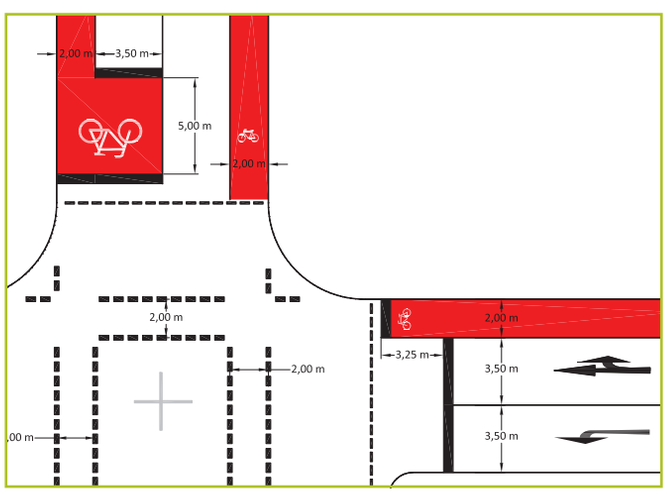

Figure 85: Planning sketch of advanced stop line
Source: Rudolph

50 Paragraph taken from PRESTO consortium (2011g)
51 Paragraph taken from PRESTO consortium (2010a)

2. Pedelecs/E-bikes

Figure 86: Pedelec
Source: riese+mueller

2.1 General information about pedelecs and e-bikes

In recent years electric propelled bicycles have become increasingly with bicycle buyers. The so called pedelec – pedal electric assisted bicycle (for definition see 3.2.1 below) – assists the cyclist with a small electric engine while pedalling.

These bicycles are not only popular in hilly areas. People also like to use pedelecs in very flat regions, especially in the Netherlands. Formerly dismissed as bikes for the weak and for old-age pensioners, pedelecs are now popular with young and old, men and women and, especially commuters.

For a number of years, sales of pedelecs in the EU have risen steadily. Figure 87 shows the sales of pedelecs in Germany for 2007 to 2010. In 2010 over 200.000 electrically propelled bikes were sold in all. Forecasts anticipate sales of about 400.000 to 600.000 per year in 2015.

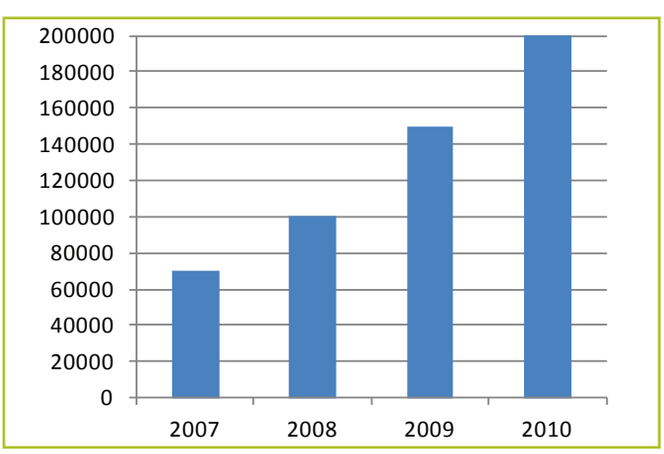

Figure 87: Pedelec sales in Germany per year
Source: gopedelec.eu 2011

2.2 Definitions

The term “electric bicycle” covers two different technical concepts of vehicles with an auxiliary electric motor. They even have a different legal status:

2.2.1 Pedelec (up to 25 km/h)

Bicycles equipped with an auxiliary motor that cannot be exclusively propelled by that motor. Only when the cyclist pedals, does the motor assist. These vehicles are generally called pedelecs. A pedelec equipped with a speed sensor will require the rider to pedal a few strokes before the motor starts. The EN 15194 standard permits pedelecs from 0 to 5 km/h, with the motor providing the main power for propulsion. When the speed exceeds 5 km/h the pedals must be used and current is progressively reduced until the bicycle reaches a speed of 25 km/h[52].

2.2.2 E-bike (faster than 25 km/h)

Bicycles equipped with an auxiliary electric motor that can be exclusively propelled by that motor. The cyclist is not necessarily required to pedal. These vehicles are generally called e-bikes[53].

2.3 Opportunities for urban traffic

According to the European Commission’s Statistical Pocketbook for 2001. EU Energy and Transport in Figures, every European makes about three trips per day. Half of the trips are not more than 3 km. Moreover, about half of all car trips are 6 km or less. These figures clearly demonstrate that the potential for substituting car trips by cycling is huge[54].

With its auxiliary electric motor the pedelec is a very eco friendly mode of transport. Even journeys of around 10 km can be made with ease. The amount of energy consumed is very small compared with cars or motor cycles. Energy consumption is about 0,5 to 2,0 kWh per 100 km, depending on the topography. That means the operating costs of pedelecs are also low. For 100 km the direct energy cost is around EUR 0,10 to EUR 0,40 (assuming for Germany that 1,0 kWh costs around EUR 0,20). The costs have to be calculated for each country but nevertheless energy consumption and costs are much lower than those of cars or motor cycles. Even mopeds cost more to run than pedelecs. Reliable manu-

52 Paragraph taken from Go Pedelec! (2011)
53 Paragraph taken from Go Pedelec! (2011)
54 PRESTO consortium (2010b)

facturers quote pedelec battery ranges from 40 to 60 km (36 V - 500 Wh systems).

Because pedelecs have an auxiliary motor that assists the cyclist, they have the potential to replace many journeys that until now have been made by car. The PRESTO-Project[55] states some interesting facts why people prefer using a pedelec to an ordinary bike:

- Conventional cycling is (too) difficult
- To make cycling with headwind easier
- To be able to cycle over longer distances without (much) extra effort
- To make it easier to climb hills
- To cycle faster (less travel time) without (much) extra effort
- As an alternative for less environmentally-friendly means of transport
- To get to work without sweating.

The electric bike is particularly appropriate for convincing die-hard car drivers to leave their vehicle aside for short distances because it overcomes a number of "popular" objections to cycling. As shown in the table above, interest in pedelecs springs to a large extent from the fact that cycling is made easier and more comfortable[56].

The Swiss study "Elektro-Zweiräder – Auswirkungen auf das Mobilitätsverhalten" (Electric Two-Wheelers – Effects on Mobility) shows that the use of pedelecs resulted in 5,2 % fewer car miles. What's more, the study has found that Pedelecs incite people to think about routines in their transport behaviour.

Commuters opt for the car rather than for the bike as soon as they have to travel more than 7 kilometers. The average speed of an electric bike is 24 km/h, compared with 17 km/h on a traditional bike. Since electric bikes make riding easier (no sweating) and faster, one-way commuter journeys of up to 15 km are within reach.

Employers can encourage employees to use a pedelec for commuting, for instance by participating in existing tax incentive schemes such as allowances for commuting by bike or company bikes, by including pedelecs in mobility plans or by leasing pedelecs.

Carrying a child and/or full shopping bags on a bike can be quite arduous. Pedelecs solve the problem of carrying weight, whether it concerns a child in a seat on the rear carrier, bags on the front and/or back of your vehicle and/ or a trailer.

Pedelecs also allow parents and shoppers to avoid parking problems in town.

Home delivery is becoming fashionable again. Grocers, bakers, butchers, etc. are redeveloping this service to the customer in an attempt to distinguish themselves from their competitors and to improve their customer relations. Whereas in earlier days, they would have used a moped, today a pedelec will prove just as fast and effective whilst being clean and quiet. This in turn will make a positive contribution to the company's social responsibility. In the meantime, the pizza-boys and all other food home delivery services are abandoning mopeds for pedelecs[57].

Cargo and logistics in urban areas

Surveys in different cities in Germany and Austria showed that 20-25 % journeys in cities are related to urban freight transport. Other surveys indicated even figures of 44-54 % of all trips in cities being related to goods transportation and 34-42 % of this freight traffic involve light goods. It is in this sector that a huge market potential can be found for freight couriers on electric cargo bikes as almost 100 % of transportation is done by motor traffic.

Figure 88: Different logistic companies see future for deliveries on bicycles
Source: Cargocycling.org and Cyclelogistics.eu

Even the Swedish company IKEA realised the advantages of pedelecs and introduced rental pedelecs with big trailers so that even its famous "Billy bookshelves" can be taken home by the customer without a car (see Figure 89).

55 Paragraph taken from PRESTO consortium (2010b)
56 Paragraph taken from PRESTO consortium (2010b)
57 Paragraph taken from PRESTO consortium (2010b)

Figure 89: IKEA CargoBike Delft, Netherlands
Source: railzone.nl

Figure 90: Pedelec
Source: riese+mueller

Lawyers, bankers, real estate agents, doctors and couriers are also using pedelecs to make their professional trips faster, more reliable and enjoyable. During the Copenhagen Climate Conference in 2009, the Avenue Hotel14 made pedelecs available to their guests with a view to helping them "greening" their stay. This is only one of a growing number of hotels that have a fleet of pedelecs available for their guests, who are mainly business people. The pedelecs allow them to get to their meetings on time. With that, new companies are emerging that offer pedelec fleets not only to hotels but also to companies, tourist businesses and local councils.

There are other groups who benefit from e-bikes. For example civil servants and politicians, elderly people, people with health problems and tourists.

2.4 Infrastructural requirements for pedelecs and e-bikes

A larger number of electric bicycles and the fact that the average speed of electric bikes is 24 km/h, compared with 17 km/h on a traditional bike require infrastructure adjustments due to the technical differences in comparison with conventional bicycles. Requirements include more "cycle highways", more secure and high quality parking facilities and battery charging points.

As far as cycle roads are concerned, a distinction needs to be made between segregated cycling infrastructures and integrated cycling. For quite a number of pedelec users (i.e. commuters), speed is a main factor. So it seems logical that on segregated cycling infrastructure, they will try to maximise speed.

As a result, cohabitation of conventional and electric bicycles and in this particular instance traffic safety will have to be monitored. If the proportion of pedelecs becomes substantial, it is very likely that infrastructure will have to be adapted, for instance by making cycle lanes and tracks wider and by widening bends[58].

People are prepared to cycle to work if it involves a distance between 0 and 15 km. The availability of fast and comfortable routes is precisely one of the reasons for motorists to switch to cycling. These "cycle motorways" are perfect for pedelecs. Therefore, growing numbers of commuters on pedelecs can be expected on these routes.

Pedelecs require wider cycle lanes or even separate cycle streets with an even barrier-free surface. Conventional cycle tracks will not be used.

As for integrated cycling, traffic calming and speed management of motor transport will be essential, so that pedelecs are enabled to follow the flow of traffic. 30 km/h allows them perfectly well to amalgamate with motor vehicles like cars. Given the fact that pedelecs usually move faster, bus lanes may well be very suitable for combined use.

58 Paragraph taken from PRESTO consortium (2010b)

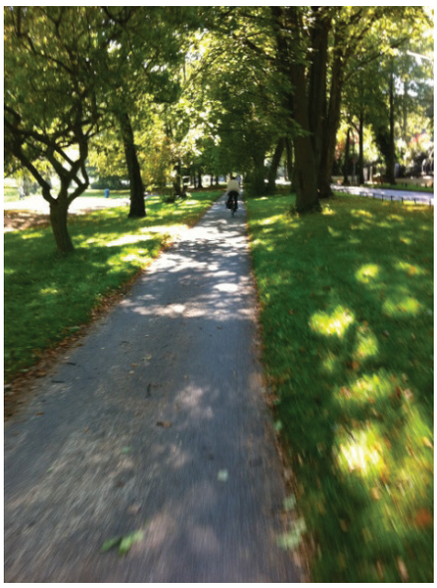

Figure 91: Fast pedelec ride
Source: Müller 2011

Figure 92: Fast pedelec ride
Source: riese+mueller

Figure 93: Bicycle highway constructed in the Netherlands
Source: fietsen.123.nl

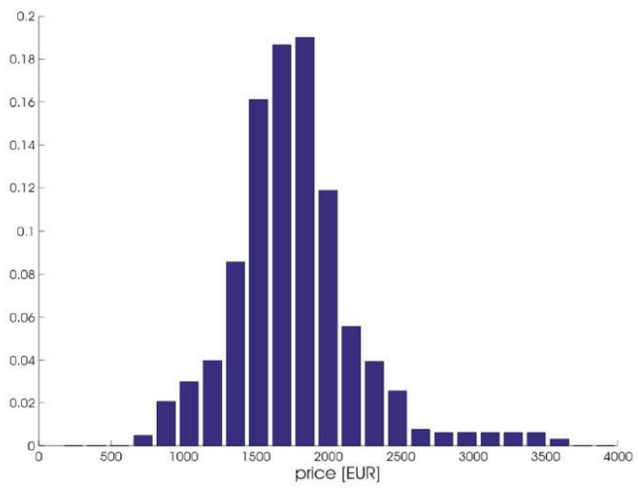

Figure 94: The distribution of pedelec prices in Flanders
Source: The pedelec market in Flanders

2.5 Parking and recharging requirements

In view of the value of pedelecs, users' expectations with regard to parking facilities will be higher. Figure 94 shows that the average purchase price in Flanders is around EUR 1.500 to 2.000 which can more or less be applied to the whole of Europe. There will be a growing demand not only for more sheltered, secured/guarded parking but for facilities that hold little risk of damaging the pedelecs. The average value of pedelecs is shown for the Flanders region as an example.

Charging a pedelec battery is a very simple operation that only requires a normal power point. In most cases, it is perfectly possible to charge the battery at home for the journey required, but the availability of charging points outside the house adds to the comfort of the user. It makes it less likely that the battery will run flat. As a result the user no longer needs to worry and, if necessary, external power points can extend the range of the pedelec. Even charging at a public power point is simple.

In the Netherlands there are now more than 400 free charging points throughout the country. They are located in restaurants, hotels, bicycle shops, museums, etc.

Apart from these individual external charging points, there are also collective charging stations, that are installed for instance in the garages of apartment buildings and in car parks, etc.

Studies have shown that there is a need for public charger stations, where the vehicle can charge while the owner sleeps or works.

The UK initiative Park and Charge[59] allows users of electrically powered two-wheelers and cars to store their vehicles in a safe and secure location and to connect them to a power supply. The Park & Charge system uses smart technology that recognises the voltage requirements of any battery-powered vehicle, ensuring a safe and efficient recharging process. Most electric bikes can take a full recharge in less than four hours, at a cost of less than EUR 0,10 a time.

Sanyo has announced the installation of its Solar Parking Lot incorporating solar panels and lithium-ion battery systems in combination with pedelecs[60]. The Solar Parking Lot is a perfectly independent and clean system eliminating the use of fossil fuels. The clean power generated from the solar panels installed on the roof is stored for recharging 40 pedelec batteries and powering the parking lot lights.

59 http://www.parkandcharge.com/

60 http://sanyo.com/news/2009/11/30-1.html

3. Parking facilities

Distributed small bicycle parking systems such as inverted U-stands, allow cyclists to park and attach their bicycle for short periods near their destination. More elaborate secured storage facilities, such as lockers or supervised storage, allow cyclists to store their bicycle safely for longer periods at slightly longer distances from their destination. Products available range from low-cost small parking devices to automated systems and supervision. Bicycles can be parked anywhere, leaning against a wall or attached to a post or a railing (where allowed).

Wherever a concentration of parked bicycles is present, expected or desired, they need to be accommodated with well-organised, convenient and safe public bicycle parking facilities. This in itself will encourage the use of cycling.

Figure 95: Stylish bicycle shackle, Hamburg (Germany)
Source: Rudolph 2011

Figure 96: Inverted U-stands, Hamburg (Germany)
Source: Rudolph 2011

- For short-term bicycle parking, reserved on-street spaces should be provided, distributed around streets and squares. They should be equipped with appropriate parking systems to support the bicycle and secure it.
- For longer-term parking and increased protection from theft, protected storage facilities should be provided, such as lockers and supervised cycle centres. They can range from small individual lockers to vast cycle stations.

3.1 Non public parking facilities (at home)

In residential areas, all residents should have safe overnight bicycle storage. This is crucial to encourage bicycle ownership and cycling. Sufficient bicycle storage should be standard in new housing, through negotiation or regulation. In older areas without indoor private storage, opportunities must be found for neighbourhood storage facilities, secured, shared and possibly co-managed by residents. Bicycle drums are practical small collective on-street lockers.

All housing needs adequate cycle storing provision. This is one of three indispensable components of the travel chain: storing at home, riding on a cycling network and parking or storing at destinations. Bicycle parking policy is usually strongly focused on destinations. But increasingly, it has become clear that parking provision at home is just as crucial.

The problem typically arises in cramped residential areas with a majority of flats or smaller houses without garages or other storage space. This is typical for most historic city centres and nineteenth-century inner suburbs. But it may also be an issue in more recently developed neighbourhoods with small dwellings:

- Space is lacking to keep a bicycle inside the home, let alone a bicycle for each member of the family. Only convinced cyclists will take the trouble to carry bicycles up stairs or park them in a narrow hallway, stairway, cellar or even the living room.
- Parking bicycles on the street overnight is inconvenient and risky. In the Netherlands, half of all stolen bicycles are stolen near the owner's home. Being obliged to always lock your bicycle is a nuisance. If the bicycle is always outside and uncovered, it will degrade more easily or suffer from vandalism. And too many parked bicycles on the pavement will become an obstacle and a visual nuisance.

A home situation of this kind strongly discourages bicycle ownership and bicycle use even when there is an excellent cycling network and adequate parking at destinations. In new housing, sufficient bicycle storage for all should become a standard provision.

3.2 Neighbourhood storage facilities

Public authorities can create and run neighbourhood storage facilities: buildings, parts of buildings or enclosed areas used for bicycle parking.

- Restrict access to a fixed group of local residents. Each resident has a reserved parking space and access at all times with a key or smart card.
- Detect opportunities for available space. New construction may be integrated in public squares or on vacant lots between dwellings. In this case, authorities are dependent on real estate opportunities that need to be taken up rapidly and may prove costly. However, there are often opportunities for reconverting space such as unused commercial storage space or the ground floor or cellar of a large private or public building. Other options may be to cover an enclosed garden, to reserve a part of an underground car garage or simply to convert a garage box for shared bicycle storage.
- Consider adding a small shared workshop space with tools for repair.
- Limit walking distance for users to a maximum of 150 m. A good location is one that as many potential users as possible can reach within that distance. This is based on Dutch experience (see table below), and may vary elsewhere.

Maximum walking distance to neighbourhood storage	Acceptable for
75 m	46 %
150 m	32 %
More than 150 m	21 %

Table 7: Maximum walking distance to neigbourhood storage
Source: PRESTO Bicycle Parking on residential areas

- Set up proper financing and management. Annual fees in the Netherlands vary from EUR 35 to EUR 90, with a policy trend of keeping them below EUR 50. Willingness to pay varies and may be surveyed in advance among potential users. Generally, neighbourhood storage will not be commercially viable without public support. Owners of an unused space may, however, accept low benefits. Including space for mopeds and motorcycles may increase profitability: space for them is scarce, and the owners are often willing to pay higher fees. The main management tasks are user registration, collection of fees and maintenance (not permanent supervision). The manager should preferably live nearby and be easy to reach in case of emergency. Drawing up a contract with each user is recommended.
- Consider a demand-led approach. Instead of taking the initiative of rolling out neighbourhood storage, authorities can prepare all the procedures and invite residents to propose initiatives. This has a twofold advantage: there is some idea of the real demand and local people can actively detect and propose location opportunities.

3.3 Public storage facilities

All cities that are serious about cycling should develop a strategy for bicycle parking in the city centre. A mix of dispersed small parking provision and large secure storage facilities will offer cyclists easy access to key urban destinations. Observation and needs analysis should determine locations, quantity and quality. As a result, this will attract more cyclists, improve the quality of public space and increase the city centre's attractiveness.[61]

Cyclists first and foremost need to be able to park bicycles. Parking means leaving the bicycle behind for a short time, 2 hours or less. They will want to park as near as possible to their destination, typically less than 50 m. Research in major UK city centres illustrates this: asked why they parked in a particular location, 86 % of cyclists said because it was close to destination (only 16 % security); it also showed that 75 % of cyclists park for less than two hours within 50 m of their destination. This demand needs to be met with a distributed offer of small parking facilities, at short distance intervals.

The simplest way is to allocate reserved bicycle parking space without installing a parking system. This can be done by simple marking, by different surface materials or using street furniture. This in itself will already incite cyclists to park there. The advantage is that space is left free for other uses, for instance in town squares. However, it is only suitable for bicycles that have their own kickstand and fitted lock. Even then, the bicycle is not attached to a fixed object and risks falling over or being stolen or vandalised.

Providing a fixed structure that supports the bicycle and to which it can be attached is recommended. This can

61 Paragraph taken from PRESTO consortium (2011j)

take the form of a stand, for a single bike or one on each side, or of a rack, for multiple bicycles in a row.

A wide range of products is available on the market, but not all are equally good value. The following criteria should be considered in assessing product quality.

- **Does it provide stability?** A bicycle with 10 kg of luggage in a side bag should be able to stand up without damage to the bicycle.
- **Does it provide protection from theft?** It should be possible to secure both the frame and the front wheel. If only a wheel can be attached, thieves may detach the wheel. If the bicycle only has a fitted lock, not attached to the parking system, thieves may just lift the bike and break the lock later.
- **Is it compatible with many types of bike?** Many systems to accommodate the fork or the front wheel may not fit children's bicycles, racing bicycles or the increasingly popular folding bicycles. Suspension systems are not suitable for longer bicycles. Specific solutions may be considered in some situations, such as special provision for children's bicycles at schools.
- **Is it practical?** The system should be easy to use, self-explanatory and require minimum effort. Sophisticated anti-theft devices may be confusingly difficult to operate. Any system that requires lifting the bike will be less used.
- **Is it robust?** The system should be solidly fixed to the ground or wall, weather-proof and vandal-resistant. Small parts often provide leverage for destruction. Systems with built-in locks, risk malfunctioning or being damaged by vandals.
- **Is it easy to maintain?** The system should not attract litter and be easy to clean even when fully occupied.

In view of these requirements, it is not surprising that the inverted U-shaped bar is widely recommended. The height is between 0,7 m and 0,8 m. The bicycle frame leans against it and the frame and a wheel can be attached with a single lock. It is easy to use and suitable for all types of bicycle. It is a simple, low-tech and robust design, easy to install and difficult to vandalise. It is inexpensive and requires minimal maintenance. An extra horizontal bar is useful to support smaller bicycles. Moreover, any number can be simply aligned and provided with a roof for covering. It also allows for design variations to fit in with street furniture.

For the same reasons, low front-wheel grips should be avoided. These can be slots in concrete, or wheel grips attached to a wall or incorporated in racks. They do not give enough stability, so that bicycles may fall over and be damaged, including on purpose by vandals. They also do not allow the frame to be secured. Finally, racks attract leaves and litter and need more maintenance. However, in Denmark, front-wheel wedge-shaped grips are widely used and recommended on condition that the grips are sufficiently wide and mounted at the same height as the wheel. But they still have the disadvantage that the frame cannot be secured, so they are not recommended where theft is a major concern. Bicycle systems allow for innovative and aesthetically pleasing design. They may become striking objects in public space. However, the basic quality criteria should always be respected.

Individual bicycle lockers are used in situations calling for protection from theft and vandalism but where the demand is too low to create a supervised storage facility (e.g. small railway stations, park & bikes near city centres).

Figure 97: Bicycle shackles, Copenhagen (Denmark)
Source: Müller 2011

Figure 98: Bicycle stage, with roof and closed boxes next to metro station, Hamburg (Germany)
Source: Rudolph 2011

- Lockers in public places are usually privately rented for periods from a day to a year. The user is identified and receives a unique key. Users pay a premium price for the added value of security and a reserved space. Lockers also allow users to store accessories safely, such as helmet, pumps, special clothing etc. Locking options vary, from keys, padlocks, smart cards and number key pads. The disadvantage is that storage space is not efficiently used, since they remain empty for part of the time.
- Lockers can also be used more flexibly on a first-come, first-served basis. They can be free: users bring their own lock or insert a coin that they retrieve afterwards. This easily leads to abuse: lockers are used to store other things or are monopolised. Alternatively, users pay short term rent and receive a key or an access code. Recently, electronic lockers have made their appearance, in which users have a smart card and book a locker in advance.
- Individual lockers are mostly mobile and can be moved to other locations. On the other hand, they are bulky and consume much more space than parking outside lockers. This means they are also more difficult to integrate physically and aesthetically into public space. They may also require some form of supervision and maintenance, possible control by CCTV.
- Lockers can be managed by public authorities, a public transport company, a parking agency or a private provider.
- The cost of a basic individual locker is around EUR 1.000.

Figure 99: Rentable bicycle boxes, Witten (Germany)
Source: Müller 2011

Figure 100: Rentable bicycle boxes, Hamburg (Germany)
Source: Rudolph 2011

A collective bicycle locker can contain a number of bicycles. Each user pays rent and has a key.

- The most important advantage of the collective locker is that it takes up much less space for the same number of bicycles than individual lockers.
- Users need to know and trust each other. Neighbourhood bicycle storage is mostly organised in this way as covered storage space shared by a number of local residents.
- One user can be designated as supervisor and contact person for the managing organisation, for instance in exchange for a reduced rent.
- Collective lockers can also be installed on the street. One example is the 'bicycle drum' which is often used in urban neighbourhoods (in The Netherlands) where there is not enough space to park bicycles off-street. The cost of a bicycle drum parking 10 bicycles is around EUR 5.000.

Figure 101: A bicycle drum, Delft (Netherlands)
Source: Ellywa, Wikipedia.org, 2007

3.4 Design recommendations for parking spaces for standard adult bicycles

- Provide a depth of 2,0 m, with a minimum of 1,8 m.
- Provide a width of 0,65 m. This is the centre-to-centre distance between bicycles needed to accommodate the standard width of handlebars, between 0,5 to 0,65 m. Cyclists can then park easily, without getting handlebars entangled with the next bicycle. Below this distance, most probably only one in two spaces will be used. At a distance of more than 0,70 m, an additional bicycle may park in between when supply is short.
- Provide a free access path of 1,8 m, for easy manoeuvring. In large storage facilities, people need to be able to walk past each other wheeling their bicycles: the access path should have 3,0 m to 3,5 m.
- Provide wider space for specific needs. At supermarkets or in shopping districts, width must be increased to allow customers to load their bags easily. The same goes for facilities outside day-care centres and kindergartens, to allow parents to lift children easily in and out of the baby seat. If space is lacking, shoppers and parents will be forced to load or lift children in the access space, blocking other cyclists.
- Consider compact high-low systems. In these, bicycles are alternatively stacked on a slightly different level. This way, handlebars cannot get entangled, and the centre-to-centre width can be reduced to 4,0 m (min. 0,38 m). The level difference should be at least 0,25 m and the lifting height should not be more than 0,35 m.
- Consider compact angled parking. When bicycles are parked at a 45° angle, handlebars are less likely to become entangled. In addition, this reduces the depth and manoeuvring space needed. The centre-to-centre distance can be reduced to 0,5 m (or even 0,4 m) and the depth to 1,4 m. The inconvenience is that parking space can only be accessed from one direction.
- Allow a standard space consumption of 1,8 m^2 per bicycle. This includes the parking space itself (1,3 m^2) and a shared access path for two rows (0,5 m^2 per bicycle). This can vary from around 1,0 m^2 for compact solutions up to 3,0 m^2 with a more comfortable width of 0,8 m.
- Only use two-tier parking as a last resort. Parking on two-tiers, one bike above another, significantly reduces space consumption by up to 50 %. In very large parking facilities, this may be unavoidable to reduce the distance to be walked. However, lifting bikes requires a serious effort that many cyclists will try to avoid. The effort may be reduced by setting the lower tier slightly below ground level and providing ramps for the upper tier, or by providing lifting mechanisms[62].

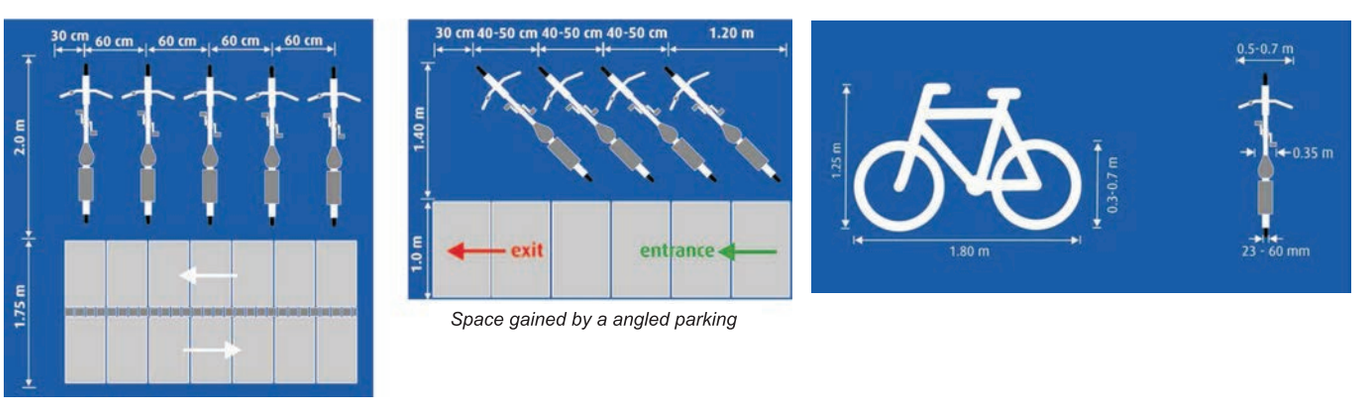

Figure 102: Danish guidance on bicycle parking dimensions (slightly larger dimensions are recommended)
Source: PRESTO consortium 2011

62 Paragraph taken from PRESTO consortium (2011k)

4. References

Clean Air Initiative (Eds.) (2008): Bicycle Infrastructure Design Manual for Indian Sub-continent. URL: http://cleanairinitiative.org/portal/system/files/Bicycle_Manual_for_Indian_Subcontinent.pdf (21.03.2012).

CROW (2007): Design manual for bicycle traffic. Record 25. Utrecht, Netherlands.

Department for Transport (2008): Cycle Infrastructure Design. Local Transport Note 2/08. London, United Kingdom. URL: http://assets.dft.gov.uk/publications/local-transport-notes/ltn-2-08.pdf (21.03.2012).

energieautark consulting GmbH (2011): „Go Pedelec!“ – Elektrofahrräder zum Testen. Wien, Austria. URL: http://www.gopedelec.de (21.03.2012).

European Cyclists Federation (2009):ECF Fact Sheet: 30 kph speed limits and cyclists safety. URL: http://www.ecf.com/wp-content/uploads/ECF_FACTSHEET1_V3_cterree30kph.pdf (21.03.2012).

Forschungsgesellschaft für Straßen- und Verkehrswesen (Publisher) (2010a): ERA – Empfehlungen für Radverkehrsanlagen. Köln, Germany.

Forschungsgesellschaft für Straßen- und Verkehrswesen (Publisher) (2010b): RILSA – Richtlinien für Lichtsignalanlagen. Köln, Germany.

Garcia, Esteban (2009): Segregated cycling and shared space in today’s cities. Velo-City 2009. Brussels, Belgium. URL: http://www.velo-city2009.com/assets/files/paper-Garcia-sub5.1.pdf (21.03.2012).

Meschik, Michael (2008): Planungshandbuch Radverkehr. Springer Verlag Wien, Austria.

Park and Charge Ltd. URL: http://www.parkandcharge.com/ (21.03.2012).

PRESTO consortium (2010a): Cycling Policy Guide Infrastructure.

PRESTO consortium (2010b): Policy guide on Electric bicycles.

PRESTO consortium (2011f): Factsheet: Cycle tracks.

PRESTO consortium (2011g): Factsheet: Intersections and crossings.

PRESTO consortium (2011h): Factsheet: Traffic-light intersections.

PRESTO consortium (2011i): Factsheet: Bicycle and buses.

PRESTO consortium (2011j): Factsheet: Bicycle parking in the city centre.

PRESTO consortium (2011k): Factsheet: Bicycle parking in residential areas.

Sanyo Electric Co., Ltd. URL: http://sanyo.com/news/2009/11/30-1.html (21.03.2012).

SEStran South East of Scotland Transport Partnership (2008): Cycling Infrastructure: Design Guidance and Best Practice. Edinburgh, Great Britain. URL: www.sestran.gov.uk (21.03.2012).

Transport for London URL: http://www.tfl.gov.uk/roadusers/cycling/11901.aspx (21.03.2012).

Part III: Service

mobile
2020

CONTENTS

1. Service as a part of an integrated cycling system

Promoting cycling as an everyday mode of transport within an integrated cycling strategy means to have in mind service measures for cyclists as well. Services for cyclists help to make cycling easier and more comfortable and therefore help to make cycling a convenient mode of transport in urban environments.

The following chapter will present all kinds of service-related measures that could be implemented to encourage the status of cycling as an everyday mode of transport. Service measures like information, public transport integration, bike sharing schemes, services related to bicycle parking and a series of other service ideas are presented. These services in addition to a qualitative infrastructure can make cycling more attractive.

The case studies presented and the examples of already existing service possibilities are aiming to provide ideas for the adaption of good practice solutions.

2. Information

Information on cycling in general, on bicycle facilities, services and on other cycling related topics is an important part of every cycling friendly mobility policy. Therefore, adequate information has to be carefully considered when trying to promote cycling. Cyclists will only use infrastructure, facilities and service offers if they know about it and are aware of the existing possibilities.

Information is an essential part of service for cyclists and adequate information could for example comprise cycling routes or parking facilities. But the provision of cycling related information can also be seen as an important part of marketing communication.

There are different dimensions of information. We distinguish between local information, general information and expert information on cycling. Local information on cycling includes all kinds of information related to the direct local environment, be it a city or a region. General information is dealing with all kinds of sources focusing on cycling itself as a means of transport, on technical bicycle issues and equipment. Whereas local and general information are directed towards the cyclist himself, expert information is mainly aimed at bicycle experts who are involved in bicycle planning or promotion.

2.1 Local information on cycling

Apart from giving general information on the benefits and possibilities of cycling as a mode of everyday transport, it is important to keep people informed about local cycling infrastructure, facilities, events and cycling culture as well. People will only use local cycling choices if they are properly informed about the existing possibilities. Therefore, it is essential to provide local information like maps, brochures or calendars containing all that is to know related to cycling in a certain region or city. The following examples will give some ideas on common local cycling information measures.

2.1.1 Local cycling maps, route planners, apps

A cycling map informs about bicycle paths or roads suitable for cycling. It is an important tool for route planning. A map can give recommendations by informing about the volume of traffic or the quality of the surface, and indicate bicycle parking, connections to public transport, time-distance relations, rest areas and much more. An online version of a cycling map has room for even more information. A simple low cost leaflet indicating cycling routes is a good starting point if money is an issue. Sponsorships or advertisements are a good way to cover at least some of the costs. Cycling-related information can also be integrated into conventional street maps. The preparation of a cycling map is also a very good opportunity to analyse the local cycling situation. Figure 1 shows the pocket sized bicycle map of Bolzano in Italy (95.000 inhabitants). [1]

1 Paragraph taken from Urbanczyk (2010) and edited

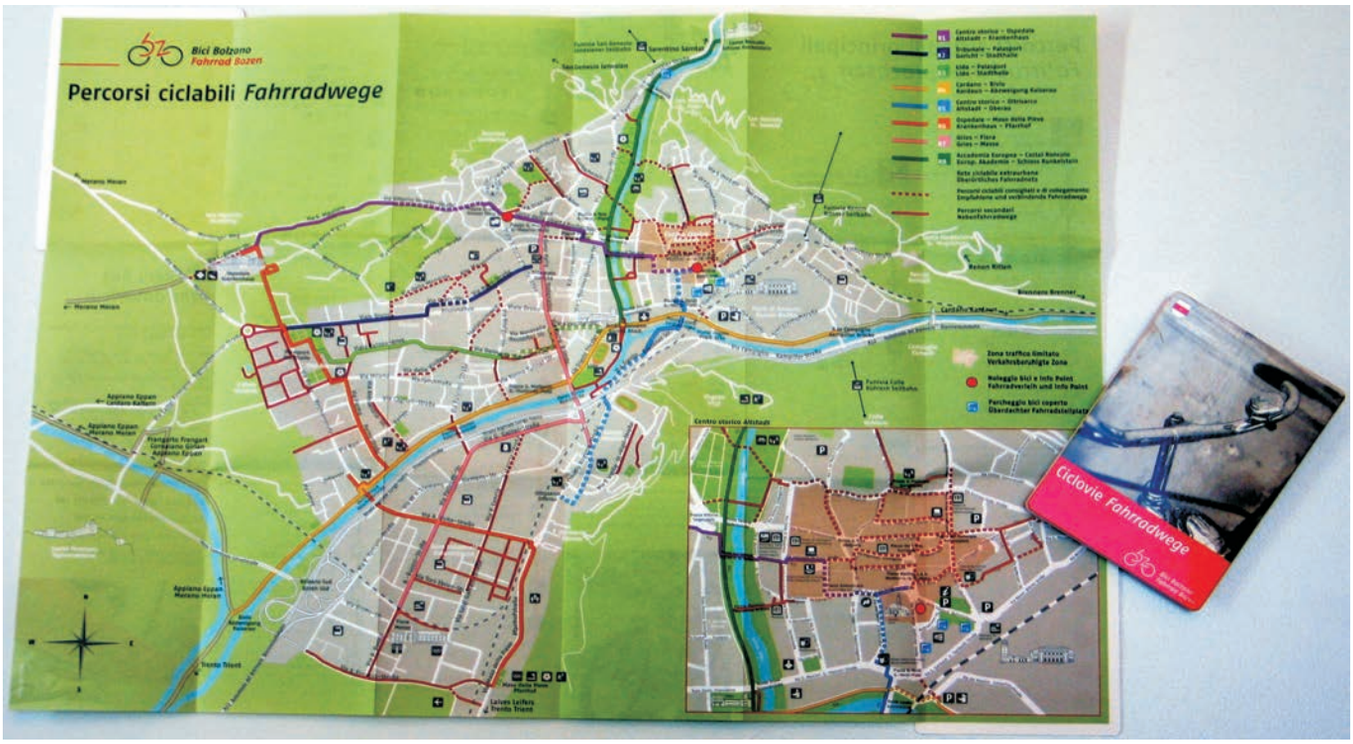

Figure 1: Pocket sized bicycle map of Bolzano (Italy)
Source: Hefter 2012

Infobox: What makes a good bicycle map?

A bicycle map should include at least the following information:[2]

- Car-free bike paths and cycle lanes (if your city has any) and bicycle-friendly roads [e.g. traffic calming in neighbourhoods, zones 30 km/h], ideally with an indication of the quality of surface, volume of traffic, and places that are best avoided
- City maps should include street names, one-way streets (and whether contraflow cycling is allowed)
- Bike parking facilities
- Common signs
- Common local destinations (shopping, schools, libraries, etc.)
- Useful contacts (e.g. of local cycling clubs, local cycling agent)

Design considerations of bicycle maps:

- Scale: Readability is a key factor and can be reached through an appropriate scale, contrast and colours. Depending on the size of the city and network, the scale should be usually between 1:15.000 and 25.000. Regional maps have a scale between 1:25.000 and 150.000. A bicycle map should always include a legend.
- Comparability and usability: The base map should be the official map of the city as provided by the local land survey office (or comparable institution). The format of the map (foldable, leaf through, or other) should be as easy as possible to use during the trip. The material should be durable and even able to withstand wind and possibly, to some extent, even rain.
- Printing: Four-colour printing is recommended.
- Updating: The bicycle map should be regularly updated (ideally every year).
- Pocket version: A smaller sized, foldable pocket version containing the main cycling information can supplement a comprehensive publication or, in case of low budget, serve as temporary substitute.
- Cost: This will depend on the material, printing quality, size, folding, scope, and number of copies. Sponsorship is one means of covering some or all of the costs.

2 Paragraph taken from PRESTO consortium (2011a)

One modern complementation to classical printed bicycle maps are internet or mobile phone based route planners. Internet based bicycle route planners enable the user to plan specific bicycle trips before starting off. Figure 2 shows a screenshot of the online route planner for the German region of North Rhine-Westphalia.

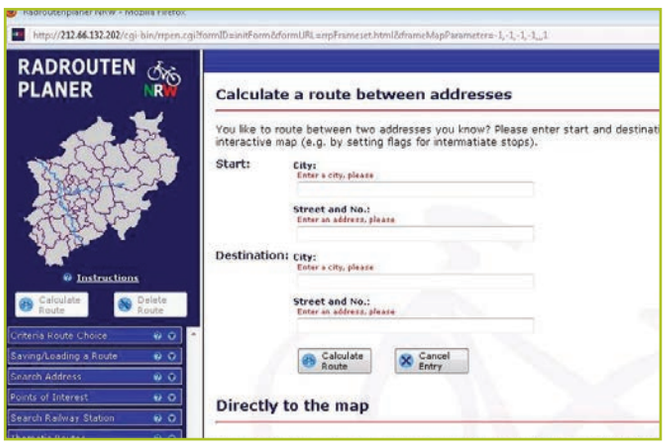

Figure 2: Screenshot of Radroutenplaner NRW
Source: www.radroutenplaner.nrw.de (22.11.2011)

In recent years smartphone based applications ("Apps") have extended these possibilities to real time orientation and route planning even when the cyclist is already on his way (see Figure 3).

Figure 3: Picture of Smartphone App
Source: www.radroutenplaner.nrw.de (22.11.2011)

Case study: Naviki project

Naviki is an online route planner which allows users to plan their cycling trips and to document own trips on the project website (see Figure 4). Documented new routes from users can be uploaded on the project website and are complementing the already existing route data.

Users can also download a special Naviki App for their smartphones and can use it as a navigation system.

Naviki offers cities, regions or other partners the possibility to adapt the Naviki platform for their own applications. Cities for example can provide the Naviki service with their own logos on their websites.

Within the Intelligent Energy Europe programme the Naviki project will be extended to other European countries. This could be a chance to adapt the Naviki route planner according to the needs of some cities participating in mobile2020 (Duration 2011-2014)[3].

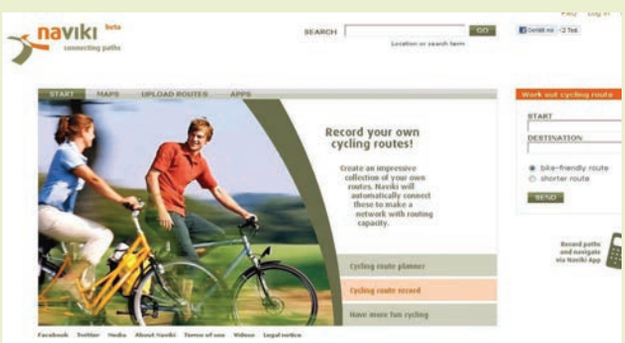

Figure 4: Screenshot of project website
Source: www.naviki.org (22.11.2011)

Further reading:

DIFU - German Institute of Urban Affairs (2012): Cycling Expertise – Mapping – Routing – Navigation for Cycling. Online available at: http://www.nationaler-radverkehrsplan.de/en/transferstelle/.

PRESTO consortium (2011a): Factsheet: Bicycle Maps.

3 Naviki project (2011)

2.1.2 Mobility information centre

A cycling information centre is a physical location (likely to offer internet services as well) with public access where cyclists or potential cyclists can go to ask questions and get information about mobility in general or cycling in particular. The provided information includes maps, information on cycling training (bike safety & education, bike repair, etc.), connections to local cycling organisations, information on organized bike tours the local area, etc. [4]

Mobility centres serve the same purpose, but include information on all forms of sustainable transportation: public transport, cycling, walking, car-sharing, etc. together in one place.

A cycling information centre provides information to citizens who might otherwise not have easy access to information about cycling options in their city. It raises awareness among non-cyclists about cycling, serves as a source of information, and gives a public face to cycling as a means of transport.

While the main focus should be on providing information to encourage and support everyday cycling in the local area, the information provided will also be useful to cycle tourists, a group which should not be ignored.

2.1.3 Information and tours for new citizens

Citizens new to a city are an ideal target group with regard to rethinking and changing their day-to-day mobility behaviour. With this in mind, the best time to inform them about transport alternatives would be immediately when they are registering in the municipal registration office. Like that, the information can help to establish new travel habits before people settle down and turn to the usual car oriented travel patterns. Indeed, a person who is moving is confronted with many changes such as a new house, a new town, new shopping areas and a new job. These changes come along with new surroundings, new daily trips and thus new routes, and distances. In this phase in one's life, people are usually more willing to accept changes and can thus change their routinized behaviour more easily. At this stage, demonstrating the range, benefits and whole portfolio of other transport modes such as the bicycle is a promising way to facilitate the use of alternatives to the car.

A "new citizen starter kit" on cycling (and/or other sustainable transport modes) is a useful tool for this purpose (see Figure 5 for an example from the city of Aachen in Germany, 260.000 inhabitants). [5]

Figure 5: Aachens new citizen starter material (Germany)
Source: Hefter 2011

Experiences from Munich (1.350.000 inhabitants), where every new citizen receives such a starter kit (see Figure 7) including relevant information on public transport and cycling in the city, shows that those new citizens who have received the "starter kit" have used sustainable modes more and the car less than those who didn't received the information. In fact, a telephone evaluation found a 3 % reduction share of car use by the people who have received this package[6].

4 Paragraph taken from PRESTO consortium (2011b) and edited

5 Paragraph taken from Urbanczyk (2010) and edited
6 Bickelbacher 2009

Case study: "Mobilitätspunkt" (Mobility Centre) – Stuttgart, Germany

The Mobility Centre in Stuttgart (600.000 inhabitants) was originally established in 1998 but, beginning in 2006, it expanded its services to become a professional competence centre in all fields of individual route planning for all transport modes. Personalised information on all modes of public transport as well as route planning for car drivers, cyclists and pedestrians are the main services provided.[7]

Services requested include:

- Individual mobility information with regard to public transport
- Car-sharing programmes
- Route planning for car drivers, cyclists and pedestrians
- Training courses on fuel-saving
- Organisation of carpooling
- Information about car parking facilities
- Mobility information for disabled and blind persons

Their target is to increase the demand for environmentally-compatible mobility services and to provide new services, such as bicycle boxes to rent (introduced in 2007).

The Stuttgart mobility centre is located in the tourist office near Stuttgart's main train station. Many of the activities related to the mobility centre were made possible through European Union project funding. For more information, go to the Civitas project webpage (www.civitas.eu/measure_sheet.phtml?lan=fr&id=281).

Stuttgart is a climber city with a cycling modal split of 8 % (in 2009). In 2005, the city of Stuttgart established the goal to move from a 7 % modal split to 12 % in the medium term and to 20 % in the long term.

Figure 6: Mobility information, Stuttgart (Germany)
Source: City of Stuttgart 2011

Further reading:

PRESTO consortium (2011b): Factsheet Cycling Information Centres/Mobility Centres.

7 Case study taken from PRESTO consortium (2011b)

Figure 7: Munich's new citizen starter folder
Source: Hefter 2011

Other cities also offer such a welcome kit to new citizens (e.g. City of Münster in Germany). A starter kit should be prepared in cooperation with different local stakeholders such as the transport operator or the local housing associations. All information should be bundled, reduced to the most important facts (in bullet point form), consolidated in a brochure or flyer. Too much information might have the unintended effect that people simply do not read it all. Substantial information should be given on[8]:

- Pedestrian and bicycle traffic (with explanations on bicycle paths, bicycle signings, bicycle parking etc.)
- Bicycle training courses (if existent)
- Bike & Ride stations and bicycle rental schemes (if available)
- Local bus, tram, public transport and railway systems, e.g. on tickets, timetables, tariffs etc.

Additional components are removable bicycle maps, even some bicycle accessories, coupons or free public transport tickets. Furthermore, the starter kit may give information on local bicycle stores, bicycle organisations, websites, or special information for handicapped or elderly people etc. It should in any case designate a contact person (e.g. the local bicycle officer) in case of further questions. A starter package is a service that is appropriate for starter, climber and champion cities.

Within the EU LIFE CYCLE project, a "new citizen package" has been developed including all relevant information on cycling.[9]

Another quite similar approach to inform new citizens on the existing bicycle infrastructure and bicycle routes in a new location is to arrange special bicycle tours for new citizens. The benefit of such new citizen tours is that the attendants can have a real life bicycle experience in their new location. These tours are guided by members of the local bicycle association who can give an introduction on the local bicycle infrastructure and bicycle routes to the new citizens. A special form of new citizen tours was introduced in some German cities in 2011 by the German bicycle user association ADFC. The so-called "ADFC City Pilots" offer this service for single persons or small groups of interested new citizens, answer individual questions, and show personal routes to selected destinations.

Guided new citizen bicycle tours offer the chance to motivate people to use their bike in the new environment. At the same time it allows the local bicycle association to get in touch with new inhabitants and to know their needs and demands.[10]

8 City of Münster (2009)

9 LIFE CYCLE project (2009)
10 ADFC (2011a)

Figure 8: ADFC City Pilot in Germany
Source: ADFC, Wieland

Main initiating stakeholders:
- Local registration office / administration
- Local bicycle associations

Possible partnerships with local stakeholders:
- Local public transport operator

Further reading:
- ADFC New Residents' tours (Germany). In: FGM-AMOR (Publisher) (2011): LIFE CYCLE Implementation Manual. How to run a cycling action. Chapter 7, Page 84.
- Presentation on Munich's new citizen starter kit. URL: http://www.scp-knowledge.eu/sites/default/files/CORPUS%20WP%203%20WS%20II%20Martin%20Schreiner%20Marketing%20Sustainable%20Mobility.pdf (20.12.2011).

2.1.4 Signposting and info-points on local cycling routes

Information on local cycling routes and facilities are an essential part of every good bicycle map. Besides appearing on maps this information can also be provided along bicycle routes via signposting and info-points. One good example for reasonable signposting for cyclists and the integration of info-points in cycling routes is the Italian city of Bolzano. In Bolzano, "horizontal signposting fulfil many functions". First of all it is an information tool which helps the citizens to gain orientation in the city. It is developed for all bikers and commuters, but also for tourists who are not familiar with the place. The content and information of the signposts can be different. [11]

11 Paragraph taken from Ökoinstitut Südtirol/Alto Adige (no year) and edited

Figure 9: Signpost, Bolzano (Italy)
Source: Deffner 2011

Beside direction signs, also information concerning the name (colour) of the bike lane, points of interests, attractions, sport places, public transport, etc. are part of the signposting. Of course the corporate design of the local bicycle mobility as a brand should be well recognizable on each signboard (see chapter 6.1.2 in part IV Communication). Additionally, the existence of these sign posts everywhere in the city helps to raise the perception of and awareness for the cyclists among all road users."

For more details on the infopoints and the corporate cycling system in Bolzano see chapter 6.1.2 in part IV on "communication and marketing".

2.1.5 Local bicycle brochures, calendars, etc.

Local bicycle guides and brochures covering different issues represent another useful promotion tool. Their content can easily be adapted to the cycling level of each respective city. For starter cities, a guide might include a brief history of bicycles and bicycling, a description of the main parts of a bicycle and its equipment. It could also mention how to maintain and repair a bicycle, and include tips on safely when using the bicycle as a mode of transport as well as a local cycling map. Both for starter and for climber cities a guide for getting around in the city, using a bike for shopping as

well as how and where to park it securely and how to link cycling with public transport could be included. [12]

Figure 10: Brochure "Velostadt Zürich"
Source: City of Zürich 2007

A bicycle calendar is a great way to inform the broader public, but also to inform those with a specific interest in cycling about upcoming cycling related events for a month, a season, or the whole year. Contents generally relate to workshops and bicycle repair courses, dates for the pick up of abandoned bicycles, or bicycle tours. The calendar may also announce the publication of new or updated cycling maps. One example is the "Bicycle Calendar" for Munich (a climber city) and its surrounding area (see Figure 11). A bicycle calendar can also be provided on local websites, for example on community sites, or on special local bicycle related websites.

Figure 11: Bicycle Calendar
Source: City of Munich 2011

2.2 General Information on cycling

General information on cycling includes all kinds of information material or might point out occasions which inform people about cycling in general. These could comprise for example information on technical details and differences of bicycles, available and suitable equipment, costs of bicycles, national or international cycling related topics or information provided via internet services.

2.2.1 Bicycle fairs and events

A bike testing event gives the public an opportunity to test and ride a variety of bicycles that they may otherwise not have been aware of. Bike manufacturers are invited to bring a range of different bikes. A short test track is set up so people can try different types of bikes. Depending on the city (starter, climber, or champion), the focus may be on potential cyclists in general, or on the needs of a specific target group. Those can be senior citizens, those with physical disabilities, or families with small children. [13]

A fundamental barrier to cycling is the lack of a bike that is mechanically sound, comfortable, and pleasant to ride. Today, people can learn about the range of bike models available via the Internet or other forms of advertising. Hands-on experience of actually trying out bikes for themselves is much more likely to build people's enthusiasm and excitement for cycling.

As a relatively new development, Pedelecs and E-bikes in particular are something that people are much less likely to buy without having first tried one out. Bike testing events also offer participants the benefit to compare among a broader selection than you would likely find at an individual retailer.

Figure 12: Public demo day at Eurobike fair in Germany
Source: Ermah, Wikipedia 2009

12 Paragraph taken from Urbanczyk (2010) and edited

13 Paragraph taken from PRESTO consortium (2011c) and edited

Target groups

In starter cities, the target group are potential cyclists. These might, for example, be adults who last cycled as children on a single-gear bike with an uncomfortable seat and are not aware of the developments in bicycle technology.

Climber cities – where cycling is relatively normal but not yet fully integrated into the culture of the city – are a good place to focus on broadening the use of bicycles. For example:

- introducing cargo bikes to businesses that do regular deliveries
- focusing on families with young children and the possibilities of transporting them by bike (with children bike seats, "tag-a-long" bikes, bike trailers, etc.)

In champion cities, where cycling is already a part of the mainstream culture, the focus could be on specific target groups, such as those with physical limitations that prevent them from joining the mainstream on traditional bikes. This could include:

- recumbent bikes (bikes designed in a way that the rider is in a sitting position and pedals horizontally rather than vertically) for those with back problems
- tricycles or recumbent tricycles for those with balance problems
- hand-pedalled bikes for paraplegics or others who have problems with leg strength or mobility
- Pedelecs and E-bikes for those who lack physical strength
- In hilly cities – whether starter, climber, or champion – a focus on Pedelecs, or even bikes with a good range of gears, could be a means of overcoming the fundamental barrier of topography.

Main initiating stakeholders:

- Local cycling organisations or pressure groups

Possible partnerships with local stakeholders:

- Bike manufacturers or local retailers
- Manufacturers of bicycle equipment
- Relevant organisations or associations in the target group community
- Local media
- Tourism organisations

Further reading:

PRESTO consortium (2011c): Factsheet: Bike Testing Events.

2.2.2 Cycling equipment

For cyclists or potential cyclists it is very important to have information on bicycles and on cycling equipment. Especially people who do not cycle but who want to do so in future depend on reliable information when it comes to purchasing a bicycle or related equipment. People who already use a bicycle are often interested in suitable bicycle equipment as well. When considering the purchase of a new bicycle, test reports given for example in bicycle magazines can be a good way of information. Often national bicycle associations launch their own magazines or webpages showing test results and giving advice on bicycle hardware and equipment.

Information on bicycle equipment is also an important point when it comes to secure cycling. National bicycle associations as well as national ministries or local authorities often publish brochures on topics like bicycle helmets, lights or brakes to promote secure cycling. For bicycle equipment like helmets testing possibilities can be a reasonable offer as well. Figure 13 shows a testing booth for bicycle helmets in Heidelberg, Germany (150.000 inhabitants).

Figure 13: Bike helmet testing & advice, Heidelberg (Germany)
Source: ADFC Heidelberg

When promoting cycling as an everyday mode of transport it is also helpful to inform about cycling equipment which makes cycling easy and comfortable. Therefore, information on solid and comfortable bicycle hardware, weatherproof cycling wear and bags for transport are helpful.

Figure 14: Brochure on secure cycling
Source: Deutsche Gesetzliche Unfallversicherung (DGUV)/ www.grafikdesign-weber.de

2.3 Expert information on cycling

For cycling experts and people engaged in cycling promotion activities there is also a huge variety of informational offers. The following chapters will give useful hints on sources of information for case studies, best practice examples and current developments in cycling planning and promotion. These sources of information can be very helpful to find already well established and applicable examples which could be adapted for one's own cycling promotion activities.

2.3.1 Information via internet

Nowadays, for many people the internet is the primary information source. And this is also true when it comes to information on cycling and cycling related topics. The internet offer information which is accesible easily for interested people and often outreaches classical information sources like printed brochures or flyers. Therefore, the internet-based information provided is very important when intending to promote a modal shift towards more cycling.

All current cycling promotion campaigns – if local or national – use internet based applications to inform or interact with people interested in cycling (for more details on internet based marketing see part IV "Communication towards behavioural change"). Besides using internet pages for cycling marketing, web pages can also be used as practical sources of information.

Some examples for internet based information on cycling for experts (e.g. planners, multipliers, experts) which are very helpful for everyone involved in cycling promotion measures, are web pages collecting information on bicycle promotion projects and case studies in other cities or countries. Some interesting websites with databases on cycling and case studies are for example:

- Netherlands Fietsberaad (www.fietsberaad.nl): This site provides knowledge and a good case database in English which collects information, case studies and videos on all cycling related topics. Most examples are from the Netherlands but the page provides information on case studies and publications from other countries as well.
- Eltis website (www.eltis.org): Funded by the EU's Intelligent Energy Europe programme the site contains information, case studies and videos on all topics and projects related to mobility management within the European Union. For registered Eltis users ("friends of Eltis") the page provides further information like publications, photos or statistics on cycling and allows direct networking with other registered experts. Besides this the service section of the website offers an overview on current EU-funding programmes for mobility related projects.
- Sustainable Urban Transport Project Asia website (www.sutp.org): The SUTP is an international cooperation project for sustainable transport in cities. The Website provides information, policy advice, studies and case examples on sustainable transport (including cycling).
- The English version of the German internet platform "Fahrradportal" which is part of the German national cycling strategy (www.nationaler-radverkehrsplan.de/en/transferstelle/) offers expertise fact sheets on all kinds of bicycle related topics. The available expertise sheets are grouped according to the following topics: analyses/mobility indicators; infrastructure; organisation, communication, and cooperation; services and mobility management.
- Project website of Lifecycle (www.lifecycle.cc) includes a case study search database.
- Webpages of the Cycling Embassies of Denmark (www.cycling-embassy.dk), Great Britain (www.cycling-embassy.org.uk) and of the Netherlands (www.dutchcycling.nl) show good national case examples for pro-cycling activities (infrastructure and promotion) to a broader public so that interested parties can learn from existing experiences and the know-how in these countries.

For cyclists local web pages providing cycling related information in their home region or city are very essential. Good examples of local sites contain information on local cycling routes, facilities and infrastructure and they often even include online route planners or other

interactive applications (see below). Some cities also host own cycling websites, other cities simply integrate information on cycling into their official city or region homepage.

Figure 15: Cycling homepage of Dublin (Ireland)
Source: www.dublincitycycling.ie

Another kind of information on cycling is offered in internet blogs. These blogs can be launched as part of broad cycling promotion campaigns or can be operated by private persons – often bicycle enthusiasts. One quite famous bicycle related internet blog is www.copenhagenize.com, a blog which was initiated by a private person presenting ordinary people using the bicycle in Copenhagen. The aim of the initiator is to change the image of cycling and to get the message across that cycling is an everyday mode of transport.[14]

Figure 16: Screenshot of copenhagenize.com
Source: www.copenhagenize.com

Of course the internet offers all kind of other cycling related information like product information, test results, information for leisure trips, etc. But it would be way too much to list all these different internet based choices.

2.3.2 National & international bicycle associations

National and international bicycle associations and organisations are important stakeholders when it comes to bicycle promotion. Besides their general lobbying for cycling as an important part of modern mobility they fulfil an information function as well.

On the European level the European Cyclists' Federation (ECF) is an umbrella organisation for national cycling associations. But particularly the national associations are an important contact point for cyclists searching for information related to their local bicycle situation. In many cities, the national associations have local offices which inform cyclists on the local infrastructure, cycling routes or cycling mobility in general. These local offices are important when it comes to personal information for cyclists. Often cyclists can buy bicycle maps or can join cycling tours initiated by the local cycling association. In some cities for example, the German ADFC hosts special cycling tours for new residents (in detail see chapter 2.1.3).

Figure 17: Local ADFC office in Bremen (Germany)
Source: ADFC Bremen, Grundey

14 Colville-Andersen (2010)

Case study: "Radort-Bremen" (bike spot Bremen) (Germany)

Radort is the information service centre (see Figure 17) of the Bremen branch of the German national cycling organisation (ADFC). Their services include:

- Bike coding (for identification of bicycles when stolen)
- A second-hand bike market (connecting individuals who want to buy or sell a bike)
- Advice on a range of cycling topics
- Information brochures

They also offer a range of literature and information about bike-related issues such as:

- Detailed regional maps for day trips or longer tours
- ADFC bike tour maps (covering Germany)
- Cycle touring books for neighbouring countries
- Cycling books (tourist guides, technical books)
- Recommendations on cycle-friendly accommodation
- Cycling journals of the ADFC (Radwelt and pedal)

In Bremen, the operational costs of Radort is subsidised by the local authority. [15]

Further reading:

PRESTO consortium (2011b): Factsheet Cycling Information Centres/Mobility Centres.

2.4 Professional journals for cycling

Another important source of information for cyclists and especially experts in cycling planning and promotion can be journals dealing with cycling related topics. For example most national cycling associations have their own regularly published journals. These journals are often available in combination with the membership in the national associations.

Some examples for interesting free journals published by bicycle associations on the internet are (please consider that some information from the internet is only available to a certain period of time):

- The one-off English journal "Cycling Cities" of the Dutch Fietsersbond (free download at www.fietsersbond.nl/english-info).
- The "Info-Bulletin" of the Velokonferenz Schweiz (free download, in German only).
- The "Cycle"-magazine of CTC, UK's national cycling organization can be read online free of charge (www.ctc.org.uk/).

15 Case study taken from PRESTO consortium (2011b) and edited

3. Cycling and public transport

Cycling is first of all a transport mode for short distances mainly between 1-10 km. But it can play a significant part in longer trips as well, as a feeder mode for public transport. Here, we will consider the intermodal connections between cycling and public transport, the infrastructure to facilitate this and the issue of carrying bicycles on public transport. The intermodal integration of cycling and public transport is an additional service feature of public transport operators. To foster the integration of cycling and public transport it is important to know its benefits. Nevertheless, it is essential to understand that regulations and investments in intermodality made by public transport operators need strong political support. As most public transport operators are owned by municipalities, decision makers and administrations are an important target group when trying to foster intermodal integration. [16]

3.1 Benefits of intermodal integration

All public transport stops must be considered as potential interchange points of the public transport networks and the cycle network. This comprises all levels of train stations, metro, tram, light rail and bus services, except for most local bus routes.

Integrating public transport networks and the cycle network brings benefits for both cycling and public transport. Public transport and cycling are generally complementary modes. They can easily be combined as links in a door-to-door trip chain (see Figure 18). [17]

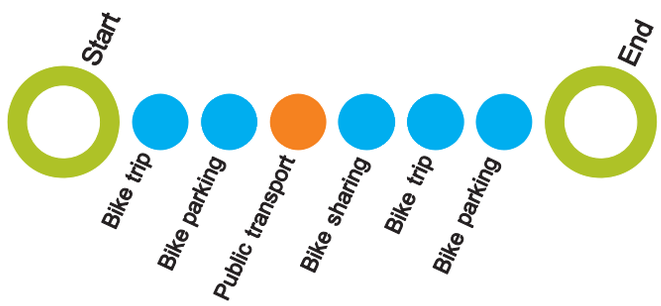

Figure 18: Example for an intermodal trip-chain
Source: Own compilation

Benefits:

- Cycling to or from a public transport stop is an efficient way of making longer trips (over 7,5 km). This of course depends on the objective and subjective quality of public transport itself but just as much on cycle-adequate interchange conditions. This means high quality, safe, easily accessible and affordable parking and storage options. It increases mobility for non-car owners at little cost, and reduces the need for car use.
- For the public transport operator and the transport authority, cycling is a valuable feeder mode, whose potential has to be developed. It increases the catchment area of stops more than tenfold compared to walking (see Figure 19). Its parking needs are much less space-consuming than the ones of cars. It may reduce the need for capacities at local bus feeder services which can reduce costs. And the combined bicycle-train-bicycle trip is a competitive alternative to a car-only trip, thus increasing ridership.

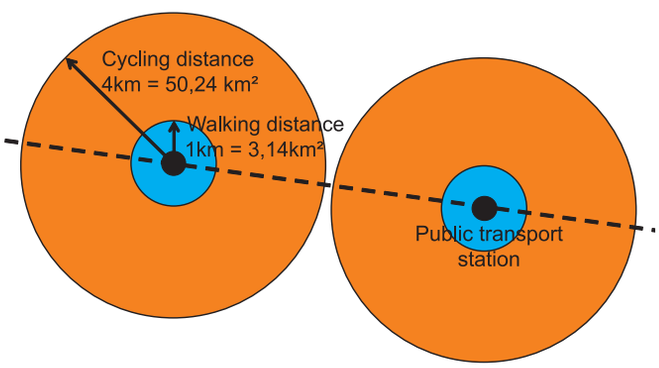

Figure 19: Potential catchment area of PT-Stations
Source: Own compilation adapted from Beim 2010

The potentials are high. In the Netherlands about 40 % of train passengers arrive by bicycle, and 10 % of train passengers continue their trip by bicycle. Also, 14 % of bus passengers use the bicycle as access mode.

3.2 Parking facilities at public-transport stations

To make this combination attractive, many public transport operators are increasingly investing in high-quality bicycle parking facilities at major public transport hubs. [18]

The provision of high-quality parking and storage facilities is essential. As bicycles are parked for a long time (> 2 hours) at public transport stops, user demands are high with regard to safety and protection.

The mix of parking possibilities should be adapted to each public transport location.

- A basic provision of stands and racks is recommended, ideally covered and protected from the weather.

16 Paragraph taken from Dufour (2010) and edited
17 Paragraph taken from PRESTO consortium (2011d) and edited
18 Paragraph taken from Dufour (2010) and edited

- As numbers increase, some rental lockers can be offered as a premium service, e.g. for season card holders
- At even larger numbers, collective storage can be considered on a subscription basis.
- At the largest hubs, free indoor and supervised parking storage becomes feasible.

Cycle parking should be standard equipment at all urban train stations. The provision should be designed for smooth bicycle-train interchange: located on a logical access route, at a short walking distance from platforms, long opening hours.

During the past 10 years, bicycle stations have been built. They originated in the Netherlands, Germany and Switzerland. For more details on bicycle stations see chapter 5.1.

Cycle parking provision also makes sense at stops of major urban public transport routes, such as metro and light-rail stations, fast tram or bus routes or for Bus Rapid Transit. Cycling may also be a feeder mode for regional coach services and terminal busses at the edge of the urban areas. For local bus lines and in smaller cities, cycling will be more of a substitute for public transport than a complement, since there are more frequent stops and distances are shorter.

Having a bicycle for the last part of a trip from the station to the final destination, is also quite attractive. For regular trips, one can have a bicycle at the destination. Commuters, for instance, can easily come in by train, pick up a bicycle (their own or a company bicycle) from storage and put it back for the night when they go home. For occasional trips, rental or public bikes are an option.

Quite unique is the Dutch OV-fiets service. This is a nationwide bike rental service available to train season-ticket holders (see case study in chapter 4.5).

3.3 Bicycle take-on on public transport

One form of integration, very popular in many countries in Europe with its intensive network of trains, is to allow bicycles on surface or underground trains. Despite initial concerns, in practice this has proven to be relatively easy to handle through sound planning. It must be noted however, that the market for this service (bicycles on trains) is mainly recreational. The German railways discovered that this recreational market is very profitable for them as it attracts a new category of clients. However the relevance of this service for daily commuters is limited as during peak hours commuter trains are often too crowded to take a lot of bicycles. The only exception are folding bicycles, a typical a niche market. [19]

Figure 20: Bike take-on in Denmark
Source: www.eltis.org, Schiffer

When implementing this option, it must also be ensured that the actual distance from the station entrance to the actual platform is adapted for bicycles. This comprises special ramps on staircases provided for bicycles, escalators and an adequate option in the platform to access the vehicle (at level boarding).

It is also important to keep in mind that all infrastructural measures taken on stations, platforms and train wagons in order to simplify bicycle take-on often also simplify the use of public transport for other travellers as well. For example people in wheelchairs, other handicapped persons or people with strollers do profit from barrier-free infrastructure on stations and more space in public transport vehicles.

Figure 21: Indication - bike take-on is limited
Source: Hefter 2011

19 Chapter taken from GTZ (Publisher) / Godefrooij et al. (Ed.) (2009) and edited

Here are some measures that have also proven effective:

Special bicycle wagons: One option for including bicycles on surface or underground train systems is to add a special wagon for this purpose, which is a typical German solution for the recreational market. A vehicle offering this option may have specific frequencies (e.g. every 30 minutes) and stop at every station en route, or be "seatless". In some cases, these vehicles may have built-in racks for vertical placement of bicycles. This option is also recommended if most of the bicycles used are large (26- or 28-inch wheels). Another option is to provide special sections within each bus or train (for example, at the front or rear of each wagon) adapted for bicycles (that is, with no seats or with racks). This makes entering and leaving the vehicle faster, since bicycle users can travel in all carriages rather than being concentrated in one specific wagon of the train.

Figure 22: Special bike racks in a German Intercity train wagon
Source: Tine, www.radreise-wiki.de

Space made available inside ordinary wagons or in baggage compartments: It is also feasible to allow bicycles in the corner or each wagon, as it occurs with Denver Light Rail, on Dutch intercity trains, or in specific cars as it occurs on Amtrak in the US (baggage compartment) and other systems around the world. These efforts often require no special wagon, relying on signage and web information to make it work.

Some systems charge a small additional fee for bicycle transport, while others do not. The question of whether to charge anything extra for carrying a bike can be tricky to answer, especially in countries where many travellers have a low income. However, when there is a high integration of bicycles and public transport, it may be feasible to charge an additional fee for the service as it may be used for maintenance, system optimisation or other costs arising in public transport.

Time restrictions: Many systems worldwide allow bikes on trains (and sometimes buses) during non-peak hours but limited transport during peak periods when it could potentially be most useful.

Folding bicycles: Folding bicycles which can be carried onto vehicles and stored against a wall or under seats, are another option, although they are not available everywhere, and can be too expensive for some users.

In some cities it is also possible to take-on bicycles on buses. But the possibility to take bicycles on buses is not that widespread, mainly due to the restricted space within most buses. One option to allow the take-on of bicycles is to install special bicycle racks on the rear-side of buses (see Figure 23).

Figure 23: Bicycle rack on bus in Germany
Source: Hadhuey 2009, www.wikipedia.org

Case study: Bike take-on in regional trains in Germany

The German Railway Company DB allows bike take-on on most local and regional trains. DB welcomes bike take-on especially for recreational cyclers but existing train facilities can be used by commuters as well. In city regions there are sometimes time restrictions for bike take-on on local trains due to overcrowding. Most local and regional train coaches clearly indicate which areas of the train coaches are specially designated for bicycle take-on (see Figure 24). Some modern regional trains even have special bicycle compartments which provide security belts to affix the bicycles. Folding seats allow passengers to sit down next to their bikes (see Figure 25). [20]

In the DB high speed train ICE it is not allowed to take-on bicycles at all.

Figure 24: Indication that bike take-on is possible
Source: Hefter 2011

Figure 25: Special bicycle compartment inside DB regional train
Source: Hefter 2011

Further reading:

Dufour, Dirk (2010): PRESTO Cycling Policy Guide. Cycling Infrastructure. Chapter 4: Cycling and public transport.

GTZ – Deutsche Gesellschaft für technische Zusammenarbeit (Publisher) / Godefrooij, Tom; Pardo, Carlosfelipe; Sagaris, Lake (Editors) (2009): Cycling-Inclusive Policy Development. A Handbook. Eschborn, Utrecht. Chapter 11: Building a multimodal transport system: integrating cycling and public transportation.

PRESTO consortium (2011d): Factsheet: Cycling Facilities at Interchanges.

Van den Bulcke 2009: Bikes on public transport. Bikes on light rail, metro, tram and bus. (Velocity, 12th of May 2009, Brussels).

20 DB Mobility Logistics AG (2011)

4. Bike sharing systems (BSS)

Bike rental or bike sharing schemes can be found in numerous cities and regions all over Europe. Nowadays, bike sharing is particularly popular in western and southern European countries whereas in eastern European countries bike sharing is not yet equally widespread. But in recent years bike sharing has become more and more popular in some of the eastern European cities as well. For example in Prague, Krakow and Ljubljana bike sharing schemes can already be found. As there are huge differences between existing bike sharing systems it is important to have a closer look on the characteristics and different approaches for bike sharing and renting. This is especially important when considering the introduction of new bike sharing schemes which should be suited for different local conditions. In general, most bike sharing schemes, whether in part or as a whole can be grouped in low-tech and high-tech solutions.

4.1 Different Systems of bike sharing

Not all Bike sharing systems (BSS) are the same. They consist of different features and characteristics that can (and should) be adapted to the local situation. The physical and institutional design factors of BSS can be grouped into the following categories: physical design, service design and institutional design (see figure 26).

4.2 Physical design

Access technology

The access technologies of BSS are diverse and depend on the size of the system, available financing and the technology used:

- Cards: The most common means of access is a (smart-) card. The bike can either be rented at a terminal or directly at the bike itself if the bike provides a card reader. Different types of cards can be used, such as magnet cards, chip cards, credit cards, or RFID cards (see Figure 27).
- Code-based rental: The user calls a number or sends an SMS with the required data to a central number and gets an access code or any other access information onto their handset. The access code is inserted into an electronic or mechanical device at the lock or the docking point.
- Keys: Some systems, especially in Italy, work with keys. The users receive the key for a bike from a device or kiosk where they have to identify themselves before the rental.
- Deposits: Some schemes as to be found in the City Bike scheme in Aalborg, Denmark (103.000 inhabitants) which is part of the CIVITAS ARCHIMEDES project, can be used by simply inserting a small deposit to use the bikes (see Figure 31). The actual use of the bikes is free of charge. [21]

Figure 27: Stockholm City Bikes scheme card
Source: Kalina, choice GmbH

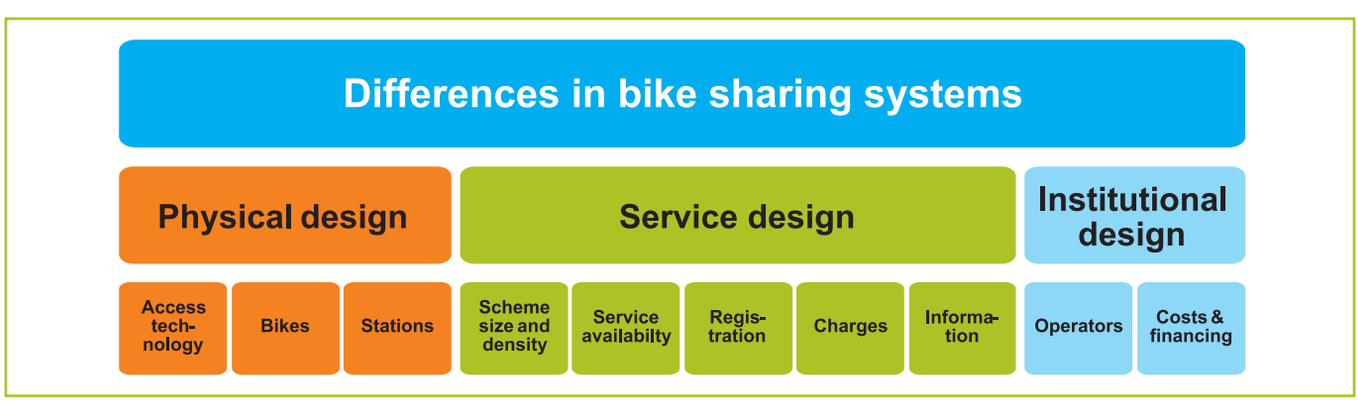

Figure 26: Differences in bike sharing systems
Source: Own compilation

21 Paragraph taken from Büttner et al. (2011) and edited

Bikes

The bikes in BSS differ in design and quality. Nevertheless they share the following general characteristics:

- Robust parts: to minimise damage caused by vandalism and to facilitate maintenance, bike sharing operators use robust parts that are easy to replace. Examples are: gear hubs, drum brakes and plastic mudguards. Many operators develop custom bike parts to reduce incidences of theft (see Figure 28).
- Unique design: to avoid theft and to make the bikes more visible in public spaces, operators use a unique design, which differs from regular private bikes. The bikes within one scheme are usually of the same colour, have the same frames, and are recognisable even when stolen and repainted (see Figure 29, Figure 30 and Figures 32 to 38).
- One size for all: BSSs almost always offer only one type of bike. Adjustable seat posts make them suitable for most users. However, some user groups such as people with children, the elderly or disabled, very small or very large persons might not be able to use the bikes comfortably.

The bikes also differ in certain characteristics. Those differences are due to the different types of operation, financing and service design.

- Advertising space: operators financing the scheme with advertising on the bikes, design the bikes accordingly. Frame and parts provide visible spaces for this purpose (see Figure 33). Those spaces might influence the usability of the bike. However, even without the need for third-party advertising, bikes sometimes provide space to advertise the scheme itself.
- Bike locks: Bikes of schemes with high-tech physical stations are usually locked electronically or mechanically to the docking stations (see Figures 35 to 38). Only few of them provide bike locks. BSS without physical stations offer bike locks to fasten the bikes securely during and between the rentals (see Figure 34).

Figure 28: Robust built headlight of “DB Call a bike”
Source: Hefter 2011

Figure 30: High-tech code lock of “DB Call a Bike”
Source: Hefter 2011

Figure 29: High-tech bike sharing system “DB Call a bike”, Frankfurt (Germany)
Source: Hefter 2011

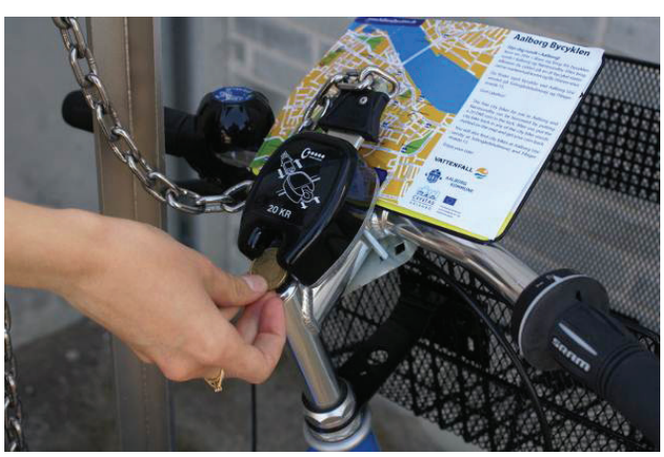

Figure 31: Deposit system of City Bike scheme in Aalborg (Denmark)
Source: The City of Aalborg

Figure 32: Robust built bike and station of low-tech sharing system, Aalborg (Denmark)
Source: The City of Aalborg

Figure 33: Low-tech bike sharing system "Nextbike", Frankfurt (Germany)
Source: Hefter 2011

Figure 34: Bike lock of Nextbike, Frankfurt (Germany) (low-tech sharing system)
Source: Hefter 2011

Stations

Stations are a feature of most BSS. They differ mainly in the technology involved. BSS without stations are not very common, but examples do exist.

- Low-tech stations: The bike is locked to the docking point mechanically either with a lock at the docking point or a lock on the bike itself. Information columns give static information on the station, the rental process and the surrounding stations.

Figure 35: BalticBike station where bicycles are locked with a common number secured bicycle lock (low-tech sharing system), Riga (Latvia)
Source: Riga Energy agency

- High-tech stations with docking points: the most common type of bike sharing stations include docking points and a rental terminal - connected to each other. The bike is locked to the electronically controlled docking point. The rental process takes place at the rental unit (terminal or at the docking point itself), which can include touch screen displays, card readers, RFID readers, printers and keyboards. BSS stations also offer space for additional advertising and information measures (see Figures 35 to 37).

Figure 36: High-tech bike sharing system "Dublin bikes" with fixed access station, Dublin (Ireland)
Source: Hefter 2011

Figure 37: Access station of high-tech sharing system "Homeport", Prague (Czech Republic)
Source: Birkholz 2011

Figure 38: Homeport bike, Prague (Czech Republic)
Source: Homeport

4.3 Service design

Scheme size and density

The size of the scheme and its density is determined by the size of the city or region, target groups, financial strength and goals of the BSS. Most urban schemes only cover central, densely populated areas of the city but provide a station approximately every 300 meters thus giving the user ample opportunity to move around within the area covered. Regional schemes are less dense but are usually designed for longer rental periods.

Service availability

Service hours and seasons differ among the cities. Most schemes offer a 24/7 service. However, some close overnight.

The picture of seasonal availability is diverse too. Some schemes close down during the winter months while others operate all year round. This is likely to depend on regional characteristics reflecting the climate and/or demand, as well as costs of redistribution (fixed personnel cost during nights, for example).

Registration

Registration is required in almost all BSS to avoid the loss of bikes by anonymous users and to ensure billing and payments. Most systems offer various types of registration to keep access barriers low: at the station, on the internet, by post, by telephone or in person. Registration costs are ranging from free of charge to some tens of Euros, depending on the registration period.

Most schemes offer registration charges that are cheaper than the price for using other modes of transport, such as PT, taxi or car. The charges often include a free rental period of 30 minutes for each ride within the registration period. Some systems, notably in France and in Aalborg, require a substantial deposit at the time of registration.

Charges

Charges are designed to support the goals of the BSS. Most schemes encourage daily short-term use. Thus the first 30 minutes of each ride are free in most systems. The rental price increases exponentially after the free period and reaches a high daily maximum or fine. In other schemes the rental has to be paid for from the first minute with a linear charge per time unit reaching a lower daily maximum. Most BSS also include fines or withholding the user's deposit for not returning or damaging bikes.

Information

There are numerous possibilities to communicate all BSS-related issues from awareness raising to registration and rental. Apart from traditional channels (such as advertisements, websites, newsletters, service centres and call centres), some operators have started using applications (Apps) for mobile handsets and Smartphones. Those Apps offer advertisement options, scheme information, registration opportunities, rental functions and real-time information about stations and bikes depending on the current position of the user. [22]

4.4 Institutional design

Operators

Operators of BSS can be divided into five main categories: [23]

- Advertising companies, street furniture providers or other public services (e.g. JCDecaux, Clear Channel, Cemusa);
- Publicly or privately owned transport companies (e.g. Call a Bike – DB Rent, EFFIA, Veolia);
- Bike sharing businesses (e.g. Nextbike, Bicincittà, C'entro in bici);
- Municipal operators (e.g. Vitoria Spain);
- Associations or cooperatives (e.g. Greenstreet in Gothenburg, Chemnitzer Stadtfahrrad).

Among these, the first two are pertinent to large-scale high-tech systems, while the latter two are characteristic for small-scale systems.

Costs and financing of bike sharing systems

Costs and financing are crucial issues in bike sharing. Two different points of view that are often mixed up have to be considered: the costs for investment and operation of a BSS (operational point of view); and the costs arising in connection with the setting-up of a contract with an operator (municipal point of view).

The main costs from an operational point of view can be divided into two main categories: infrastructure & implementation and running costs.

Implementation costs in large-scale systems add up to € 2.500 - € 3.000 per bike, depending on the system configuration. A scheme without stations or a scheme with stations which do not need any groundwork (e.g. solar or battery powered stations) can be implemented at a fraction of the costs of conventional station-based schemes. Implementation costs are usually depreciated over the duration of the contract. If the municipality operates a scheme without the help of an external contractor, the implementation costs are depreciated over the lifespan of the BSS.

Running costs in large-scale systems are stated as € 1.500 - € 2.500 per bike and year in most large schemes.

The main financing sources from an operational point of view are registration charges and usage charges paid by the customer. As many systems offer a 30-minute-period free of charge for each ride, registration charges are most likely to be the most important income source rather than the usage charges. Thus subsidies are needed for most BSS because revenues from the scheme hardly ever cover the operational and investment costs. Depending on the type of contract with the operators, the scheme is co-financed by direct subsidies, various advertising contracts, sponsorships (whole scheme, single components, stations or bikes), parking enforcement incomes or congestion charges.

For financing bike rental schemes in small or medium sized cities different approaches are conceivable. As there is no "one size fits all"-solution, interested cities should for example consider partnerships with public transport operators, street furniture companies or other industrial sponsors in form of public private partnerships. A good example for such a public private partnership is the Barclays bike rental scheme in London. Additionally, the possibility of national subsidies or the co-financing within EU-projects has to be considered for financing a public bike rental scheme. Examples for the implementation of bike sharing schemes with financial support of the European Union can be found in Aalborg in Denmark or in Krakow in Poland (see www.civitas-initiative.eu), were the implementation of bike sharing systems were supported within the EU-CIVITAS initiative.

4.5 Integration in public transport systems

The integration of bike sharing schemes into public transport systems is an important way to foster intermodal bicycle public transportation chains. Therefore in many cases bike sharing stations are located at public transport stations. [24]

22 Paragraph taken from Büttner et al. (2011) and edited
23 Paragraph taken from Büttner et al. (2011) and edited
24 Paragraph taken from Büttner et al. (2011) and edited

Case study OV-fiets in the Netherlands

The main target group of OV-fiets are commuters and frequent users who want to combine the Netherlands' rail service with a flexible bike sharing scheme. OV-fiets provides bicycles on the basis of a 24/7 service on 110 public transport stations and on 125 other rental points. Often OV-fiets stations are combined with bike parking stations. Access to the OV-fiets bicycles is provided by an OV-fiets card or an already existing railway pass. The great advance of OV-fiets is the very comfortable, fast and easy access to the bicycles, the combination with public transport and the large number of stations. OV-fiets customers pay a small annual fee and then pay monthly by standing order. [25]

Figure 39: OV-Fiets low-tech Bicycle
Source: Apdency 2009, www.wikipedia.org

Figure 40: Automatic bicycle dispenser, LentNijmegen (Netherlands), (160.000 inhabitants)
Source: Apdency 2009, www.wikipedia.org

The integration into public transport takes place on three levels: integration of information; physical integration; and in terms of technological access and charges.

Information integration: bike sharing information is combined with public transport information. Station locations can be found on bike sharing maps, whereas another way to offer information might be via websites linked to each other so intermodal routing is facilitated.

Physical integration: bike sharing stations are implemented as a parallel service to relieve public transport in peak hours or to offer services in areas where public transport cannot cover all mobility needs. Bike sharing stations are often located near public transport stations (e.g. V3 in Bordeaux with V+ Stations outside the centre for usage in connection with public transport).

Access & charges: some schemes offer access to public transport and bike sharing only using one single card (see case study OV-fiets in the Netherlands). Public transport users may sometimes get special conditions, such as a single daily charge or discount when using a BSS and other modes.

4.6 Success factors for bike sharing systems

The reasons for the success of bike sharing systems are very complex. One central indicator is the long-term survival of the scheme. The most important aspects for the survival of BSS are summarised in the seven categories below: [26]

Cycling infrastructure in the city:

- Existence and implementation of a cycling infrastructure plan
- Construction and maintenance of cycle lanes or paths
- Different safety measures at places of interaction with cars (such as junctions) and pedestrians
- safe parking places for bicycles, especially at public transport stations and bus stops

User accessibility:

- Easy access to the system with respect to space and time
- Simple registration process
- Density of stations or of bike at demand nodes, empty slots at the destination

25 Bührmann (2007), Spapé (2011)

26 Paragraph taken from Büttner et al. (2011) and edited

- Rapid repair of malfunctioning stations and bikes
- Daily and annual opening times.

Safety:

- BSS can increase the number of cycling trips significantly and thus the number of cycling-related accidents. In this context it is important to consider that relative figures (e.g. accidents per 1.000 trips) must be evaluated instead of absolute ones.
- The location of the stations should be safe and not constitute an inconvenience to other road and pavement users
- Visibility and functioning of the shared bikes (lights, brakes, parking etc.).

Bike and station design:

- Bikes and stations should be robust enough to withstand vandalism and theft
- Bikes should also have a uniform and distinct appearance so that they are visible in traffic (strengthening the identity of the system).

Financing model (ownership and operation):

- Obviously the financing model is crucial for the long-term success of the BSS. Two aspects of the BSS are decisive for the financing model: the ambitions of the local government, and the size of the system in relation to the size of the city.

Integration with other modes of transport – technical and practical:

- The integration of BSS into other shared modes of transport (public transport, car sharing, park-and-ride, ferries) in terms of registration, payment, common smart access cards etc. enhances the possibilities for the users to combine modes seamlessly and contributes to making their transport cheaper and more efficient. This is especially important in cities where there are not one but several public transport providers, in which case their cooperation would be necessary.
- There are also important gains to be made with the new information and communication technologies: mobile mapping of the location of stations and availability of bikes, possible intermodal connections at public transport stops, real-time travel time assessment with different modes and combinations of modes, new mobile phones that act as smart cards etc. For small scale systems, this line could be hard to pursue if the scheme is dependent on major investments; however, some of these small scale systems already rely on mobile technology.

Redistribution traffic:

- In order to maintain the service level of the system and to be able to instantly meet local demand for bikes at the stations, a constant redistribution of bikes from destination points to points of origin is needed. Normally, the origin and destination points shift roles throughout the day, when commuter flows change their direction. In efficient tourist systems this might work differently, but in these cases there are probably several points of interest that serve as destinations during the day, with bikes being moved back to their place of origin in the afternoon.

Figure 41: Redistribution truck, Barcelona (Spain)
Source: Belzunces 2007, www.wikipedia.org

4.7 Examples of bike sharing systems

As the previous chapters emphasise, there is a huge variety of different bike sharing systems with different technical and institutional backgrounds. One easy but simplifying way to distinguish between these different systems is to classify them into “low-tech” and “high-tech” bike sharing systems. The following two examples from eastern European countries will show one typical example for a “high-tech” and one example for a “low-tech” bike sharing approach.

Bicikelj in Slovenia

“Bicikelj” in the Slovenian City Ljubljana (278.000 inhabitants) is a bike sharing scheme operated by Europlakat and the French outdoor advertising and street furniture company JCDecaux. The scheme was introduced in Ljubljana in spring 2011 so it is relatively new.

The system provides 300 bicycles on 31 fixed stations in the wider city centre of Ljubljana. The existing stations can be located via internet on an interactive map. Rented bicycles can be returned to any of the 31 citywide stations. Registered users can rent and return

the bicycles on 7 days a week and 24 hours a day. The bicycles can be rented via chip-card and PIN-number (one-year-subscribers only) on a special station terminal. Subscriptions range from a weekly basis to an annual subscription. The rate for a 7-day-subscription is € 1 and only € 3 for an annual subscription. In both cases the first hour of use is free of charge and the user only has to pay if he uses the bike for longer than one hour. One-week-only subscribers can register on the Bicikelj website with their credit card and will get an identification number and a PIN-number for renting the bikes[27].

With its fixed stations plus terminals and a chip-card access system and very sturdily built bikes, "Bicikelj" is a typical example of a "high-tech" bike sharing scheme. The Bicikelj system is nearly identical to the Paris bike sharing system "Velib" or with the "Dublin Bike" system in Ireland which are both operated by JCDecaux as well.

More information on Bicikelj can be found on the official Bicikelj internet page: http://en.bicikelj.si/. For additional information on the high-tech bikesharing systems of JCDecaux see: http://en.cyclocity.com/.

Figure 42: Bicikelj high-tech station in Slovenia
Source: www.europlakat.si

BalticBike in Latvia

In 2010 the bike sharing scheme "BalticBike" with 100 bicycles available at 11 locations was launched in the Latvian cities of Jurmala (55.000 inhabitants) and Riga (880.000 inhabitants). BalticBike is a co-operation of the Latvian national airline airBaltic and the bike sharing company Nextbike. The bikesharing company Nextbike is also operating similar low-tech schemes in Poland, Germany, Austria and other European countries.

The bicycles of BalticBike can be used by registered users and access is gained by calling a telephone hotline (the number is printed on the bikes). The user has to enter the bicycle number into the mobile phone and will receive the code to unlock the bicycle lock. Bicycles can be returned to any of the official BalticBike renting stations. Users of BalticBike have to pay for every use with their credit card. Baltic bike offers a 24 hour service on 7 days a week.

Figure 43: BalticBike low tech bikes
Source: www.Balticbike.com

The BalticBike scheme is a typical example of a "low-tech" bike sharing scheme because the bicycles and the renting stations disclaim on special access computer systems and stations. The bicycles can be unlocked by simply opening the number secured bicycle lock[28].

The target groups of BalticBike are tourists and recreational cyclists as well as regular users and commuters.

Additional information can be found on the official BalticBike internet page: http://www.balticbike.com. More information about the different Nextbike schemes in Europe can be found at http://www.nextbike.net/.

4.8 Public bike rental services

Another way to make public bicycles available is by bike rental services. The main difference between bike rental services and bike sharing schemes is that bike rental services do not offer 24/7 self services and do not need high-tech stations or bikes because the renting process is done by service persons. On the other hand bike rental services need service employees to carry out the renting process. The renting and returning of the bikes is only possible within the opening hours of the rental service. In most cases the bikes have to be returned to the original renting point and cannot be returned to any other point like in most self service bike sharing schemes.

27 JCDecaux SA for EUROPLAKAT (2011)

28 Nextbike GmbH (2011)

Often bike rental services are provided by bicycle retailers or by hotels in touristic regions. But there are examples of public or municipal operated bicycle rental services as well. In Bolzano for example 130 public bicycles can be rented on a central point in the city centre (see Figure 44). The opening hours of the rental service are from around 8am to 8pm each day. The rental service in Bolzano is provided by the municipality and is part of the general bicycle strategy of the city of Bolzano.

Another example for a bike rental service in south Eastern Europe is Cicloteque in Bucharest, Romania (2 Million inhabitants). Cicloteque is operated by the non governmental organization MaiMultVerde. The Cicloteque bicycles can be rented at five stations within the city centre of Bucharest during the official opening hours. The 400 available bicycles can be rented and returned to any of the five Cicloteque stations from 8 am/10 am to 10pm each day. The system is financially supported by a financial institute which is present on the small advertisement spaces on the bicycles.

Further reading:

Büttner et al. (2011): Optimising Bike Sharing in European Cities. A Handbook.

Bike-sharing world map on Google-Maps: http://maps.google.com/maps/ms?ie=UTF8&oe=UTF8&msa=0&msid=104227318304000014160.00043d80f9456b3416ced

The Bike-sharing blog: http://bike-sharing.blogspot.com/

Wikipedia article on bike sharing systems: http://en.wikipedia.org/wiki/Bicycle_sharing_system

Figure 44: Bicycle rental station, Bolzano (Italy)
Source: Deffner 2006

Figure 46: Cicloteque rental bike, Bucharest (Romania)
Source: Cicloteque / MaiMultVerde

Figure 45: Cicloteque rental point, Bucharest (Romania)
Source: Cicloteque / MaiMultVerde

5. Bicycle parking services

Parking services comprise more than the simple provision of an adequate bicycle parking infrastructure. It is also essential to know that parking service sometimes only needs little or no infrastructural measures and that accompanying services are important as well.

The topic of building a bicycle parking infrastructure is already explained in detail in topic 2 on infrastructure planning, that's why in the following section the main focus lies on accompanying parking services and "soft" measures.

5.1 Bicycle stations

Bicycle stations are large parking facilities often located next to public transport stations which combine the provision of safe and weatherproof parking spaces for bicycles and bicycle related services or other services. The building of bicycle parking facilities is usually undertaken within an already existing infrastructure. In the case of bicycle stations the service aspect is a key characteristic and therefore bicycle stations can be added to service measures for cyclists. Bicycle stations can offer a wide range of potential services of which the most common ones – besides guarded parking - are:

- Bike repair and maintenance services
- Bike cleaning service, for example with an automatic bicycle washer
- Bicycle shop for new or second-hand bicycles
- Rental bike-service, bike sharing station
- Sale of cycling maps, brochures or accessories
- Information point for cyclists, local bicycle association office
- Engraving of security codes (see 7.6)
- Recharge service for E-bikes and Pedelecs

Besides typical bicycle related services, bicycle stations can offer other non-bicycle related services as well which help to make the stations economically sustainable. Examples for such non-bicycle related services can be:

- Courier, parcel or postal services
- Ticket sales for public transport, especially for bicycle stations located near small train or public transport stations
- Left-luggage office
- Other small shops like newsagents, bakeries or cafés
- Integration of a local tourist information office

"By combining these services the supervising personnel can do additional tasks and at the same time offer a higher service level to cyclists."[29] The combination of service and parking also helps to make bicycle stations more profitable. In Germany many bicycle stations are run by staff employed within the framework of job creation schemes for example for long-term unemployed people or as a qualifying measure for unemployed young people.

Bicycle stations can be an important link in the public transportation chain as they offer a better integration of bicycles in the intermodal trip chain (see chapter 3.2 in this manual). For more technical details on bicycle parking facilities in general see part II of this handbook.

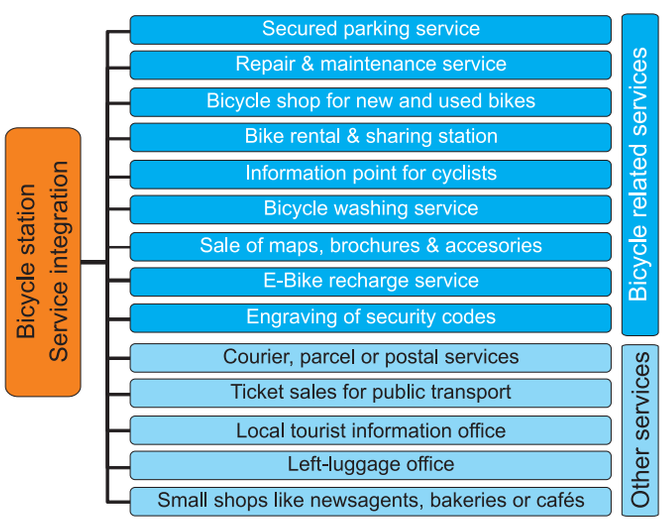

Figure 47: Service features of bicycle stations
Source: Own compilation

Main initiating stakeholder:

- Local administration

Possible partnerships with local stakeholders:

- Public transport operators
- Local job market integration programs
- Local bicycle associations
- Small shops & retailers

Further reading:

PRESTO consortium (2011d): Factsheet: Cycling Facilities at Interchanges.

29 Dufour (2010)

Case study: Bicycle station in Mannheim (Germany)

The bicycle station in Mannheim (Germany, 325.000 inhabitants) is located next to the central railway station and has a direct and barrier-free entrance to the first railway track of the station. Since 1997 the bicycle station has offered cyclists secure parking for 918 bicycles on 24 hours and 7 days a week. The building used for the bicycle station is a former post office hall which was abandoned and therefore the bicycle station could be established in an already existing building.

The bicycle station in Mannheim is a typical example for the approach to combine bicycle parking with other bicycle related services. Mannheim's bicycle station offers for example also the following services:

- bicycle shop for new and used bikes, sale of bicycle equipment and accessories
- bicycle repair and maintenance service
- lending free bikes while own bike is repaired in the repair shop
- recycling of old & unused bicycles
- annual second-hand bike market
- rental bike service
- bicycle security coding
- info-point of the local bicycle association

The bicycle station in Mannheim is operated by a local public non-profit organization which aims to qualify young and unemployed people to better integrate them into the job market. At the bicycle station young people will be qualified for example as bicycle mechanics. The combination with job market integration programs can help to raise additional budgets to establish bicycle stations and on the other hand gives young people the chance to find their way back into the job market. [30]

Figure 48: Bicycle station, Mannheim (Germany)
Source: Hefter 2011

5.2 Special bike parking arrangements

Sometimes parking facilities are just needed for a very short period. This case could for example occur during big public events. Events like open air concerts, sport events or other festivals can often be reached by bicycle. In these cases it is not necessary to install permanent bicycle parking facilities for a large number of cyclists. Many organizers of big events often do not even consider proper parking facilities for cyclists at all.

Therefore, the City of Zürich (Switzerland, 390.000 inhabitants) has established an adequate service for similar situations offering mobile bicycle stands that can be rented for free. Organizers only have to pay for the manpower needed to deliver and install the bicycle racks. The city of Zürich owns a total of 235 stands which were produced for the national Expo 2002. As the service of renting mobile bike parking stands in Zurich is very convenient, many event organisers appreciate this service. The Zürich city department seeks to cooperate with event organisers in order to promote cycling to and from events.[31]

Figure 49: Mobile bike stands, Zürich (Switzerland)
Source: City of Zürich

Another service possibility for people using the bicycle to get to events is the provision of guarded parking spaces or areas where cyclists can park their bikes while attending an event. So cyclists can be sure their

31 Mayrhofer (2011)

30 BIOTOPIA Arbeitsförderungsbetriebe Mannheim gGmbH (2011)

bicycles are protected against theft. An example for such guarded parking arrangements can be found in Dortmund (Germany, 580.000 inhabitants), where the local bicycle club offers the possibility to park bicycles in a guarded area while the bike owners watch the home games of the local football team (see Figure 50). The main advance of guarded parking is the small infrastructural effort because an enclosed area with simple bike stands can be used for securely parking a large amount of bicycles.[32]

Figure 50: Guarded parking, Dortmund (Germany)
Source: ADFC Dortmund e.V.

5.3 The bicycle butler

In Copenhagen a successful pilot project to solve the problem of incorrectly parked bicycles around metro stations was introduced in 2010. The so called "bicycle butler's most important job was to place wrongly parked bicycles correctly in the bicycle racks in good spirits and with a smile on his face." The bicycle butler did not "only move the bicycles that were in the way, he also oiled the chain and pumped the tyres if needed."[33]

To inform cyclists that her or his bicycle has to be removed, signs were installed and every removed bicycle got a small note on the handlebar about the reason of the removal. The aim of the six months project was to change the parking behaviour of those cyclists who were parking their cycles anywhere next to metro stations and thereby blocking entrances and emergency ways. The project "bicycle butler" was financed as part of a public job market project to get long-term unemployed people back into the regular job market.

The project was a great success because after the introduction of the bicycle butler the share of wrongly parked cycles decreased significantly around the selected metro stations. This project is also a good example of measures to change people's behaviour by a positive and innovative way.

Figure 51: Bicycle butler, Copenhagen (Denmark)
Source: Cycling Embassy of Denmark

5.4 Removal of unused bicycles

One approach similar in some aspects to the bicycle butler in Copenhagen is often practised in Germany. Old, deserted and often broken bicycles parked or "forgotten" in public space will be removed after a given ultimatum.

Figure 52: Broken down bicycle with yellow warning sticker, Frankfurt (Germany)
Source: Hefter 2012

For example in the German cities of Frankfurt am Main, Mannheim[34] and Aachen[35] once a year the public cleansing service, the local bicycle associations and the local police department are together patrolling the inner city and other points where bicycles are parked in order to track down unused or broken bicycles. These will then either be removed directly if they are endangering

32 Planungsbüro VIA eG (2004)
33 Cycling Embassy of Denmark (2010)
34 City of Mannheim (2011)
35 City of Aachen (2011)

public security or they will be marked with a special information sticker or hanger (see picture above). The owner of the broken or deserted looking bicycle will be asked to remove the bicycle within a given period of time. If the bicycle is not claimed by then, it will be removed by the public cleansing service and stored for some time. If the owner doesn't show up, the bicycle will either be recycled or sometimes repaired for example at a local bicycle station and later sold as a second-hand bike.

Broken bicycles in public spaces and crowded bicycle parking racks are disturbing the townscape, and are blocking parking space unnecessarily. There is also a certain broken window effect which fosters further vandalism and theft of other bicycles. The removal of these bikes is therefore advisable.

6. Cycling training for adults

Fear of traffic is one of the main reasons why people do not cycle[36]. Riding a bicycle safely, efficiently and comfortably requires skills which are by no means a matter of course, in particular for citizens of cities with a low proportion of cyclists. Cyclists are more vulnerable than motorised road users, particularly when infrastructure is missing and conditions are poor. People who would like to cycle more often are afraid of the apparently dangerous urban traffic situation. This is particularly true for cities with a modal share lower than 5 % (starter cities), because there other road users are not used to interacting with cyclists.

Awareness raising and information campaigns such as safe cycling campaigns are one way of getting more people cycling in a safer manner. Those campaigns can contribute strongly to better practices on the road. More active ways to reach people who cycle recreationally or who do not cycle at all are training and educational programmes to teach them how to cycle in safety and confidence. Targeted training courses are made for people who want to cycle; they aim to reduce cycling accidents, address negative aspects of some cyclists' behaviour, and prepare the youngest traffic participants to become safer road users. In general terms, they aim to teach[37]:

- how to ride a bicycle (skills of cycling)
- how to interact safely with other traffic participants
- how to use a bicycle and the existing infrastructure in the best possible, quickest, safest and most comfortable way for daily purposes (make daily use of the bicycle)
- which general traffic regulations are important for cyclists (especially important for people without a driving licence)

In the same way, other road users could and should also be taught how to interact with cyclists by understanding their needs and appreciating their vulnerability[38].

Figure 53: Adult cycling training exercise
Source: ADFC, Rasch

Target groups

Potential target groups of training programmes are either socio-demographic sub groups or cyclists and potential cyclists e.g.:

- Adult novice cyclists
- Elderly and disabled people
- Women
- Immigrants from other cultural areas[39]

Main initiating stakeholder:
- Organizations related to the target groups (as senior clubs, integration courses)
- Local cycling associations

Possible partnerships with local stakeholders:
- Local public transport operators
- Health agencies or organizations
- Local bicycle retailers
- Sport associations
- Police

36 Bikeabaility programme (2011)
37 CTG; IG Velo (2007)
38 GTZ (Publ.) / Godefrooij et al. (Ed.) (2009)
39 Paragraph take from: Urbanczyk (2010) and edited

6.1 Adult novice cyclists

Training of adult novice cyclists should contain the teaching of how to handle a bicycle and how to behave in traffic. Such courses for a mainstream audience are most needed in starter cities, where most adults did not grow up with cycling. Adult novices who choose to undertake training in cycling skills as a group, show high levels of motivation as they themselves took the initiative and made the commitment to learn to cycle safely. They should be supported and encouraged in whatever way possible to continue cycling on a regular basis.

Bicycle shops play an important role when it comes to educating novice cyclists. Bicycle retailers can act as multipliers and mediators since they are close to the users and understand their needs. They can inform potential cyclists about the equipment available and arouse interest in regular cycling. A bicycle retailer is also an important actor in terms of promoting training courses as it is one logical place a potential cyclist might think to ask for cycling information. Bicycle shops can also be approached as partners in training.

6.1.1 Implementation and cost considerations

The length and the content of the courses offered will wary depending on the target group. People who want to learn to cycle from scratch will require more time than those who only need traffic skills. While theory is definitely useful, the experience of cycling on the road in the company of an experienced instructor is what will most likely convince a non-cyclist to get on his or her bike more often. Traffic theory, practical skills of how to handle a bike, and an on-road ride with an instructor should be all components of an adult cycling skills programme. [40]

It can probably be avoided to reinvent the wheel (i.e. developing a curriculum that has probably already been developed elsewhere) by contacting other cities that have set up similar cycling training programmes.

Costs that need to be included in a budget are: programme development, programme administration, instructor wages, advertising and promotion, programme evaluation, materials (safety vests, repair tools, traffic cones, etc.)

Possible income sources include: state support, corporate sponsorship, participant fees.

Main initiating stakeholder:
- Local bicycle associations

Possible partnerships with local stakeholders:
- Local public transport operators
- Health agencies or organisations
- Local bicycle retailers
- Target group specific organisations

Further reading:

PRESTO consortium (2011e): Factsheet: Targeted adult cycling training programmes.

6.2 Elderly and disabled people

When physical abilities like vision and balance decline and the fear of falling off the bicycle, even experienced older cyclists tend to give up daily cycling. The proportion of elderly people and people with different kinds of impairments is constantly growing due to demographic change. It calls for more awareness and establishing training options which are specifically tailored to the needs and capabilities of senior citizens. Seniors want to maintain independence and mobility and stay fit for as long as possible. Course content for seniors could cover issues such as:

- cycling in darkness
- safe behaviour in rain or other bad weather conditions
- handling difficult traffic situations
- bike inspections

All this can make cycling more comfortable, is improving cycling skills and confidence, and give an update on traffic rules. As in all training, theory should be followed by a practical exercise. This might also be an opportunity to introduce participants to alternatives such as Pedelecs and adult tricycles (including test rides).

Ads in the local newspaper or posters at senior citizens' centres can inform and motivate seniors to register for a course. Medical practitioners, local pharmacies, senior club gatherings, health insurance companies or health agencies/organisations can be involved as partners to promote, prepare and implement the training.

40 Paragraph taken from PRESTO consortium (2011e) and edited

Figure 54: Cycling brochure for elderly people (Netherlands)
Source: Dewickere, Fietsersbond vzw (2010)

6.3 Women

In places with higher cycling levels, cycle use is more evenly represented throughout all sectors of community. In countries where cycling levels a rather low[44], the share of female cyclists is also disproportionately low. In particular girls – even if they cycled as young children – often tend to quit during their teenage years because they consider it uncool.

Efforts encouraging school children to cycle seem to fail when girls reach puberty. They consider the image of cyclists they see as simply not appealing to them. In addition, a lack of cycling infrastructure requires a certain level of self-assertion and self-confidence around car traffic which is less common in girls[45]. This attitude usually lasts beyond puberty, but can still be influenced by educational programmes targeted at females. Apart from giving knowledge on how to handle a bicycle and negotiate traffic, bicycle training for women and girls may focus on maintaining a bicycle, riding a bicycle in the rain or dark, training how to carry things with a properly equipped bicycle (e.g. baskets, panniers), giving advice on choosing the right bicycle model and essential accessories and what to wear as well as on accompanying children or cycling whilst pregnant[46].

Case study: Safe and healthy on the bike (Belgium)

The purpose of the project is to encourage elderly people to keep cycling on a daily basis to help them to stay in touch with the surrounding society and to stay healthy. [41]

Reasons to give up cycling include increasing traffic speeds and traffic volumes, changing traffic rules, and reduced physical skills. Statistics show higher numbers of older cyclists injured or killed in road accidents. The consequences of giving up cycling are a decrease of daily physical activity and reduced participation in the outside world. Therefore, the project aims to enable and encourage older people to keep cycling as long as possible and to develop safe-cycling skills.

Implementation

During the project special courses were planned and implemented. The refreshment courses, in Dutch called "Opfrissingscursus 'Senioren veilig op de fiets!'"[42] last one day and are for those aged 55+.

They started with giving a message about how important it is for them to keep biking. This is followed by an interactive programme explaining traffic regulations, including a "Traffic Quiz". The courses involve a local mechanic who checks bikes for their roadworthiness. A video about safe and assertive cycling for seniors is shown ("Senioren: veilig met de fiets"[43]) from the Belgian Road Safety Agency (BIVV). Tips are given about cycling comfort and optional safety equipment.

The importance of continuously practicing cycling skills is stressed during the course. The cycling includes explaining the best ways to start a bike, stop it suddenly and ride it with one-hand. Also skills for daily use as avoiding unexpected obstacles, making left turns and riding on a narrow path are taught. Finally, there is a bike tour through the local area, with special attention to several difficult situations, and how best to handle them. Those who complete the course successfully get a Bike Safety Certificate.

41 Case study taken from Rzewnicki (2009c) and edited
42 "Refresher Course 'Seniors safe on the bicycle'"
43 "Seniors: Safe with the bicycle"
44 Pucher/Buehler (2008)
45 Beauty and the Bike project (2009)
46 Sustrans (2009)

Women and girls can be attracted to training by collaborating with local employers (e.g. by paying the costs of such training), supermarkets and shops (by promoting the training), local fitness companies and schools.

6.4 Immigrants from other cultural areas

In countries such as Denmark, the Netherlands or Germany, classes teaching immigrants how to cycle have proven very popular. Immigrants (woman immigrants as the main target group) usually come from countries where cycling is not common cultural trait or where it is associated with masculinity. It may even be considered improper for a woman[47]. These women have never learnt the basics of riding a bicycle and may even need extra encouragement to try it. Training courses targeting immigrant women not only improve the women's cycling skills, but also their language skills, their fitness levels, their independence and their integration into the community, often triggering participation in other activities as well[48].

Men are not generally culturally constrained from riding a bike but, depending on the culture they come from, immigrant men often see the bicycle as a poor man's vehicle. In the Netherlands some cycling initiatives for immigrant men have been set up[49]. They are promoted in cooperation with immigrant-serving organisations, and are most effective when promotional material and announcements are distributed in different languages.

Case study: Tilburg (Netherlands) – Cycling education for immigrant women

For more than 25 years, the Centre for Immigrant Women in the city of Tilburg (The Netherlands, 200.000 inhabitants) has offered cycling courses for immigrant women. The courses with groups of 10 to 12 participants take place for one hour per week and last for 10 weeks. The programme is funded by the local administration together with provincial, national, or other special funding subsidies. Participants pay €25 each.

Lessons are divided into a cycling part, a theory part, and a social part, all three of which are considered equally important. The cycling lessons help the women in a variety of ways: cycling is fast and cheap, helps to build up the confidence and independence of participants, and gives them physical exercise. The courses themselves not only improve the women's cycling skills, but they have become a meeting place for immigrant women where they can talk and exchange information. The course ends with a final exam and cycling certificates for those who pass.

In 1996, Steunpunt Fiets (Bicycle Support) was founded in Tilburg. There, the Centre for Immigrant Women took the initiative to develop course material for the cycling courses that are offered in many cities and villages. The aim of Steunpunt Fiets is to support the integration and emancipation of foreign women through practical support during cycling courses throughout the country. [50]

47 Van der Kloof (2009)
48 Ward (2007)
49 Van der Kloof (2009)

50 Case study taken from PRESTO consortium (2011e) and edited

7. Other bike services

Aside from the above mentioned services for cyclists there are a lot of other possibilities for services as well. All have in common to make cycling mobility comfortable, attractive and easy.

7.1 Bicycle do-it-yourself services

When being "on the road", it can be very useful for cyclists if cities provide easy to use do-it-yourself services for maintaining or repairing the bicycle. Such services are especially helpful when the next bicycle repair shop is far away. It could also be important to be able to do small repairs and maintenance services on one's bicycle in order to save money.

7.1.1 Air stations

Examples for such small but useful solutions can be the installation of bicycle air stations alongside cycle routes or in city centres. These air stations can stand alone or can be integrated in information posts or similar street furniture. Examples can be found in the German city of Münster, in the Swiss city of Zürich or in Odense in Denmark (see Figure 55).

Figure 55: Bicycle pump station, Odense (Denmark)
Source: www.eltis.org, Schiffer 2010

7.1.2 Vending machines for bicycle inner tubes

Another useful provision is the installation of vending machines for inner tubes of bicycle tires or for small tire repair kits. They can be situated for example on walls of houses or near bicycle parking racks or bike parking stations. Sometimes bicycle retailers or shops install these vending machines next to their shops and also take care of operating these vending machines. The benefit of these vending machines is that cyclists can buy inner tubes for their bicycle tires 24/7, thus even on days or during times when regular bicycle shops are closed.[51]

Figure 56: Vending machine for inner tubes
Source: Götzke 2008, www.wikipedia.org

7.1.3 Self service repair points

An interesting service approach for bicycles was introduced for example in the Austrian city of Salzburg (148.000 inhabitants). As there is a lack of repair shops in the city centre, the city administration of Salzburg started to install self-service repair points for bicycles. The first prototype of this self service repair point was built into an unused electronic distribution box inside a wall (see Figure 57). Because of the success of the first prototype, upgraded service points were installed in Salzburg in several places and an advertisement company is now taking care of the installation of these repair points. One self service repair point in Salzburg is even part of an advertising column. These repair points provide all kinds of necessary tools as well as an air pump and a hanging device to hold the bike. All tools are secured against theft. It is an ideal combination with vending machines for the inner tubes of bicycle tires.[52]

51 Böhme (2011)
52 Weiss (2008)

Figure 57: Self repair points, Salzburg (Austria)
Source: City of Salzburg

7.1.4 Service at petrol stations

For cyclists it can also be helpful if petrol stations allow the use of their already existing infrastructure like air pumps. Petrol stations could offer additional services like providing tools for small repairs or selling inner tubes or repair kits for bicycles. The provision of bicycle related services at already existing petrol stations could be a win-win-situation for cyclists and petrol station operators alike.

Case study: Bicycle Services and Products at Petrol Stations (Hungary)

In 2011, responding to an emerging trend of recreational and transport cycling in Hungary, MOL - the Hungarian Oil and Gas Company – launched a new service for its domestic petrol stations: Bicycle Points (BringaPONTok). The points offer a range of special bicycle services and products at 125 MOL petrol stations throughout the country.

The Bicycle Points, of which there were 125 in September 2011, are located along main bicycle routes in cities and tourist areas frequented by cyclists. The points consist of stands stocked with bicycle-orientated products (inner tubes, repair kits, locks, riding gloves, etc.), the availability of tools that customers may borrow for on-site repairs, and a new range of healthy drinks and snacks.

22 of the stations feature special bicycle washing facilities and 28 offer separate rest facilities for cyclists.

In conjunction with the opening of Bicycle Points, MOL added a cycling section to its website, including a page on recreational tours around Hungary. Each tour includes downloadable maps and directions files for GPS devices.

Apart from the benefits that accrue to MOL, the service is a plus for cyclists, as it has provided basic cycling services and products at scores of locations around the country, including places too remote to support self-standing cycling shops. [53]

Figure 58: Bicycle accessories in MOL Shop
Source: Spencer 2011

53 Case study taken from Spencer (2011)

Case study: „Bicycle Service Network" in Frankfurt/Main (Germany)

The bicycle office of Frankfurt/Main in Germany (680.000 inhabitants) launched a service for cyclists called "Rad Service Netzwerk" allowing cyclists to do small repairs or services on their bicycle when cycling in the city. Local companies and other partners within the city area provide so called service kits containing an air-pump, tools and a tire repair kit. Cyclists can find the participating partners of the bicycle service network either via an interactive map on the webpage of the bicycle office or when cycling in the city area via a sign in the display windows of the partner companies (see picture). [54]

Figure 59: Sign indicating to be a service network partner in retailers
Source: Hefter 2011

Figure 60: Technical bicycle check
Source: www.eltis.org, Schiffer 2010

Bicycle repair workshops are often arranged by local bicycle associations, adult education centres or by student organisations. Some of these repair workshops are aimed at certain target groups like for example women, who are often more unsure when it comes to technical issues.

Main initiating stakeholder:
- Local bicycle associations
- Adult education centres

Possible partnerships with local stakeholders:
- Local bicycle retailers
- Universities / national training centres

7.1.5 Bicycle repair workshops

Another helpful service offer for cyclists is the chance to learn how to check and repair a bicycle themselves. On the one hand the knowledge how to fix a broken chain or to change an inner tube is helpful when no professional repair shop is available at the moment. On the other hand it enables the cyclists to do small repairs or regular maintenance services themselves and thereby saving money.

The ability to technically understand a bicycle and to fix it by oneself can be very important because people will trust in the bicycle as an everyday transport vehicle. For low-income groups self-repair is a way to safe money.

7.2 Bike mobility services

For cars all kinds of extra services and warranties are offered by manufacturers, retailers, or associations whereas for bicycles this is a new approach. When cycling is an everyday mode of transport it is very important to have a well functioning and safe bicycle. Therefore, additional services which help to make cycling a reliable mode of transport are helpful.

7.2.1 Bicycle inspection service

It is generally regarded as necessary to have regular inspections for cars but for bicycles this is often not considered as a matter of course. In Germany many local sections of the bicycle associations offer regular inspections to check the road safety of bicycles. Some important parts of such an inspection could be:

- Light testing
- Set up of brakes

54 City of Frankfurt am Main (2011a)

- Lubrication of bicycle chain
- Tire check
- Set up of the gear shift

Typical times to inspect the road safety of bicycles are the springtime or the autumn. Often bicycles stay unused during winter and therefore have to be checked in spring when the new "cycling season" starts again. If the bicycle is used in winter it is also important to inspect the bike in spring because cycling in in the cold season is often wearing out many bicycle parts due to snow, ice and road salt.

Autumn is the best time to inspect the lightening and reflectors of bicycles. Light tests are often part of safe cycling campaigns to promote the use of bicycle lights in general. For example bicycle associations or the local police can offer a personal light test on bicycle events or in schools when promoting safe cycling.

Figure 61: Light check service in Bonn, Germany
Source: ADFC, Gloger

Main initiating stakeholder:
- Local bicycle associations
- Local police station

Possible partnerships with local stakeholders:
- Local bicycle retailers

7.2.2 Bike mobility warranty

The German VSF e.V.-network of self-governing bicycle companies introduced a bicycle "that is especially orientated on the reliability and longevity of daily traffic". The approach of the "No-Problem-Bicycle" means that available technology and products should be combined in a reasonable way, to offer a safe and unproblematic bicycle for use in traffic."[55]

Figure 62: Picture of "VSF..all-ride-Logo"
Source: Verbund Service und Fahrrad e.V. 2011

Besides a special focus on low maintenance hardware for bicycles, the concept was additionally upgraded with special services. Customers having bought such a "VSF..all-ride bike" get a special guaranty for mobility. For example if the bicycle needs to be repaired, customers can in the meantime use an alternative bike for free. The "VSF..all-ride concept" relies on a co-operation with different bicycle manufacturers who build these particularly robust bicycles and issue the extra warranty. Customers of the "VSF..all-ride bicycles" can acquire an optional service package which includes "extra services like a full-service for 2 years including a repair of a possible flat tyre, four inspections, quick-service, lifelong lubrication of the chain, spare wheel and many more."[56]

55 Possert (2008)
56 Possert (2008)

7.3 Corporate mobility management

An integrative measure to promote cycling is to offer services that motivates employees to use the bike for commuting or for business trips. One common promotion tool is to carry out bike-to-work schemes (see in detail part IV of this handbook). Another possibility is the provision of company services and facilities to make it technically more attractive to cycle to work. Such services can range from the sheer provision of parking facilities, up to changing rooms, lockers or showers. In some contexts the possibility to change the cycling outfit against a business outfit could be suitable. As E-Bikes and Pedelecs have become more and more popular in recent years the provision of recharge stations can be an option for companies too.

Companies can also foster commuting by bicycle by subsidising public transport tickets so that employees can combine public transport and cycling. Costs for such subsidies can be partly covered by a reduced need for company car parking spaces if more employees switch from car to bicycle.

Benefits for companies in short:

- Reduction of costs for car parking space (production and maintenance)
- Easier commuting for employees
- Fitter and healthier employees
- Smaller environmental carbon footprint for companies
- Improved image as sustainable and responsible company
- Reduction of company car fleet

Figure 63: Company bikes of the city, Zürich (Switzerland)
Source: City of Zürich

A different approach to integrate bicycles into corporate related mobility is the provision of company bikes which can be used for business-related trips in case of short distance travel. For example the city administration of Zürich in Switzerland provides 110 bicycles for their employees that are destined for business-related trips (see Figure 63). These bicycles are maintained by the employer and can be used without any kind of reservation or other kinds of bureaucratic barriers.[57]

The integration of cycling into general corporate mobility management strategies needs a (part-time) Mobility Coordinator or similar support within the company administration. The Belgian retail company Colruyt employs a special Mobility Coordinator and the company provides company owned bicycles at public transport stations. Colruyt combines the promotion of bicycle use with other measures like carpooling and motivational measures to use public transportation.[58]

Another example is the city council of Munich. It assists companies with the introduction of environmental friendly mobility management strategies. “Participating companies receive support in the form of four workshops and four in-company training sessions provided by environmental consultants.”[59] For example, companies get information and know-how on topics like the compilation of mobility data, examples for activity, project- implementation or improvements of bicycle infrastructure.

57 Walter (2009)
58 Canters (2011)
59 Rzewnicki (2009a)

Case study: Model Project Bike & Business 2.0 (Germany)

The model project Bike & Business 2.0 aims to introduce Pedelecs into mobility management strategies of companies and public authorities in the Rhine-Main Region in Germany. Employees of the participating companies and administrations can use Pedelecs for their business-related trips as well as for daily commuting so car trips can be avoided. The background for introducing Pedelecs into the mobility management of companies is that many daily trips are longer than 5 kilometers and therefore often too long for cycling. Pedelecs are an ideal environmentally friendly and fast vehicle for longer trips up to 15 or 20 kilometers.

The model project was co-financed by the German government and was also accompanied by scientific research to document the suitability for daily use. [60]

Further reading:

EPOMM Max-Project: http://www.epomm.eu

Another innovative form of mobility management is the "Mobility Budget" which can be found in companies with the aim to influence the mobility behaviour of employees. A Mobility Budget is a fixed monthly budget that an employee can use to pay for all travel costs, regardless of the chosen mode of travel. If the budget is not completely spent by the end of the month, the employee is allowed to either keep the money, or the remaining amount is used for other employee benefits (e.g. extra holiday). The smarter the employee travels, i.e. by using a bike, public transport or even by attending a phone conference rather than a meeting on site, the more will be saved. This simple but powerful financial incentive stimulates employees to travel in a more sustainable way.

The implementation of a Mobility Budget within a corporate mobility management has a number of benefits:

- For the employer: possibility to steer commuter travel so that better controlling and the reduction of travel and parking costs can be realized. A Mobility Budget may contribute to the objectives of the company being a sustainable and an attractive employer. The Mobility Budget can lead to financial savings.
- For the employees: financial benefits and more flexibility in and control over individual money spend on travel. As a consequence there can be a better balance between work and private life, as travel related stress can be reduced.
- For society: less kilometres travelled by car means less traffic congestion and hence less economical loss, less investment needed for the roads and less emissions.

However, if not supported by a good tool (online platform, excel-files), the administrative burden can be high. In the Netherlands, there are several services offering administrative support in the implementation of a Mobility Budget (e.g. Mobility Mixx). Besides, the budget must be high enough to motivate employees to change their travel behaviour, but not too high to keep them from making necessary trips.

In the Netherlands, so far Mobility Budgets were only introduced in a few companies. Recently companies are starting to experiment with Mobility Budgets also in France and in Belgium. In Sweden, a study on Mobility Budgets was finished exploring whether and under which circumstances this measure can be transferred to the Swedish context. This study revealed that one important barrier for the implementation of a Mobility Budget is the fiscal system. If this is not compatible with the reimbursement of the travel costs or the employee or the company loses money implementing a Mobility Budget, the measure will not work. Financial benefit is indeed the most important reason for employees to join a Mobility Budget.

Another success factor is the availability of suitable alternatives to travelling by car, such as a dense public transport network, seamless mobility solutions, integrated ticketing and bike sharing near stations.

60 ADFC Landesverband Hessen e.V.; Planungsverband Ballungsraum Frankfurt/Rhein-Main (2010)

Case study: Mobility Budget at YACHT-company in the Netherlands

A few years ago, about three quarters of the employees of Yacht, a Dutch employment agency for university graduates, had a rental car. This accounted for 2.000 cars, 85 million kilometres travelled and 5,5 million litres of fuel consumed per year. In 2007, the company introduced a Mobility Budget. This allowed employees to choose between returning their car and either receiving 120 % of the leasing rate to pay for travel costs, or to get a season ticket for public transport and receive the remaining amount of money as extra wage. The amount of employees participating in the Mobility Budget programmes increased from 13,4 % in 2009 to 15,4 % in 2010. In addition to the Mobility Budget, Yacht implemented other sustainable travel measures. One was offering rental cars with low CO_2 emissions. Another measure was providing employees with a Mobility Card - a chip card with which employees can pay train tickets, taxi, rental cars or Park-and-Ride-parking. A third measure was introducing car sharing with SMART cars. With all these measures, the company managed to realise a reduction of 19 % in CO_2 emissions within one year.

Further reading:

EPOMM (2012): Mobility Budget. In: EPOMM E-Newsletter March 2012.
URL: http://www.epomm.eu/newsletter/electronic/0312_EPOMM_enews.html (14.03.2012)

7.4 Service of retailers for cyclists

When cycling is promoted as an everyday mode of transport it is a basic consideration that cyclists are consumers as well. This fact should be accommodated. "Retail trade[rs] often undervalues cyclists as customers because they usually spend less money than customers that come [with the] car. If one considers, however, that cyclists shop more regularly and favour shops within their local neighbourhood, they then become a profitable client group for local trade, and one that retailers can secure through a wide range of offerings."[61]

For retailers, the value of cycling consumers should not be underestimated because:

- Bicycle parking facilities are much cheaper and space-saving than car parking facilities (production and maintenance).
- Cycling consumers are more often frequenting local retailers instead of large suburban shopping centres.
- Cycle friendliness improves the image of the shop or retailer as a sustainable and modern company.
- Cycle friendly shops can advertise bicycle services and infrastructure and can thus gain new customers.

That is why retailers could consider introducing adequate service and infrastructure for their cycling customers. Every kind of investment in retail services and infrastructure for cyclists can be a "win-win-win" investment. Retailers can gain customers, shopping for cyclists becomes more comfortable and local economy and supply will be supported. To address the target group of retailers and local shopkeepers when it comes to invest in bicycle friendly services and infrastructure can also be a special focus of bicycle promotion campaigns or projects.

Some possible service choices for shopping cyclists can be for example[62,63]:

- Provision of adequate parking spaces and facilities near to shops. Vienna in Austria (1.700.000 inhabitants) cooperates for example with the grocery retail company Spar. They built citywide bike racks in front of Spar markets with the slogan "bike and buy".[64] (See Figure 64)
- Home delivery service for purchases: Such a service under the name "shop and go"[65] can be found for example in the German city of Mülheim/Ruhr (170.000 inhabitants). Customers just can leave their bags at participating stores who will then take care of the home delivery. The delivery service cost a small additional fee of 3 € per delivery. The project "shop and go" is a collaboration of the local retailers association and the inner city management.

61 Federal Ministry of Transport, Building and Housing (2002)

62 Federal Ministry of Transport, Building and Housing (2002)
63 BUND (2008)
64 City of Wien (2010)
65 City of Mülheim an der Ruhr (2011)

Figure 64: Bicycle parking racks in front of Spar supermarkets, Vienna (Austria)
Source: Rosinak & Partner

- Lockers in large stores or shopping centres: Cyclists can securely store their belongings and bags while shopping. The German city of Kitzingen (21.000 inhabitants) offers for example special lockers in which inner city visitors can securely store their belongings (see Figure 65).

Figure 65: Lockers in Kitzingen (Germany)
Source: Tourist-Information Kitzingen, Beer

- Rental service for special bicycle trailers: They make it easier to take along small children (see Figure 66) or bulky purchases when shopping with the bicycle. Another option can be a rental service for bicycle panniers or baskets to transport the purchases.
- Service jobs: Provision of small maintenance service jobs on bicycles while the cyclist is shopping (for example air-, oiling- or repair-service)

The essential thought behind every service approach to promote bicycle use for shopping is to make shopping as comfortable and easy as possible. In this context also planning strategies, as for example to allow the usage of pedestrian areas to improve accessibility for cyclists, are important. Another way to increase the share of cyclists can also be to launch specific campaigns as in the case study below.

Figure 66: Bicycle trailer for children
Source: BICY project, www.bicy.it

Case study: Going shopping with Bike Bells Ringing (The Netherlands)

This bike-to-shop scheme was first implemented in Breukelen (15.000 inhabitants) in 2006, as part of a car & traffic reduction plan. Following the successful Flemish model, shoppers collect stamps which give them a chance to win prizes. The program was run by a consultancy hired by the city and is annually repeated.

Implementation

When the inhabitants have visited one of the 43 participating shops by bicycle, they receive a stamp. A full card of ten stamps (one per visit) gives them a chance to win several cycling prices. 550 full stamp cards were turned in, representing 5.500 shop visits. Over 200 people have provided tips on the cards on how local authorities could improve cycling policies. Most of them concern improvements with respect to paving, more and better parking facilities and increased safety in the village. [66]

For more details see: www.belgerinkel.nl (in Dutch only)

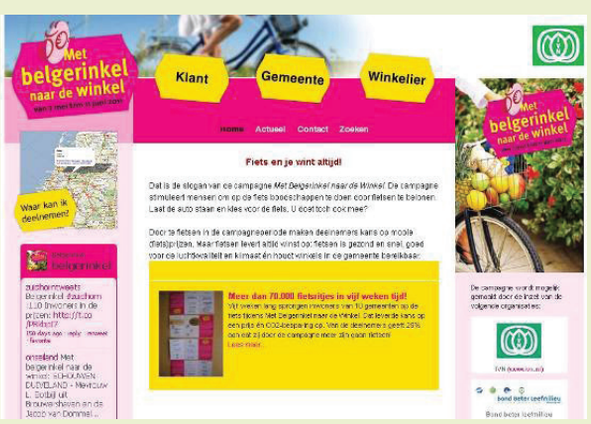

Figure 67: Screenshot of campaign webpage
Source: www.belgerinkel.nl (28.11.2011)

Main initiating stakeholder:

- Local administration / inner city management

Possible partnerships with local stakeholders:

- Local or national retail companies
- Bicycle associations
- Local retailer associations

66 Case study taken from Rzewnicki (2009b)

Further reading:

DIFU - German Institute of Urban Affairs (2012): Cycling Expertise – Local Actions to Encourage Cycling for Shopping. Online available at: www.nationaler-radverkehrsplan.de/en/transfers telle/

7.5 Bicycle delivery services

Delivery of all kinds of goods by bicycle is another approach. Especially widespread in this context are bicycle courier services. But besides the well-known bike couriers, bicycles can be also be used for last mile transport for city delivery. Special cargo-bikes can for example be used to deliver parcels. Also small enterprises selling food, coffee, ice cream or mail services can use cargo bikes for delivery.

One example for a last mile delivery service can be found in central London (see http://gnewtcargo.co.uk/)[67]. In Bucharest, Romania cargo bikes are used within the pilot project with the name “RECICLETA” (see Figure 68) to collect waste paper (see Eltis)[68]. On the one hand the project aims to encourage paper recycling and on the other hand offers a job perspective for unemployed people.

Figure 68: RECICLETA cargo bike in Romania
Source: RECICLETA

Within the Intelligent Energy Europe programme the project “CYCLE Logistics Move goods by cycle” started in 2011 to foster the use of bicycles for inner city transport and logistics (for more details see www.cyclelogistics.eu).

67 Stadtschreiber (2011)
68 Dragutescu, Baston (2011)

7.6 Security coding as theft prevention

One service reducing the risk of bicycle theft is to engrave a special security code into the frame of bicycles. The code can either be engraved directly into the frame of the bicycle (see Figure 69) or can be attached to the frame with a self adhesive label which is difficult to remove (see Figure 70). The service of engraving or labelling the bicycle with a special security code is often carried out by local bicycle associations or the local police. Equipped with such a security code the bicycle can be linked to the official owner of the bicycle if it was stolen or found. If a bicycle with a security code is stolen it is much harder to resell it and therefore the theft of such a registered bike is unattractive for potential thieves.

A good possibility to provide the service of engraving or labelling bicycles with security codes is to combine such services with other bike related promotion events or bike testing events.[69]

Figure 69: Engraving machine
Source: Pfaerrich 2006, www.wikipedia.org

Figure 70: Label showing that bicycle is coded
Source: ADFC Frankfurt

69 ADFC (2011b)

7.7 Local feedback services of cities – web 2.0 services

Some cities allow cyclists to give direct feedback on the local cycling infrastructure or other cycling related topics. Frequently, a local contact person – who will often be the official bicycle coordinator or spokesperson – can be contacted by cyclists if they have questions or remarks on the local cycling situation.

One example of such a feedback service can be for instance the establishment of a special “broken-glass-phone-number” or e-mail-address, where people can for example report if bicycle routes are littered with broken glass. The Swiss city of Zürich established such a telephone and internet service some years ago[70]. The city of Frankfurt am Main in Germany even makes it possible to report and mark problems (like broken glass on cycle lanes) directly into an interactive internet bicycle map (see Figure 71) and also to add own photos of the spot in question[71].

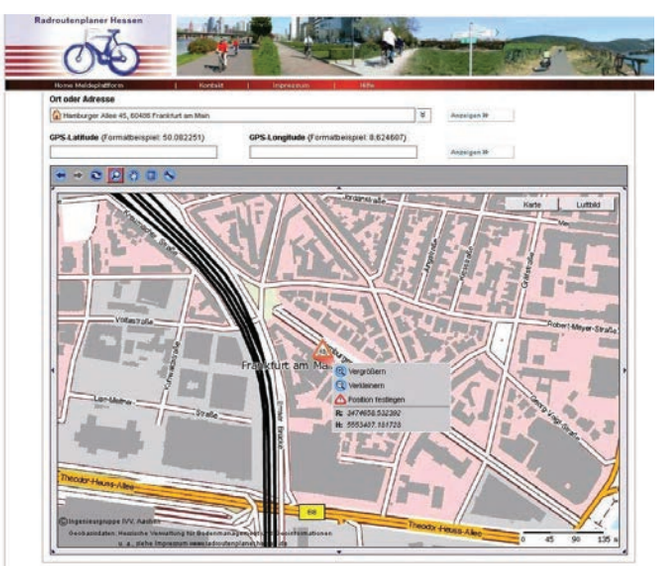

Figure 71: Screenshot of interactive feedback map, Hessen (Germany)
Source: ivm GmbH / www.meldeplattform-radverkehr.de

70 City of Zürich (2004)
71 City of Frankfurt am Main (2011b)

8. References

ADFC - Allgemeiner Deutscher Fahrrad-Club e.V. (2011a): Handbuch Neubürgertouren im ADFC.

ADFC - Allgemeiner Deutscher Fahrrad-Club e.V. (2011b): Fahrrad-Codierung. Der Code gegen den Klau. URL: http://www.adfc.de/Technik/Diebstahl/Vorbeugen/FahrradCodierung/Fahrrad-Codierung (07.11.2011).

ADFC Landesverband Hessen e.V.; Planungsverband Ballungsraum Frankfurt/Rhein-Main (2010): Bike + business. Eine Region kommt in die Gänge. Frankfurt am Main.

Beim, Michał (2010): Integration of cycling with public transport – German experience. Presentation at PRESTO on-site training in Zagreb.

Beauty and the Bike project (2009): www.bikebeauty.org/documents/theproject.pdf (01.02.2012).

Bickelbacher, Paul (2009): During NICHES+ meeting: Neighbourhood accessibility planning 27.10.2009 in Munich. URL: http://www.niches-transport.org/fileadmin/NICHESplus/ChampionCities/K_Langer_presentation_engl.pdf (01.02.2012).

Bikeability programme (2011): Bikeability. Cycling Proficiency for the 21st century. URL: http://www.dft.gov.uk/bikeability/what-is-bikeability/ (22.12.11).

BIOTOPIA Arbeitsförderungsbetriebe Mannheim gGmbH (2011): BIOTOPIA Fahrradstation. URL: http://www.biotopia.de/?page=fast&b=2 (01.12.2011).

Böhme, Stephan (2011): Cycling in Muenster. (Presentation on the 27th of June 2011 during an Excursion in Münster, organized by the Fietsberaad). URL: http://www.fietsberaad.nl/library/repository/bestanden/Fahrradfahren_in_Muenster_english.pdf (21.12.2011).

Bührmann, Sebastian (2007): OV Fiets: Public Bicycles in The Netherlands. (Eltis Case Study).

BUND - Bund für Umwelt und Naturschutz, BUND Berlin e.V. (Hrsg.) (2008): Radverkehr belebt das Geschäft. Empfehlungen für Handel und Verwaltung.

Büttner, Janett; Mlasowsky, Hendrik; Birkholz, Tim, Gröper, Dana; Castro Fernández, Alberto; Emberger, Günter; Petersen, Tom; Robért, Markus; Serrano Vila, Susana; Reth, Philipp; Blümel, Hermann; Romero Rodriguez, Carles; Pla Pineda, Elena; Piotrowicz, Andrzey B.; Esjmont, Rafał; Kuropatwiński; Kowalewska, Magdalena; Vecchiotti, Filippo; Reitere, Harald; Robert, Sébastian; Gagneur, Jaques; Richard, Olivier; Jean, Maxime; Basterfield, Sara; Williamson, Chris; Snead, Charles; Giles, Neal; Georgiou, Elena; Galatík, Jiří; Plíšková, Radomíra; Martinek, Jaroslav; Menichetti, Marco; Banfi; Matteo (2011): Optimising Bike Sharing in European Cities. A Handbook. URL: http://www.obisproject.com/palio/html.run?_Instance=obis&_PageID=200&_LngID=21&_CatID=13&pic=0&_CheckSum=-2099506551 (20.02.2012).

Canters, Raf (2011): Colruyt supermarket chain employees save more than 9 million car kilometers per year (Belgium). (Eltis Case Study).

City of Aachen (2011): Beseitigung dauerhaft ungenutzter Fahrräder aus dem öffentlichen Straßenraum. URL: http://www.aachen.de/de/stadt_buerger/verkehr_strasse/verkehrsueberwachung/schrottraeder/index.html (28.11.2011).

City Frankfurt am Main (2011a): Pannenhilfe für Rad und Radler. URL: http://radfahren-ffm.de (22.12.2011) .

City of Frankfurt am Main (2011b): Meldeplattform Radverkehr. URL: http://radfahren-ffm.de/12-0-Radverkehrsmelder.html (30.11.2011).

City of Mannheim (2011): Orangefarbene Banderolen für Falschparker. URL: http://www.mannheim.de/nachrichten/orangefarbene-benderolen-fahrraddauerparker (28.11.2011).

City of Mülheim an der Ruhr (2011): Shop and go. URL: http://www.muelheim-ruhr.de/cms/shop_and_go1.html (30.11.2011).

City of Münster (2009): Good practices in the field of activity „Mobility“. URL: www.muenster.de/stadt/exwost/practice_IV4.html (22.12.11).

City of Wien (2010): “Bike & Buy”: SPAR mit Rad-Parkplätzen. URL: http://www.wien.gv.at/rk/msg/2010/0419/009.html (30.11.2011).

City of Zürich (2004): Velofon & Fussfon - Infoblatt 2/2004. URL: http://www.stadt-zuerich.ch/ted/de/index/taz/publikationen_u_broschueren/IB_2_2004.html (30.11.2011).

Colville-Andersen, Mikael (2010): Blogs über die Kopenhagener Fahrradkultur. (Fahrradportal Case Study).

CTG; IG Velo (2007): How the development of cyclist training courses benefits cycling and cycling promoters. Shared experience from the UK and Switzerland. URL: http://www.nationaler-radverkehrsplan.de/eu-bundlaender/eu/velocity/presentations/ velocity2007_tu4e2_pres.pdf (22.12.11).

Cycling Embassy of Denmark (2010): The Bicycle Butler – from scolding fingers to oil and a smile. URL: http://www.cycling-embassy.dk/2010/11/03/the-bicycle-butler-%E2%80%93-from-scolding-fingers-to-oil-and-a-smile/ (01.02.2012).

DB Mobility Logistics AG (2011): Bahn & Bike, Reisen mit Zug, Bus und Fahrrad. Frankfurt/Main.

Dragutescu, Ana; Baston, Ana-Maria (2011): RECICLETA - cargo-bicycles to collect waste paper in Bucharest, Romania. (Eltis Case study).

Dufour, Dirk (2010): PRESTO Cycling Policy Guide. Cycling Infrastructure. URL: http://www.presto-cycling.eu/images/policyguides/presto_cycling%20policy%20guide%20infrastructure_english.pdf (20.02.2012).

EPOMM (2012): Mobility Budget. In: EPOMM E-Newsletter March 2012. URL: http://www.epomm.eu/newsletter/electronic/0312_EPOMM_enews.html (14.03.2012).

Federal Ministry of Transport, Building and Housing (Publisher) (2002): National Cycling Plan 2002-2012. Ride your bike! Measures to promote Cycling in Germany. Berlin. URL: http://www.nationaler-radverkehrsplan.de/en/ (20.02.2012).

FGM-AMOR (Publisher) (2011): LIFE CYCLE Implementation Manual. How to run a cycling action. URL: http://www.lifecycle.cc/docs/LIFECYCLE_Implementation_Manual_pdf.pdf (20.02.2012).

GTZ – Deutsche Gesellschaft für technische Zusammenarbeit (Publisher) / Godefrooij, Tom; Pardo, Carlosfelipe; Sagaris, Lake (Editors) (2009): Cycling-Inclusive Policy Development. A Handbook. Eschborn, Utrecht. URL: http://www.sutp.org (23.02.2012).

JCDecaux SA for EUROPLAKAT (2011): Website of Bicikelj. URL: http://en.bicikelj.si/ (30.11.2011).

LIFE CYCLE project (2009): ADFC New Residents' Tours, Germany. URL: http://www.lifecycle.cc/index.phtml?ID=1426&id=1601 (22.12.2011).

Mayrhofer, Max (2011): Mobile bicycle stands for rent in the City of Zurich. (Eltis Case Study).

Naviki project (2011): Information provided on project webpage. URL: www.naviki.org (01.02.2012).

Nextbike GmbH (2011): Internetpage of BalticBike. URL: https://nextbike.net/lv/index.php?id=944&L=en&type=0 (30.11.2011).

Ökoinstitut Südtirol/Alto Adige (no year): Toolkit for the implementation of a corporate cycling system. Bicycle friendly Bolzano/Bozen. URL: http://www.iee-library.eu/images/all_ieelibrary_docs/746%20corporate_cycling_system_bolzano_planners_handbook.pdf (20.02.2012).

Planungsbüro VIA eG (2004): Radverkehr in der Praxis. Kenntnisse und Beispiel aus dem In- und Ausland (Arbeitstitel). Entwurf der geplanten Publikation zur Radverkehrsförderung in der BMVBW-Reihe „direkt", Anlange zum Ergebnisbericht im Vorhaben „Fahrradverkehr in Deutschland und im Ausland, Stand von Theorie und Praxis" (FE 77.0462/2001).

Possert, Barbara (2008): Service for bicycles: Guarantee for Mobility for the "VSF.all-ride" Bicycles (Germany). (Eltis Case Study).

PRESTO consortium (2011a): Factsheet: Bicycle Maps.

PRESTO consortium (2011b): Factsheet: Cycling Information Centres/Mobility Centres.

PRESTO consortium (2011c): Factsheet: Bike Testing Events.

PRESTO consortium (2011d): Factsheet: Cycling Facilities at Interchanges.

PRESTO consortium (2011e): Factsheet: Targeted adult cycling training programmes.

Pucher, John; Buehler, Ralph (2008): Making Cycling Irresistible: Lessons from The Netherlands, Denmark and Germany. In: Transport Reviews, Vol. 28, No. 4, 495–528. URL: http://policy.rutgers.edu/faculty/pucher/irresistible.pdf (01.02.2012).

Rzewnicki, Randy (2009a): Promoting the Bicycle in the Munich Corporate Management Programm (Germany). (Eltis Case study).

Rzewnicki, Randy (2009b): Going shopping with Bike Bells Ringing (The Netherlands). (Eltis Case Study).

Rzewnicki, Randy (2009c): “Safe and healthy on the bike” Encouraging seniors to keep cycling to stay engaged & fit in Belgium. (Eltis Case Study).

Spapé, Ineke (2011): „OV-fiets“ in den Niederlanden. ÖV und Rad zusammen stark. (Presentation at the German national cycling mobility congress 2011 in Nuremberg).

Spencer, Greg (2011): Bicycle Service and Products at Petrol Stations (Eltis case study).

Stadtschreiber, Eva (2011): Emission-free last mile delivery service in London, UK. (Eltis Case Study).

Sustrans (2009): BikeBelles project. URL: www.bikebelles.org.uk/ (01.02.2012).

Urbanczyk, Rafael (2010): PRESTO Cycling Policy Guide. Promotion of Cycling. URL: http://www.presto-cycling.eu/en/policy-guidelines-a-fact-sheets/promotion-of-urban-cycling (23.02.2012).

Van den Bulcke 2009: Bikes on public transport. Bikes on light rail, metro, tram and bus. (Velocity, 12th of May 2009, Brussels). URL: http://www.usemobility.eu/sites/default/files/resources/fiets_en_ov_-_summary_en.pdf (20.02.2012).

Van der Kloof, Angela 2009: Bicycle training for adults in the Netherlands. Good practices and methods. URL: http://www.velo-city2009.com/assets/files/paper-van-der-Kloof-sub3.2.pdf (01.02.2012).

Walter, Urs (2009): Zürichs company bikes: efficient vehicles, popular with city employees (Switzerland). (Eltis Case Study).

Ward, Josh (2007): Creative Integration - Denmark to Immigrants -- Let’s Ride. In: Spiegel-Online International. URL: http://www.spiegel.de/international/europe/0,1518,501869,00.html (01.02.2012).

Weiss, Peter (2008): Fahrradservice: stadtweite, kostenlose Reparaturstationen. (Fahrradportal Case Study).

Part IV: Communication on behavioural change

mobile
2020

CONTENTS

1. Communication as an integral part of mobility culture

The following material will give detailed information about all important aspects concerning communication aiming at behavioural change related to bicycle mobility. This includes information on

- Ways and forms of communication,
- Guidance for communication with different stakeholders involved in bicycle mobility,
- Knowledge on messaging and branding in bicycle promotion campaigns,
- How to identify specific target groups for communication measures,
- mMotivational and promotion measures for bicycle mobility.

Besides a lot of communication know-how, the material includes many good case examples for communication aiming at behavioural change, so it is possible to easily adapt these well established and suitable communication approaches for the mobile2020.

2. Why is promotion for cycling necessary?

The bicycle is perceived very differently depending where you are in Europe. In places with a relatively large number of cyclists, the perception of cycling is generally positive or at least neutral (i.e. people take them for granted not giving them much thought). In other places, however, bicycles evoke negative associations or even prejudices such as being old-fashioned, uncomfortable, dangerous, slow and/or only for sporty people, not suitable for transporting things, or simply a symbol of poverty.[1] This way of thinking is commonly found in ordinary citizens, but also applies to politicians and decision makers. With the negative effects of motorised transport becoming more and more apparent, the time is now ideal to explore the huge, and very much underdeveloped, potential of cycling mobility in our urban society.

The first barrier to cycling – acquiring a bike – has already been overcome to a large extent (Möller 2007).[2] As of 1996, almost half of the population of the EU (15 countries) owned a bicycle (see Figure 1).[3]

Of course promotional interventions have to be accompanied by, and integrated into, infrastructural improvements. That way, they will prove most successful and the potential existing within urban transport can be activated.

In this handbook cycling promotion comprises all activities aiming at fostering and communicating cycling as an everyday mode of transport in cities. Promotion is not only focussed on marketing but is including it.

2.1 Habits, perceptions and barriers

A well built up cycling infrastructure alone does not automatically lead to increased bicycle use.[4, 5] The personal decision-making process for or against a specific mode of transport is quite complex. People's travel choices and behaviour are rather a result of upbringing, socialisation, personal attitudes and orientations which are forming habits as a result of rational processes and fact-based decisions. It is therefore wise to understand the barriers and possibilities of exerting influence.

There are several parameters which can be adjusted in order to affect behaviour and to change attitudes towards mobility. Apart from external and personal constraints or the travel distance, the choice of a mode of transport depends on the perceived availability of transport alternatives. Additionally, we are facing an evaluation of personal benefit versus personal cost if a pattern needs to be changed. Thus, the task of promotion is to inform road users and raise awareness of all available mobility options, including the bicycle.

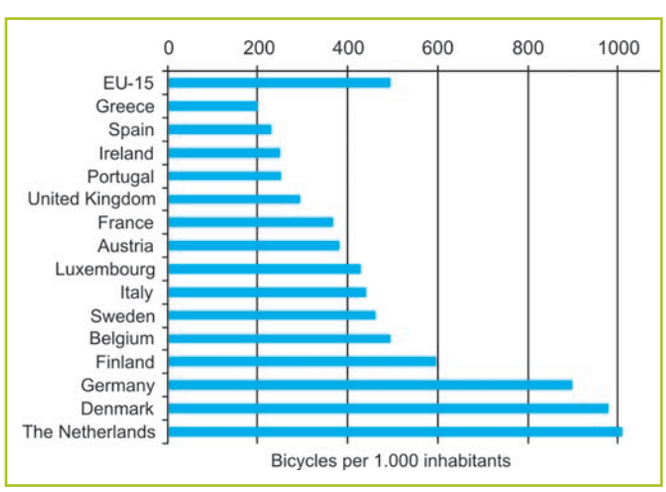

Figure 1: Bicycle ownership in the EU 15 between 1991 and 1996
Source: Data from Dekoster; Schollaert 1999

1 ECMT (2004)
2 Möller (2007)
3 Paragraph taken from Urbanczyk (2010) and edited

4 Chapter 2.1 taken from Urbanczyk (2010) and edited
5 City of London Planning Division (2005)

Another important parameter with respect to promotion is the concept of habit. We humans are creatures of habit and, until we are confronted by something that forces us to change, we generally continue in our old manners.

But it takes more than knowing the benefits of cycling; we often have certain pre-conceived ideas and beliefs about cycling. Every road user (partly subconsciously) personally assesses the quality of all means of transport, judging their efficiency, convenience, flexibility, costs, or simply the level of fun. People who rarely or never cycle tend to judge cycling as slow, dangerous and uncomfortable. Many of those who try cycling are surprised how quick, safe and comfortable it is. If promotion can make people try cycling, it will often convince them of its benefits.

There are also external factors that influence people's assessment. Some of those can be changed to a certain extent, whereas others are fixed. Even if hard to tackle, changeable factors include image, the quality of a transport mode, emotions, or politics and planning. Whereas factors that cannot be changed or influenced (or only with difficulty) include weather, topography or social norms (e.g. if in some countries cycling is for example not considered appropriate for women).[6]

Clearly, promotion has to consider informational aspects as well as experience-oriented ones. Thus communication towards more cycling should take three main parameters into account:

- Information on options (material benefits)
- Communication of symbolic benefits
- Addressing life-situations and their changes by giving hands-on experience

2.2 Benefits and reasons for cycling

There are numerous fact-based and emotional lists, why cycling is an effective mode of transport in towns. Depending on who is addressed (see chapter 5 target groups), it depends how such a short catalogue looks like. In the following, an example is given on how decision makers and the political level can be addressed.

There are other lists as well, e.g. in the web, which are addressing the single citizen independent of his or her role in public life (links are give in the "further reading"-box at the end of the chapter).

When talking with decision makers and planners, it helps to draw attention to the arguments why the promotion of cycling is a profitable and important investment and which positive effects go along with more cycling. When communicating with the broader public, it is important not only to present facts and rational arguments for cycling, but also to take the emotional and symbolic side into consideration. However, in both cases, arguments should comprise the rational as well as the emotional side.

2.2.1 Seven benefits for cycling

Cycling in cities…[7]

- is fun and flexible
- improves the quality of life
- is cost effective
- is healthy
- is safe
- preserves the European urban heritage
- makes a difference to the environment

1. It is fun and freedom

The bike has repeatedly been voted the most popular invention of the past 200 years. Cycling is simply great fun. Cycling gives a sense of freedom what sitting in a car can never offer. Descending a hill on a bike is exhilarating, something you never feel in a car. Cycling also gives greater freedom with respect to the choice of way. With a bike you can go down narrow lanes, on canal paths and often cut corners that you cannot cut by car.

2. Cycling improves the quality of life and public spaces

Bicycling makes urban areas more liveable places.[8] It enables people to notice and interact with their urban environment. It also helps to create a sense of place and belonging and positively influences community spirit. In some places, in particular in champion cycling cities, riding a bicycle is not just a mode of transport but an expression of a certain lifestyle. It represents freedom of movement, independence and fun. Everyone cycles, so cycling is the great social leveller. Rich or poor, Oxford don or little kid, everyone can enjoy taking the bike.

Today, urban living conditions are severely affected by traffic-generated noise. According to a survey conducted within the EU's SILENCE project, road traffic is the

6 Pez (1998)

7 Chapter 2.2.1 based on Urbanczyk (2010) and edited

8 Cycling Promotion Fund Australia (no year)

most significant single source of noise in Europe.[9] The WHO states that every third EU citizen is exposed to a level of road traffic noise which is seriously disturbing[10]. More than one 1/8 of the EU population is exposed to a noise level which is detrimental to health[11] (WHO 2003). Constant noise leads to health problems such as disturbed sleep, stress symptoms and high blood pressure. Improved cycling conditions serve to invite people to replace short car journeys by the "silent modes" of walking and cycling.

3. Cycling is cost effective

Costs of transport and travel time: In the EU, transport costs represent about 13 % (in 2005) of total household expenditures.[12] Given the trend in fuel prices, this share is likely to increase in the future. While it does not affect the cost of owning a car, replacing some of the short car journeys by cycling journeys does significantly contribute to saving costs for fuel, parking, tolls and maintenance. Travel time costs also need to be considered when calculating transportation costs. It is estimated that leaving the car in the parking lot could save an estimate around 90 Euro per week for the average communter (in the UK).

In many congested towns, a bike can offer the quickest method of transport. In some European cities the average speed on roads is lower than 100 years ago! Even a moderately fit cyclist will have no trouble in beating cars, buses and tramways. With a bike, you don't have to spend time driving around looking for parking. You can park almost exactly at your destination.

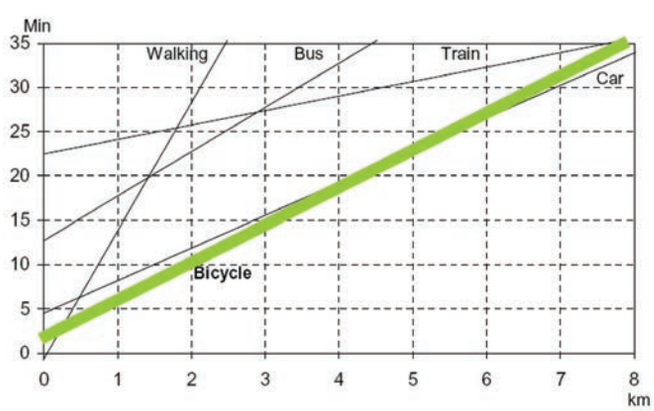

Figure 2: Journey time against distance time
Source: Urbanczyk 2010 referring to Dekoster, Schollaert 1999

The Value of Travel Time (VTT) refers to the cost of time spent on transport, including both waiting and actual travel. Travel time, particularly with congested road conditions, is among the highest transport costs. The Value of Travel Time Savings (VTTS) refers to the benefits of reduced travel time.[13] If travel time is measured from door to door, for distances up to 5 km in an urban environment, the bicycle is generally faster than any other mode of transport. Figure 2 demonstrates the speed of a bicycle in comparison to other modes of transport.

External costs of cycling and car use: External costs are the effects of mobility that are judged to be financially negative, but which are not directly covered by the private user. These include for example the costs of building and maintaining infrastructure, emissions, noise nuisance, congestion, land use impacts, stress and costs of traffic accidents.

The extent to which a road user exposes other traffic participants to danger is a good indicator of external costs when one considers the costs arising from road accidents and it shows that cyclists are vulnerable but harmless. Therefore, only an insignificant part of the external costs of road traffic accidents is to be attributed to cyclists. Other external costs of cycling, such as bicycle infrastructure (per user) are low (the capacity of the lanes is higher since they can accommodate more cyclists per metre). Cycling also does not generate any emission costs.[14] In addition, as said before, the more people cycle, the less the risk for accidents.

External costs for	Bicycle traffic	Car traffic
Road traffic accidents	low	high
Road infrastructure	low	high
Emissions	low	high

Table 1: Comparison of external costs of bicycle and car traffic
Source: Own compilation

Cycling and retail: Most urban shopping trips cover distances that can be easily walked or cycled. Though cyclists buy less on each trip (in comparison with car users), they are found to shop more frequently. Studies show that the volume of sales per cyclist and month is higher than that of car users.[15]

In this regard, studies have shown that there is a *financial return on investment* from implementing cycling measures focusing on increasing the number of cyclists. Examples from Copenhagen show, that every kilometre cycled has a value of about one US dollar with regard to health costs.[16] "Cycling England" examined examples of cycling interventions (e.g. Bike IT, Cycle Training or

9 See www.silence-ip.org (5.2.2012)
10 Which is 55 Ldn 37 dB(A)
11 Which is 65 Ldn dB(A)
12 TERM (2005)
13 VTPI (2009), Forester (1994)
14 Vermeulen (2003)
15 City of Graz (2006)
16 Data from copenhagenize.eu

London Cycle Network) and found that both, infrastructure and promotion measures produce a positive return on investment. The study indicates that if an interaction leads to an increase in cycling trips, this can alleviate traffic congestion and reduce pollution and health service costs. While this does not mean that all investments in cycling will produce high returns, the relatively high values received when projects generate new cyclists, suggest that this is an important chance to make investments that will, over time, more than recover their costs.[17]

4. Cycling is healthy

According to the WHO, after tobacco consumption, physical inactivity is the most important health risk. It is the major underlying cause of death and numerous diseases in industrial societies. Inactivity also leads to higher costs created by absences from work.[18] Cycling increases fitness, which, in turn, improves our defences against minor illnesses. It is good for the heart, the circulatory and immune systems. Improved fitness leads to fewer aches and pains, better posture and an increased quality of life – all of which reduce health care expenditures.

Cycling is a low impact aerobic exercise and an excellent way of losing weight. Cycling can also be combined with shopping and commuting therefore, enabling very busy people to find time for exercise. With obesity becoming an endemic problem in western societies, cycling can play a key role in helping to keep the population in shape.

It is generally recognised that physical activity is good for mental health. It can alter brain chemistry to improve your mood or lead to feelings of wellbeing. A sedentary lifestyle, on the other hand, increases the risk of depression which, in turn, increases the likelihood of a sedentary lifestyle. Cycling can improve the fitness of both body and mind.

One of the good things about cycling is that you do not need a high level of fitness to do it, but whatever pace you cycle at, you know you're burning calories instead of petrol.

If you work in an office or have a stressful job, exercise such as cycling can be a powerful way to help reduce stress and take your mind off many problems. Exercise releases chemicals such as serotonin. Serotonin is known to promote a feeling of well-being. But, also vigorous exercise is an effective way to take your mind off trifling problems. Often coming back from a bike ride, you can see problems from a new perspective.

5. Cycling is safe

In cities with few cyclists, cycling is often perceived as dangerous. Wearing helmets, high visibility vests and other "warning" equipment is implying risks. As with so many fears, however, a fear of the dangers of cycling is not based on facts. Although cyclists and pedestrians are more vulnerable than people sitting in a car, there are in fact more people dying as a result of physical inactivity than because of cycling accidents.[19] As an example one can see Austria: there 56 people died in cycling accidents in the year 2003, whereas about 6,500 people died as a result of physical inactivity.[20]

Cycling is not an inherently dangerous activity. Certain situations may become dangerous if cyclists and other road users do not respect each other, if rules are violated or if someone makes a mistake. But these situations, and thus safety, can be influenced first of all, through appropriate infrastructure and by respecting traffic regulations, but also through promotional approaches targeted at different groups.

One might expect that an increase in cyclists would also increase accident rates. However, studies have shown that the opposite is true. For example, between 1996/1997 and 2002, cycling traffic in the city of Odense (DK) increased by 20 %.[21] In the same period, the number of accidents involving cyclists decreased by 20 %. Thus, the larger the modal share of bicycles in a city, the lower the accident rate. One reason for the decline is that cyclists become more confident with experience. Equally important is the factor that other road users become more used to and aware of cyclists as they are more numerous. As more car users start using bikes themselves, they obtain a better understanding of how their driving affects cyclists.

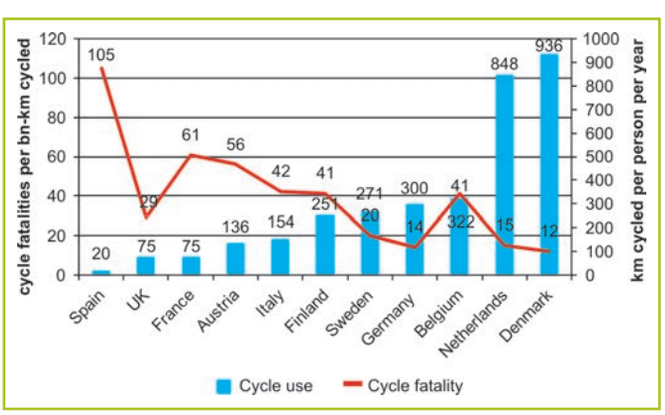

Figure 3: Connection between cycle use and accident rate
Source: ECF 2011

17 Cycling England (2007)
18 Ibid
19 WHO (2004)
20 City of Graz (2006)
21 WHO (2006)

6. Cycling preserves the European city heritage

The European city is unique. It has a compact structure, enabling living, working and recreation all within close proximity. The historical European paradigm of dense settlement and short distances is perfect for walking and cycling. It strongly supports the objective of reducing the need for travel, and, thus reducing motorised traffic.

The bicycle was the first mode of mass transportation in Europe in the mid-20th century. In particular before and after World War II, the bicycle was a common and affordable daily mode of transport.[22]

Table 2 shows the modal share of different transport modes for daily activities in the EU 27 countries.

Since the 1960s the effects of suburbanisation with low settlement density and dispersed development resulted in an increase of car ownership. Driving became a dominant mode of transport.[23] Long distances made walking and cycling unattractive, dependence on motorised transport increased, and led to rapid urban decline.[24] On the one hand this trend is still unbroken, on the other hand there have been various planning paradigms since the 1990s to overcome the consequences by the paradigm of the "city of short distances". Furthermore, a trend towards re-urbanisation has been taking place in numerous European countries, proving that many citizens prefer to live in cities.[25] This marks an opportunity to re-introduce the bike as a key mode of transport for cities.

Main mode of transport for daily activities in the EU 27 countries						
	% car	% public transport	% walking	% cycling	% motorbike	% other
EU 27	52,9	21,8	12,6	7,4	2,1	1,4
Belgium	61,2	16,5	5,1	13,4	0,4	1,1
Bulgaria	32,7	28,2	30,1	1,8	0,4	1,0
Czech Rep.	36,2	36,8	15,8	7,2	1,5	0,5
Denmark	63,4	11,8	3,7	19,0	0,2	1,6
Germany	60,9	14,8	7,1	13,1	1,5	1,4
Estonia	37,2	31,3	22,0	4,7	0,3	1,2
Greece	46,1	25,1	16,5	2,7	7,3	1,6
Spain	47,4	30,2	14,5	1,6	3,7	1,2
France	63,7	20,1	9,4	2,6	2,3	0,7
Ireland	67,7	14,2	12,2	3,2	0,4	1,3
Italy	54,4	18,2	14,4	4,7	5,2	0,9
Cyprus	89,2	4,6	2,8	0,3	2,0	0,4
Latvia	29,0	63,3	25,1	7,5	0	0,9
Lithuania	48,5	29,9	12,9	5,1	0,2	0,8
Luxembourg	63,6	28,4	5,7	1,7	0	0,1
Hungary	28,2	35,3	11,6	19,1	1,2	0,2
Malta	64,7	25,9	5,9	0	0,6	1,0
Netherlands	48,5	11,0	3,0	31,2	1,7	2,9
Austria	61,3	20,1	8,0	8,0	0,9	0,9
Poland	43,0	31,4	14,2	9,3	0,6	0,2
Portugal	52,9	21,9	17,7	1,6	1,1	1,4
Romania	30,3	26,5	28,9	5,2	0,5	1,5
Slovenia	68,4	10,3	12,6	6,9	0,7	0,4
Slovakia	32,3	30,9	22,9	9,5	0,5	0,6
Finland	61,9	12,6	10,2	12,5	0,1	2,4
Sweden	52,0	19,8	11,4	17,1	0,3	1,9
United Kingdom	56,7	22,1	13,4	2,2	1,2	3,5

Table 2: Main mode of transport for daily activities in the EU 27 countries.
(Missing values up to 100 % are the categories 'no daily / regular mobility' and 'no answer'. The sample size is around 1.000 persons in each country except in Malta, Cyprus and Luxembourg were around 500 persons were interviewed.)
Source: Data from European Commission (Publisher) (2011)

22 de la Bruheze, Veraart (1999)

23 European Environment Agency (2006)
24 WHO (2006)
25 Priemus (2003)

Three current developments underscore the growing role of urban areas as desirable places to live. First, there is demographic change: an ageing population relies on short distances and services which are only available in urban areas. Secondly, there is a rising share of urban oriented life styles. And third, there is the trend of household sizes getting smaller. These developments create conditions that make the bicycle an increasingly mainstream mode of transport in denser urban areas.

European cities are lacking space and therefore need a spatial-efficient transport system. A bicycle combines these requirements. It is quick in particular on short distances (…), takes very little space in motion and when parked. Bicycle infrastructure fits well in dense or historical city patterns and does not necessarily require large scale interventions and investments in the urban space.

7. Cycling is a green technology

While climate change and oil depletion are constant issues of global political debates environmental effects of motorised transport on local level are also still urgent: e.g. the increased levels of emissions (NOx, CO, S) and fine particulates in cities. For example short car trips generate disproportionately more pollutants than longer car journeys. To illustrate the dimension: Throughout Europe, 30 % of all car trips are shorter than three kilometres, 50 % are shorter than six kilometres.[26] This leaves huge potential for a modal shift.

Compared to other areas, the matter of reducing CO_2 emissions in the transport sector is especially promising. Here, up to 13 per cent could be saved (IFEU 2008). The German City of Mainz shows, that bicycles have the potential to save CO_2 emissions (see Figure 4).[27] A study of the British Cyclists' Public Affairs Group demonstrated that even a modest increase in cycling could rapidly reduce transport emissions by 6 % in Great Britain. An increase in cycling numbers comparable to those in the Netherlands (27 % of all trips are done by bicycle) could lead to a reduction of CO_2 emissions of up to 20 %.[28]

Even if electric cars or other low/zero emission vehicles become marketable in future, they will not be able to alleviate the environmental problems of noise pollution, barrier effects and soil sealing by road infrastructure, exploitation of resources and waste management of used vehicle parts.

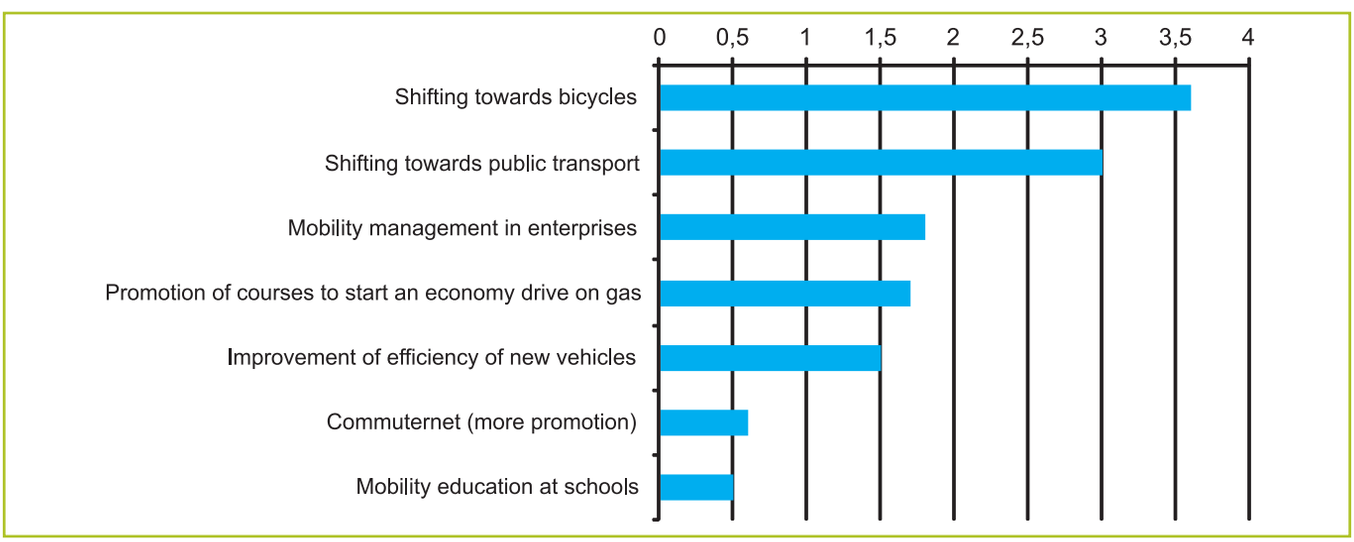

Figure 4: CO_2 saving potentials in % by action
Source: Urbanczyk 2011

Further reading:

FMG-AMOR (2011): Trendy Travel: 20 good reasons for cycling.

Möller, Thomas (2007): Baltic Sea Cycling project - Cycling Inspiration book.

Tejvan (2008): 10 reasons to take up cycling. In: Cycling info. www.cyclinginfo.co.uk/blog/314/cycling/10-reasons-to-take-up-cycling/ (05.01.2011).

WHO Online-Tool to calculate health effects of cycling: www.heatwalkingcycling.org/index.php?pg=cycling&act=introduction.

26 Dekoster, Schollaert (1999)
27 IFEU (2008)
28 Davies (1995)

3. Cooperation and strategic thinking

Communication with the aim of behavioural change does not only have to do with direct promotion and marketing of cycling towards the "end user"/transport user, namely every single traffic participant. Moreover, to foster cycling mobility it includes to a large extent communication with politicians and decision makers. Therefore, this chapter will focus on how we distinguish between stakeholders, target groups and other actors. We also show some methods and findings for actor analysis and key factors on cycling inclusive policies with focus on communication. This serves the aims of mobile2020 to help build a broad knowledge basis for national multipliers to shape communication and cooperation processes.

In order to successfully foster and promote cycling, one will always need the support and help of different stakeholders. Collaborations, partnerships and other types of support are of great importance for any kind of action to be taken, whether in a public administration, cycling association or other type of organization. However, you need to decide what kind of collaboration you are seeking, since you will most likely need several partners which are not equally interested in all of your actions.[29] It is important to know, how to communicate with these groups and how to make them partners in the cycling promotion process. A stakeholder definition from transdisciplinary research:[30]

"**Stakeholders** are persons, groups or institutions whose needs and interests contribute to a problem situation (here: low bicycle use as everyday transport), at first undefined if positively or negatively. In (implementation) processes they articulate their needs and take over an entitled interest. They contribute to the definition and phrasing of the problem with their knowledge and skills. For the problem solution they are an important entity, to evaluate the societal relevance and practicability of results."[31]

Actors on the other hand are all every day persons or institutions that shape a local or regional society. They are not necessarily stakeholders as not all contribute to the specific problem (un-risen potential of bicycle mobility).

Target groups are transport users/consumers who are asked to change their mental maps and daily mobility patterns. They can be segmented by demographic characteristics, user behaviour or life style models (see chapter 5). In some way also the municipalities (decision makers/ politicians & civil servants) and the local businesses are target groups depending on the perspective of each implementation partner (whether or not part of the administration, service provider or NGO).

Stakeholders, however, are members of the local public. They are parties, who can affect the local implementation of the project goals, e.g.:

- Local/regional/national politicians/city council, public authorities/ municipalities, road administration,
- Police,
- local businesses/companies,
- health care professionals, especially with an interest in public health, obesity prevention and mental health,
- energy agencies,
- civic and environmental organisations and pressure groups, other NGOs,
- educational institutions: kindergardens, schools, universities,
- public transport operators,
- trade unions,
- chambers of commerce,
- tourist associations,
- professional and economy branch associations,
- media.

But of course, stakeholders are consumers, cyclists, and pedestrians as well and their actions are influenced by their own daily experience as transport users. So both sides – the target groups and the stakeholders are interlinked in a complex way.[32]

According to the objectives of mobile 2020 the most important stakeholders are:

- local and regional urban and transport planners working in municipal administrations (head of departments as well as executive officers)
- Local /regional politicians in city councils
- Urban and transport planners in planning consultancies

Generally speaking, one can say that a well guided involvement of stakeholders is helpful for a foundation aiming to make cycling an integral part of the local mobility culture. In order to achieve good stakeholder involvement you should take the following points into consideration:

29 Taken from FGM-AMOR (Publisher) (2011)
30 This means: Research that includes scientific and practical knowledge to come to solutions of problems
31 Becker, Jahn (2006)
32 Paragraph taken from Thiemann-Linden et al. (2010)

- Who are the relevant stakeholders for which objective or project part? Which arguments will appeal to them? → stakeholder analysis (chapter 3.1)
- In which way should the communication and integration take place? → stakeholder involvement plan (chapter 3.2)
- How can the stakeholders be integrated on a long term basis? → networking (chapter 3.3)

Key factors for successful communication

Referring to the definition of mobility culture (see introduction of this handbook) the following essential factors of transformation towards a more sustainable mobility culture in terms of communication can be seen:[33]

- After all discussions, disputes, and discourses about transport policies there now is a need for a long lasting basic consensus within the cities' different political groupings, regarding urban and traffic development; part of this is an overall political, actor related and administrational cooperation;
- Certain key actors often seem to be drivers for continuation of the transformation process;
- Urban development paradigm: Rational planning processes need to take into consideration emotional qualities like for example the concept of high amenity value of urban spaces.
- In order to be professional, communication mechanisms have to be respected already during vision development processes, such as campaign oriented integrated communication or corporate design aspects;
- Integrated measures need the consistence of technical maturity and creative quality in both, construction and communicating measures, especially when it comes to details;
- A user and a door-to-door perspective to emphasise multimodal and multi-optional transport services;

Communication aspects are addressed on different levels:

- While creating consensus and cooperation of professional actors;
- While exchanging opinions and knowledge with the citizens (learning from each other);
- During interactions of traffic participants (more self-regulation);
- Communication as 'staging' (image and emotionally based customer retention).

3.1 Stakeholder analysis

Since it is very important to know how to communicate, work together and integrate different stakeholders in the process of cycling promotion, an approach including actor analysis can be helpful. [34] Cooperation needs to be tailored according to the specific stakeholder groups. These include politicians, traffic planners, the business community, schools, supporters, or members of bicycle user groups. Each target group requires its own approach:

- Show supporters their contribution is worthwhile;
- Recognize experts' skills, even in the event of disagreement on the political level;
- Give politicians political choices; do not entangle them in technical discussions;
- Civil servants deserve nuanced treatment: they are not responsible for political matters, but can be very influential.

To better understand the situation, stakeholder analysis can be helpful. Therefore, a group of planners, users and other interested parties work together to identify and analyse each stakeholder according to their primary and derived interests. Who are potential allies, supporters or opponents? And how influential are they?

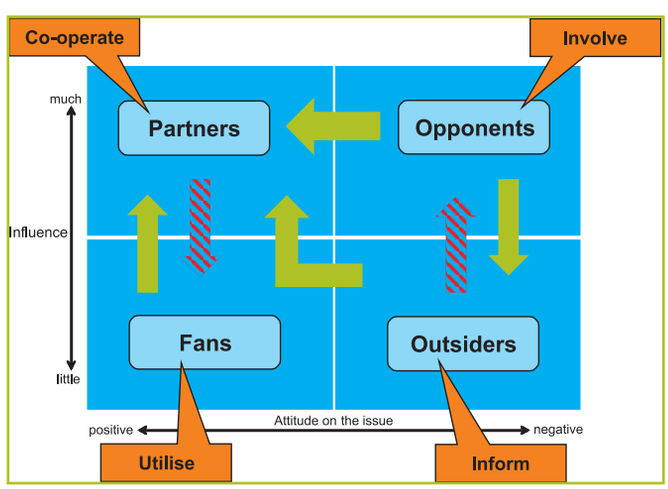

Figure 5: Basic structure of a stakeholder analysis
Source: Own compilation adapted from GTZ (Publisher) / Godefrooij et al. (Ed.) (2009)

The matrix in Figure 5 offers an excellent structure for analysing the different target groups and their position. Using it, you can identify where key players stand today and where you would like them to move throughout a participatory and planning process or during multiplication activities. Depending on the level of influence and their positive or negative attitude towards the issue, stakeholders can be identified as partners, opponents,

33 Deffner/Goetz (2008)

34 Chapter 3.1 taken from GTZ (Publisher) / Godefrooij et al. (Ed.) (2009) and edited

fans or outsiders. Of course these are only rough categories, but it may help to decide on how to approach them to advance one's case.

The figure presents a matrix that locates different actors according to their attitudes and their influence within the policy process. The green arrows indicate desired movements, whereas the red arrows indicate movements one should try to prevent. We want opponents to become partners, fans or, if all else fails, outsiders. Please also note that sometimes fans are important to help push partners into more solid commitments. New partnerships can grow with related associations (e.g. pedestrian or senior associations) by expanding the support for policies which include cycling. It is useful to produce two versions of this matrix as part of the initial stakeholder analysis: one stating the current situation and another one dealing with where we would like to move people within the next month to one year of the policy planning and implementation cycle.

It then becomes clear whether it is worthwhile or even necessary to put a lot of effort into approaching specific stakeholders, and what can be achieved by doing so. The initiators of these processes must ask why a specific group should be addressed and how best to reach them. A real understanding of their interests and aims will make this easier.

Start from a clear idea of objectives, stakeholders and the best approach for each and then move into concrete interventions. Remember that there are many more factors beyond the ones mentioned above. Other considerations include for example the means available, the skills and (personal) qualities of those who must do the job, estimated cost effectiveness, and so on.

3.2 Stakeholder integration

Partnerships and alliances are particularly important, because they can add crucial resources to the policy development process or reduce costs by adding knowledge, a supporters' base and other elements that would otherwise require considerable effort and resources to be achieved.[35] Most groups have gatekeepers, key leaders whose explicit support can validate a new position among whole communities or groups of other actors. Networking brings these groups together and keeps them "in the loop", thus building an informed community trough organic processes that can yield key support at crucial points in the policy development process.

An open cooperation of all stakeholders is crucial for a successful promotional strategy to concentrate professional, organizational and financial resources. The establishment of stakeholder-networks appears to be a successful strategy especially on the regional level because on this level comparable basic conditions and problems can often be found.[36]

Methods to involve stakeholders have been tested and described in detail in the Active Access Project (see references). Suggestions for working mechanisms are for example regular roundtables, meetings, special events, workshops and evaluation questionnaires as well as in-depth interviews. Stakeholders should be approached in a way to make them feel like members of a team working towards common project objectives, which they understand and are committed to.

Special focus: Bicycle user groups and their integration

User groups play a very special role in developing and implementing cycling policies. They often catalyse agenda setting and raise awareness. They can voice the interests of the users and they can be a critical watchdog to monitor progress.

Cyclists' organisations know what cycling requires and the restraints that must be lifted. Experiences from the Locomotives Programme, run by Interface for Cycling Expertise, has shown that civil society organisations and activists can have a strong impact on the awareness and willingness of authorities to recognize the importance of cycling for urban transport and economic development.

When it comes to concrete implementation of road facilities, the communities immediately affected by works should be involved. The ultimate reasons for such community involvement are threefold: First, people should have a say in the shaping of their immediate living environment for the sake of democracy. Secondly, and even more importantly, such a community involvement will result in better plans, better solutions to problems, and the avoidance of costly mistakes. Thirdly, when target groups feel a shared sense of ownership, support for implementation will increase.

It is beyond the scope of this Handbook to provide a detailed description of the multiple ways of facilitating user group participation in cycling-inclusive transport planning policies. Some of the most common methods include:

35 Chapter 3.2 taken from GTZ (Publisher) / Godefrooij et al. (Ed.) (2009) and edited

36 Paragraph taken from Planungsbüro VIA eG (2004)

- Focus group discussions to identify problems and make an inventory of these challenges;
- General user groups/tasks forces/panels articulate and prioritize user needs;
- Competitive or other forms of funding allow user groups to participate more fully or to undertake specific initiatives (education, cycling Sundays, safe routes to school, etc.) within a national or regional cycling plan;
- Local user groups/task forces/panels actively involved in the planning and implementation of cycling interventions; and
- User associations may play a major role in the maintenance and operations of the built cycling infrastructure.

3.3 Stakeholder integration plan

One instrument for systematic stakeholder integration is to set up a special stakeholder involvement plan which defines project-related strategies to involve and convince all necessary stakeholders. Such an involvement plan is used for example in the project Active Access.[37] Important questions of such an involvement plan are for example:

1. Structure

Please complete the following table and add any further detail (if needed) in the additional paragraphs below. Please see notes for guidance when completing each field.

2. Convincing arguments

Consider the workshop results and presentations from the kick-off meeting when formulating arguments in a SPECIFIC way depending to the particular stakeholder in question. Some examples for arguments for a walking bus to primary school:

- Healthy mobility for children and accompanying parents
- Safety through adult surveillance
- Fun for children travelling with company
- Being better prepared for attentive learning because children had exercise before school
- Avoids car use (saves noise, threat, climate)
- Spare time for parents who do not have to accompany their children every day on their own
- No need for car access and less parking space at school
- …

3. Whom to approach and how to go about it

Identify individuals to be contacted and list their job title/role and name if known. Consider and note how these individuals will be contacted and by whom e.g. by email, letter, phone call or other less conventional methods.

4. Follow up strategy

Propose a follow-up strategy to ensure stakeholders remain engaged and informed about the project e.g. through regular events, newsletters, creation of institutions like round tables, gifts/giveaways and acknowledgements.

Approach	Relevant Stakeholders	Convincing arguments	Whom ad how to approach	Follow up strategy
• Walking bus to primary school	• Teachers • Parents • Media • …	• Children more attentive in class • Do not need to accompany children • everyday/health • Environment/safety	• Head of school by phone • Parents representative by letter • Local media journalist by taking them out for lunch	• Meetings/round • Table, Newsletters, Updates on • project through, photos/email
…	…	…	…	…

Table 3: Example of structuring stakeholders and reflecting their aims and how to approach them
Source: Thiemann-Linden (2010)

Further reading:

Thiemann-Linden et al. (2010): Active Access. Stakeholder Involvement Plan.

37 Chapter 3.3 taken from Thiemann-Linden et al. (2010) and edited

4. Strategies and elements of marketing communication

Marketing is not only understood as advertising and public relations but also as a comprehensive, long-term concept which is based upon one main idea, namely the aim – analogous to this marketing-concept – to develop a 'Unique Selling Proposition (USP)' for the product 'enhancing bicycle use'.

As the main focus lies on the change of behaviour and not the consumption of a certain consumer good, we apply social marketing. A common definition of social marketing is as follows:[38]

Social marketing is the adaption of commercial marketing techniques that aim to cause a common change in attitude and to influence, sustain or create awareness of relevant social norms, attitudes and behavioural patterns.

Several criterions have to be fulfilled for a positive social-marketing strategy. Besides behavioural change as the main objective, the use of market research and the identification of target groups are central requirements. Furthermore, the target groups need to experience a concrete benefit in the sense of a trade-off. This benefit of social-marketing objects often lies in the future and does not occur immediately after 'purchasing'. Beyond that, social marketing should contain all four instrument groups of classical marketing: product-, price-, communication- and distribution-policy.

The aim is to influence behaviour through different marketing-activities. By doing so the perception, attitude and the behaviour of the traffic participants shall be reached and respectively be changed. The purposes of social marketing in general contain four kinds of social changes:[39]

- The level of information of the target group shall be changed
- The target group shall be motivated towards a certain activity (for example a vaccination)
- Enduring routines of behaviour shall be changed (smoking, car-driving, etc.)
- Attitudes towards a certain topic shall be changed

This clearly shows that the aspired social change does not aim at a single change but is very complex. It is easy to increase the level of information (1) through information measures. At the same time people shall be motivated for a certain activity, for example to use the bicycle more frequently (2). In addition they shall change behavioural routines - the transport behaviour (3). The most difficult aim to reach is the change of attitudes (4).

Therefore it becomes evident, that the mere implementation of information- and awareness-campaigns to create more knowledge and awareness will not be sufficient. Moreover, a reinterpretation of society's norms and values should be reached through integrated communication-strategies which include image-campaigns, stakeholder-participation and internal communication in local administrations and planning bodies.

The selection of social-marketing measures is influenced by the way personal benefit and personal costs are displayed.[40] How change can be linked with a concrete personal benefit depends on the particular target group and results in different combinations of measures: In the case 'change of transport behaviour towards more bicycle use' the personal benefit is concrete and the costs (change of routines and attitudes) are high. That is why a change is difficult. Here the instruments of communication are especially important in order to communicate the benefits in a clear, emotional and comprehensive way.

In general, a communication strategy must explain who says what to whom, when and using what medium. The most effective approach is to direct the communication at interested groups and persons who intent to change their behaviour. Campaigns geared at special target groups, individuals etc., are more effective when public awareness campaigns have been carried out already either locally or nationally, because the public will then be more receptive to attempts at influencing attitudes and behaviour. It is essential to know what stage the general public has reached already within the process of behavioural change, as otherwise money will be wasted on campaigns that miss their target. The basic goal of communication strategies is to influence the public just sufficiently to tip the balance in the direction of modal transfer and safer behaviour – at minimum expense. Once the balance has been tipped, it is important to maintain the change of behaviour.[41]

38 Andreasen (1994)
39 Kotler/Roberto (1991)
40 Rangan et al. (1996)
41 Paragraph taken from Danish Road Directorate (2000)

4.1 Phases of cycling promotion

One way to visualize marketing communication and its interconnection with the 'hardware' aspects of cycling promotion (cycling inclusive planning, infrastructure and services) is to use a phase model[42] and adapt it to cycling promotion:

Figure 6: Phases of cycling promotion
Source: Own compilation adapted from Brandner (2000)

Figure 6 shows the core elements of marketing which consist of strategic and operative marketing. It integrates the phases analysis, prognosis (scenarios, brainstorming), realisation (create a vision and implementation) and control (evaluation). These overall phases have to be looked at individually: main aspect is the communicative level of marketing. This refers mainly to step 4, where the operative marketing includes the whole marketing mix: the four groups of instruments of product, distribution communication and price. Here, only the communication and product strategies applicable shortly before implementation are of interest.

4.1.1 Preparation: Planning and partnerships

For the promotion of cycling at a local level, an integrated, politically adopted action plan is indispensable.[43] Communication measures should be already integrated into the overall bicycle strategy or SUMP (or something similar; see Part I Planning). It is advisable to agree on the plan or strategy with all affected parties in order to save money, ensure commitment for implementation, and reduce conflicts among various targets and projects.

The availability of financial resources should be ensured from the beginning. Any plan without a well-defined financial component is in danger of just gathering dust. Private institutions or other organisations may open up new sources of funding. National or EU funding may also be available for specific measures. An ever-increasing number of organisations and agencies are interested in reducing car use and promoting cycling. They should be involved in the preparation and coordination of cycling strategies. Potential initiators and partners are mostly the stakeholders listed in the introduction to chapter 3.[44] Further partners could be:

- employers
- bicycle dealers and manufacturers

An integrated campaign includes the creation of a corporate design, the use of a combination of instruments, and the integration of different measures under one broad umbrella. Such a systematic application of marketing, aims at achieving a behavioural change for a social good. The addressee needs to see a clear approach in all activities. This may include promotion campaigns (e.g. posters, displays, radio, cinema and TV spots, etc.) and conventional public relations (e.g. events, competitions, services or financial incentives, etc.).

4.1.2 Analysis of the situation

An important starting point for adopting such a plan is to get an overview of the present cycling situation. Some of these analyses need to be done anyway when planning and prioritising infrastructure and service measures. Some examples which also focus on communicational issues are:[45]

- Accidents and black spots (e.g. accident maps, police records)
- Traffic volumes (e.g. traffic counters or manual counts, questionnaires)
- Travel patterns (e.g. analysis of traffic congestions)
- User satisfaction with the current situation (e.g. review debates in press, questionnaires, surveys)
- Traffic structure (e.g. inspection of routes, parking facilities, road constructions)
- Analysis of cycling friendly local companies and / or companies with many cycling commuters

Information can be gathered originally (primary research such as counting, observation, interviews, questionnaires, focus group meetings, consultations) or by

42 Brandner (2000)
43 Chapters 4.1.1 to 4.1.6 edited and taken from Urbanczyk (2010)
44 Danish Road Directorate (2000)
45 National Social Marketing Centre (no year)

others (secondary research such as statistics, newspapers, internet).[46]

External consultants may provide expertise if there is no sufficient internal competence. In the long-term, hiring new experienced staff is a good idea. Many cities also appoint a bicycle officer.

4.1.3 Setting objectives

Be clear about what you want to achieve. Your goals should reflect the needs of your target group (e.g. recreational cyclists, potential cyclists, regular cyclists) as well as of your participating stakeholders. Your targets should be ambitious but realistic, and should contribute to the achievements of national targets (if existing).

According to the Marketing Cycling Handbook, your objectives should be **SMART**:[47]

- **Specific**: Make sure the objectives relate to specific outcomes and this does not mean the actions you take to achieve them (a promotional flyer is no objective but a way to reach it).
- **Measurable**: Make your objectives quantifiable (e.g. a percentage, a rate)
- **Achievable**: Is the objective really achievable given a reasonable amount of effort and right application?
- **Relevant**: Make your objectives relevant to the needs of your consumers
- **Time-specific**: Set clear start and end dates.

Concrete targets could be the shift from car to bicycle traffic by x % in a given time, the reduction of severe injuries of cyclists by x % in a given period, or construction of x kilometres of cycle lanes.[48]

4.1.4 Action plan

Once it is clear what you want to achieve, you need to define how to achieve it. An action plan should identify the needs of the target groups. What do people want and which benefits do they expect? The action plan should include a list of tools to use (see chapter 4.2, 5, 6) and how progress is measured (see chapter 7). Note that measures include infrastructure as well as promotion and other soft measures. The optimal strategy to obtain a real shift from cars to bicycles combines a range of improvements for cyclists together with restrictions for car use. Here, infrastructure and service measures are listed since they also need communicational effort. New tracks, racks, and maps need to be known and perceived as added value.

Measures might include:[49]

- Infrastructure planning (e.g. cycle routes and networks, contra-flow cycling)
- Bicycle parking (e.g. more bicycle racks, bike stations, weather protection)
- Better road maintenance (e.g. winter maintenance)
- Road safety (e.g. black spot treatments)
- Restrictions on car use (e.g. road closures, speed-limits)
- Intermodality (e.g. bike&ride, bike on train)
- Bicycle schemes (e.g. city bikes, company bikes)
- Events (e.g. bicycle days, car-free days)
- Informational and awareness-raising campaigns (e.g. cycle-to-work-campaigns, promotion of new cycle lanes, safety campaigns)
- Training and education (e.g. targeted trainings)

4.1.5 Setting priorities

Each measure should be clearly described, ideally including a picture. Estimate the costs of each action and formulate alternatives for each measure. Prioritise your list of measures by trying to assess its impact in terms of a modal shift (remembering that real behaviour change can take many months). Useful questions for the assessment might be:[50]

- How many new cycle trips will the measure bring about?
- How many bicycle accidents will this measure prevent?
- How many road users will be affected by the measure?
- What will the measure mean for road users?
- What percentage of road users will change their behaviour?

4.1.6 Implementation

Undertaking coordination from one single point ensures a good overview of the process. A bicycle coordinator or an external specialist should be in charge of overseeing the whole implementation process. He or she should be the main contact person for all partners involved. Be prepared to adapt your action plan whenever needed,

46 National Cycling Strategy Board (2004)
47 Ibid.
48 Danish Road Directorate (2000)
49 Ibid.
50 Ibid.

allowing for space as new measures come up and others fall away. The media will be an important actor for communicating with your target groups. Ideally, they should be involved from the outset, but at a bare minimum, at the inauguration of any new measure.

As evaluation is a special section in this part, it is not again specifically mentioned under the phases of promotion (see chapter 7).

4.2 Elements of marketing communication

4.2.1 Theoretical models on behaviour change

The transtheoretical model (TTM) is an action model in environmental and social psychology/sociology.[51] Originally the TTM is based on six steps of behavioural change which succeed each other. The aim of the model which was developed in 1982 by Prochaska and DiClemente is to explain intentional decision-making processes. The time perspective is included explicitly. For this reason it is the only model taking into consideration that a change in behaviour happens in a process-related way and that people who change their behaviour are each in a different phase. Furthermore some steps relate to the fact that for example new routines and habits have to be build in order to prevent a fall-back into former behaviour. In this respect the model is efficient and transferable. However, until now it was used mainly in relation with inadequate health behaviour, for example to overcome addictions or to promote more physical exercise. It is, however, still controversial if the analogy 'car-driving equals the bad/addiction' is correct. In our case the focus lies less on quitting a behaviour and more on a shift towards a certain behaviour.

The transtheoretical model assumes that every kind of behavioural change is a long-term process passing different levels. Originally, it consists of six levels of manifesting behavioural change.[52] For a bicycle motivation and image campaign (see 6.1) this model was reduced to three levels (see Figure 7):

- Preliminary phase (pre-/contemplation), in which the communication uses rational and emotional arguments for CO_2-free mobility and tries to provoke thinking about mobility behaviour.
- Activity phase, in this phase car-users get the personal chance to try cycling or walking for themselves (preparation and action)
- Confirmation phase (maintenance phase), aims at all people who have actually changed their mobility behaviour trying to motivate and reinforce these people to stick to their new mobility habits. This phase is of utmost importance because confirmation of behavioural change can prevent a fall-back into old behavioural patterns which often happens after a behavioural change.[53]

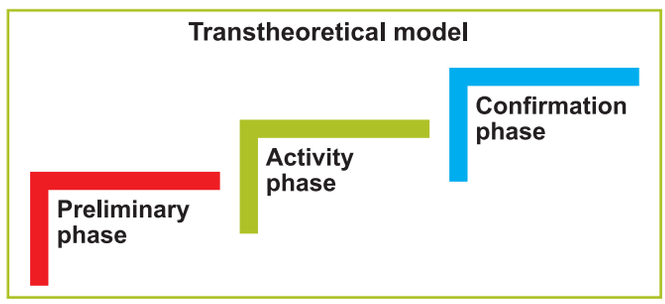

Figure 7: Three steps of the campaign 'Kopf-an: Motor aus'
Source: Own compilation adapted from Fairkehr 2011

The transtheoretical model has been already empirically evaluated in its assumptions in several studies from different fields of health related behaviour. The variables could be confirmed related to their predictive power.[54] However: According to analyses from different studies the model is suitable to trigger short-term behavioural changes; long-term effects (lasting longer than several months) often fail to appear.[55] As possible reasons the following aspects could be identified:

- Activities like cycling comprise different behavioural patterns (in difference for example when compared with smoking).
- The separation of persons on a "starting level" is crucial for the communication strategy. Because of the complexity this determination is still afflicted with failures.
- Physically active behaviour is influenced by many external factors (age, gender, socio-economic status) which are not considered within the transtheoretical model.

However, to use a model like the TTM in order to be able to think in advance about how behaviour change could work helps to develop a communication strategy. Without a model in the background, the strategy is likely to exist only of assumptions and erratic compilation of measures.

51 Summary of TTM and considerations taken from Deffner/Götz (2008a) and edited
52 Keller (1998); Prochaska et al. (1994)
53 Fairkehr GmbH (2011)
54 Prochaska et al. (1998)
55 Adams & White (2005)

Note

When assigning a communication agency to work out a strategy or campaign, there should be some references in their concept explaining on which concept the communication experts rely and how it is supposed to function.

Models in advertising impact and communication research

The in the meantime, the AIDA-model which was developed more than 100 years ago is a stage model.[56] It was developed 1898 by E. St. Elmo Lewis and was initially intended as a kind of guideline for sales conversations.[57] The acronym A-I-D-A stands for:

- Attention (attention for a product),
- Interest (arising interest for the product),
- Desire (desire to purchase the advertised product) and
- Action (action of consumption).

Following AIDA, a lot of further stage models have been developed,[58] which are very widespread in the field of advertising- and communication research. Stage models are rather a description of reaction chains than determining factors. But two important components which are significant in the classic consumption of a product as well as when it comes to performing certain behaviours are indeed missing: On the one hand there is the inclusion of behaviour (involvement). On the other hand there is the so called experience of application meaning that a person already has experiences with the (desired) behaviour in any field and that these experiences or rather sub aspects of them have been positive for the person.

The steps of action within behavioural change are not only process-related. Furthermore there is no certain order in the sense of a reaction-chain. This becomes apparent with the so called model of the 3-hierarchies: The typical learning-chain which underlies the AIDA-model is

- learn (cognitive processing),
- feel (affective processing),
- do (conative processing)

But research has found out that also spontaneous trying-out of new behaviour can occur. This means that the 'do' can be the first link in the chain (do-feel-learn) or that the order can be learn-do-feel as well. Within these hierarchies the target groups/persons - like in the transtheoretical model - are each located in different phases in which they can be addressed. Besides, the involvement of the target group/person plays a significant role and offers different starting points for a communicative access.

Conclusions

In spite of all its constraints the AIDA-model can be used as a framework to achieve behavioural changes. For the promotion of bicycle traffic the four phases can be adapted in the following way: [59]

- Create *Awareness*: The target audience has to know about a cycling opportunity in order to be in a position to choose it → 'I've seen these great images of women cycling.'
- Generate *Interest*: Beyond initial awareness, people have to get curious and interested → 'Perhaps I should think about taking up cycling.'
- Awaken *Desire*: A passive interest needs to be developed into an active desire to participate → 'I'd like to look like that!'
- Invite *Action*: Find the final "trigger" that can make the target audience take the plunge – in other words, start cycling! → "And there's a fantastic offer at the XY bike shop at the moment.'

Furthermore the following conclusions can be drawn from communication models: There is no appointed order between do, learn and feel. This has to be considered when concrete strategies are developed (model of the 3-hierarchies): [60]

- The typical order *learn-feel-do* applies if the target group is already open-minded, if it can be reached argumentative. In this case the emotional aspects of cycling will be anticipated → 'yes, that would be fun for me too' and this will result in a certain behaviour.
- The sequence of *do-feel-learn* applies if there is a spontaneous event at the beginning, for example if there is the low-threshold possibility for a bicycle test ride. First there can be an affective converting of the experienced event, so a learning effect occurs → 'Oh, actually it has been quite nice – I could do this more often!'
- Besides this the order *learn-do-feel* is possible. In this case the person is for example intensively deal-

56 Summary on AIDA and considerations taken from Deffner/Götz (2008a) and edited
57 Bongard (2003)
58 Liebert (2003)
59 List edited and adapted from National Cycling Strategy Board (2004)
60 Summary and considerations taken from Deffner/Götz (2008a) and edited

ing with the subject of arguments for cycling for instance because many colleagues use the bicycle on their way to work. Then the behaviour will occur because of this reason. Later on there can also be a positive attitude → 'Should I try this by myself?'

- Finally, it may be possible that within the *feel-do-learn* order the emotional level can be addressed – for example through fascinating, highly emotional bicycle technology with a high appeal which raises a desire to give it a go and later on triggers wow-effects of learning.
- Avoid boomerang effects: It is important to keep in mind the risk that negative attitudes can be provoked by advertising messages. This can happen especially in relation with CO_2 and environmental topics (possible reaction: 'I cannot hear it anymore!'). It is thinkable to draw the following conclusion: It is essential to take the benefit, fun and target group specific attitudes into consideration and to communicate the main aim casually: 'By the way, it saves CO_2 too'.

4.2.2 What is the message?

Cycling offers indeed many benefits, but promoting the full range of benefits to everyone at the same time will not be successful.[61] Rather it is advisable to identify the views, needs and messages that will appeal mostly to the main target group(s).[62]

For boomerang reasons (see 4.2.1), bicycle promoters should not only focus on the "save the environment"-message. Those for whom the message is convincing have probably already been won over. Rather than continuing to wave the environmental flag with little or no effect, other messages are needed to appeal to other audiences.

Key messages should invoke positive emotions by conveying the spirit of fun and joy, freedom and independence of cycling (or whatever positive image would most likely appeal to the given segment of the population). Promotion needs to encourage people to use their bikes by creating positive associations of cycling. Since travel behaviour is often irrational, promotional activities focusing on rational reasons to cycle are inevitably less successful.

See Table 4 for examples of messages for different target groups.[63]

Target group	Message
School children	Cycling is fun, makes you feel free and independent. You are part of traffic.
Adults	Cycling is fun, makes you fit and healthy.
Commuters	Cycling saves time and money and keeps you fit.
Novice cyclists	Cycling is quick, easy and flexible.
Females	Cycling is chic, fun and shapes your body.
Immigrants	Cycling means freedom of movement and independence. It is quick and easy.
Elderly	Cycling is relaxing and good for health.
Car drivers	Cycling is fast and convenient and saves money.

Table 4: Examples of messages for different target groups
Source: Own compilation adapted from Urbanczyk (2011)

Broader messages can be motivational ones about safety and more mutual consideration and respect targeted at all road users. At the societal level, topics such as safety, the environment, traffic congestion or respect in road traffic are predominant. Messages can also be targeted towards other road users such as car drivers. Campaigns denigrating car users should be avoided.

Even in places with higher cycling levels where the benefits of cycling are generally clear to almost everyone, it is still valuable to reinforce positive associations. Copenhagen, one of the foremost cycling cities in the world, used its successful "I bike Copenhagen" campaign to remind and reassure citizens how attractive cycling is – and therefore how sympathetic Copenhageners are because they cycle.

"One might promote the benefits of a new cycle route as "an enjoyable, fast and convenient way to the shops", rather than as "a hard surfaced track created by the city council to divert bikes from the High Street".[64]

4.3 Corporate design

Independently of whether a broad campaign or single measures are planned, an important step for a successful and effective marketing is the development of a corporate design. The corporate design must be unique and catchy and representing the product: cycling mobility. The logo, as a kind of self-explaining symbol, must be present on all cycling relevant elements in the city (signposts, info-points, posters, advertising, internet, etc.). Like any other product, cycling mobility obtains an identity with the logo and the whole corporate design. In all information- and marketing elements the aesthetical aspect i.e. the visual appeal must be highly valued. Cycling has to get a positive perception and image.

61 Chapter 4.2.2 taken from Urbanczyk (2010) and edited
62 National Cycling Strategy Board (2004)
63 Ibid.
64 National Cycling Strategy Board (2004)

Figure 8: Logos of cycling cities integrating a positive message and local elements: The Copenhagen logo (above) and the Munich logo (below).
Source: www.ibikecph.dk, www.radlhauptstadt.münchen.de

The logo is a carrier of the brand "cycling mobility" and conveys this message. Whether a word and logo brand or only a logo brand is developed, depends on the local circumstances, the presence of other previous marketing measures (e.g. city marketing brands) etc. Many successful logos show a special feature of the place/city e.g. city colours, abbreviation, shape of the city or a local landmark or monument. It is recommended to develop the corporate design including the logo together with a professional marketing agency. The logo should ideally carry the following messages:

- Easy identification "bicycle" or "bike mobility"
- Easy recognition
- The idea of "velocity"
- An emotional binding
- Site specific aspects (colours, shortcuts, etc.)

In addition to the logo, a catchy and easy to remember advertising slogan should be developed. The writing as well as the colours must be consistent with the logo. Under the signature, the bike mobility of each city must be proposed and everybody should identify immediately what the signature tries to communicate.

The brand (logo + slogan) should help to make a unique product of the bike mobility in a city. This product must be easy distinguishable from other means of transport, and this can only happen on the emotional level.

Case study: „I bike Copenhagen"

With it's 'I bike CPH'-campaign, the city of Copenhagen promotes itself, both to its own citizens, as well as to the rest of the world, as the best place to cycle. The awareness among Copenhageners that outsiders find their cycling culture special improves their own attitude toward cycling. This is creating a circle of positive reinforcement.

The term "to Copenhagenize" evolved and became synonymous among urban planners for successful planning and design that puts pedestrians and cycling in the focus of city transport, and is a benefit for residents, the environment and the vitality of cities.

This promotional campaign is, however, only one part of a much larger master plan to increase cycling levels in Copenhagen and to improve the quality of the cycling experience in the city.[65]

Further reading:
Ökoinstitut Südtirol/Alto Adige (no year): Toolkit for the implementation of a corporate cycling system. Bicycle friendly Bolzano/Bozen.

65 PRESTO consortium Factsheet on broad promotional campaigns

5. Identifying target groups

Generally, cycling is feasible for almost everybody: young and old, male and female, those from different social groups or at different fitness levels, and in many cases, even for people with disabilities. As already mentioned in chapter 4.2.2, no single message will appeal to such a wide range of people. Messages need to be created that appeal to the various needs and wants of each group.

For changing people's travel behaviour, their mobility related motives, needs and attitudes have to be looked at. There are different ways to identify characteristics and to group similar people with similar needs. This is what is described in the following subchapters.[66, 67]

5.1 From segmentation to targeting

There are two successive stages in the marketing processes:[68] segmentation and targeting (see Figure 9). **Segmentation** means dividing consumers with similar needs into sub-groups. You will then have a group of people of the same needs, which you can now address directly. Criteria for segmenting consumers may be, for example, age, gender, living neighbourhoods, work places, bike ownership, or their attitudes toward various transport modes.

Transport for London (TfL) divided the London cycling market (people who already cycle) into eight segments according to the type of cyclist, cycling frequency, and purpose. The analysis of all cycling trips found out that 70 % of those who cycled were only occasional cyclists (e.g. during the summer, for shopping or leisure, at weekends, fair weather commuters, etc.) and that 30 % of all cyclists in London accounted for 80 % of all cycling trips. For this group, there is no need of persuasion. The objective there is to support and encourage their behaviour (e.g. by improving facilities) every once in a while (see 4.2.1 transtheoretical model).

People who only cycle occasionally account for 25 % of all trips and therefore represent the most interesting group. They are already positively disposed towards cycling and therefore the best target group to encourage to cycle more through promotional approaches (e.g. by providing them more information on routes, by offering cycling training or by individual consulting).

This leaves 85 % of people in London who do not cycle at all (e.g. people who do not own a bicycle, who have no cycling skills, or who have a negative perception about cycling). Reaching this group is a challenge, but (following a segmentation of this group) at least some can be convinced through broad promotion campaigns or training offers.[69]

The London study clearly outlines the various potential target groups for cycling: Among the big groups of non-cyclists there are different age and gender groups as well as commuters, school children, students, retirees etc. Generally, they can be distinguished by orientations and attitudes which form their lifestyles and mobility styles. Promotional activities can address specific needs and wishes more directly when using tailored messages, channels and media in adequate design of look-and-feel.[70]

In a second step, these sub-groups with certain shared characteristics are assessed according to their potential for bicycle take-up. It is best to focus first on the groups which are most likely to be receptive (potential groups). Then you can concentrate your resources on meeting their needs and desires.

In a third step the next group is aimed at. This process is called **"targeting"**. Exemplary target groups are described in the next subchapters.

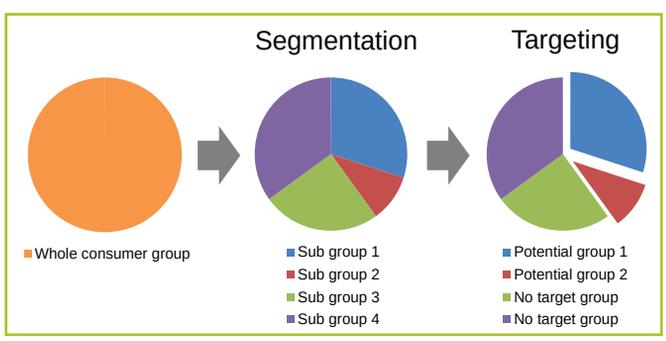

Figure 9: Process from segmentation to targeting
Source: Own compilation

5.2 Approaches for identifying target groups

The fact that people have different needs and motivations is one reason to target promotion efforts. As already mentioned, it is useful to concentrate communication measures on certain target groups which promise the greatest potential to change their behaviour towards more cycling. In most cases the budget is

66 Deffner et al. (2009)
67 Cycling England (no year)
68 Chapter 5.1 taken from Urbanczyk (2010) and edited
69 Cycling England (no year)
70 Öhmann (2009)

not sufficient to target all groups at once. As there are many ways of targeting, the following examples give some insight into the different ways to segment the population.

In marketing research, target groups are groups of people which are seen as potential consumers and users of products and services. As already mentioned in chapter 4, the field of social marketing does not deal with the promotion of consumer products but with awareness-raising towards social problems and behavioural changes. Addressed will be those target groups which are of higher relevance for the specific problem respectively for which the likeliness to adopt the promoted ideas and behaviours is highest. Target groups can be characterized by

- a certain life situation or socio-demographic attributes,
- a certain (user) behaviour,
- certain general opinions, for example similar ideas and attitudes towards life. In the field of lifestyle-marketing, general attitudes, lifestyles and stylistic preferences are therefore addressed.

In line with this approach are the following proposed target group segmentations in relation to bicycle mobility. Target groups will not simply be identified by differentiating between transport user groups according to the means of transport like for example car-drivers, public transport users, etc. There are simple approaches to characterize target groups according to their socio-demographic attributes. For example the groups seniors, pupils, employed persons are indeed quite common but represent a more or less rough differentiation. Taking into consideration lifestyles of individuals plays an important role for addressing different target groups. In a first step, such target group models segment the whole spectrum of the population – and all appearing attitudes, behaviours and lifestyles. Then one or more of these subgroups can be selected as target groups.

5.2.1 By age, demography or phase of life

One common and practical way of segmenting populations is by age or demography. These criteria are used because one assumes that each of these groups has specific needs and preconditions, e.g.:

- pupils, particularly those in the later stages of primary school, who are a very active cycling group
- active retired people
- people in their twenties who used to cycle but have lost the habit.[71]

But besides segmenting only by age, demography includes other factors like gender, spatial contexts of living and levels of education.

Another segmentation approach relates to different phases of life. Within the project 'Lifecycle', certain opportunities are identified where travel behaviour change can happen. These changes can be used to promote cycling.

The key to fostering cycling as a life-long habit is to introduce its benefits to people at specific times in their lives when they are most likely to rethink their daily mobility habits and/or their attitude toward physical activity and their personal health.[72]

The Lifecycle implementation manual lists the following opportunities for change in travel behaviour:

- Birth of children
- The start of kindergarten
- When a child first learns to cycle
- Start of primary school
- Start of secondary school
- Driving license (moped, motorbike, car)
- Start of higher education
- First employment (including apprenticeship)
- Starting a family/joint household
- Changing residence
- Change of employment
- Caring for a family member
- Retirement
- Social engagement and leisure activity

The proportion of people in each life phase and age group can be roughly estimated, even without consulting local statistical data e.g. the residential register.

71 List taken from National Cycling Strategy Board (UK) (2004)
72 Paragraph taken from FGM-AMOR (Publisher) (2011)

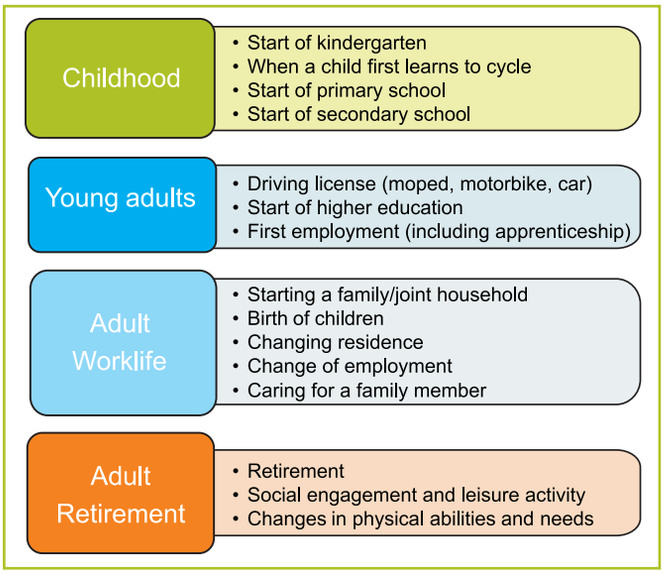

Figure 10: Opportunities during a life course when new routines are formed and therefore changes in travel behaviour are easier.
Source: Own compilation

5.2.2 By specific cycling habits

One approach to identify target groups for cycling promotion measures is presented within the PRESTO project (see Figure 11). This approach identifies four different target groups related to varying cycling habits and cycling frequency of persons: [73]

Competitive cyclists represent the smallest group. They cycle for athletic reasons and consider it sports or their "mission". There is no need of direct influence by promotion but still a need of keeping them on track and encouraging them use their bicycle for every day reasons as well. They could also be considered as form of recreational cyclists.

Regular or utility cyclists (every day cyclists) represent a bigger group. Regular cycling encompasses any cycling not done primarily for fitness, recreation, or sport but simply as a means of transport. The fitness aspect is only a positive side effect. The bicycle is used every week or even on a daily basis for specific purposes (e.g. for shopping, commuting, visiting friends, etc.). These cyclists are already aware of the benefits of cycling, but still need to be rewarded and reassured.

Recreational cyclists cycle rarely and mostly just for leisure pursuit, e.g. on weekends. They do not regard their bike as a mode of transport for daily use. Moreover they see it as means of distraction, adventure and to be in nature.

This large group represents a huge potential in all cities and should be addressed with campaigns, events, test tracks and other means of promotion.

Potential cyclists (or non-cyclists) represent the biggest group; they have not ridden a bike for more than a year however many of them might consider cycling if the conditions for it were better. Targeted promotion campaigns could have a promising effect on many subsegments of this group.

Although every European city, be it a champion, a climber or a starter cycling city, has a different share of competitive, regular, recreational, and potential cyclists, shifting people from recreational and potential cyclists to regular and utility cyclists is the common aim of existing policies. Figure 11 outlines a desirable shift between these target groups toward more cycling.

To identify which groups exist in which proportion in a certain population, e.g. a city, can be done by a representative survey. The questions could comprise cycling habits and frequencies but also trip purposes for which the bike is used as means of transport or recreation.

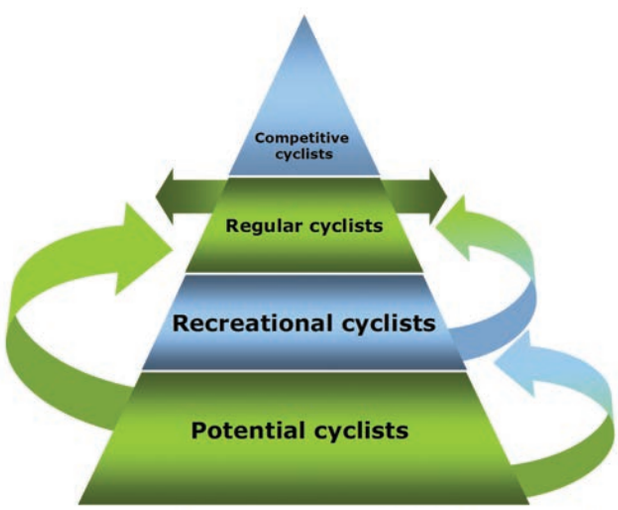

Figure 11: Target groups and the desirable shift
Source: Urbanczyk 2011

5.2.3 By geography or location

A simple way to segment the population is according to geography respectively the location. This may be useful if people shall be encouraged to bike to work, for example. It may mean targeting those who live or work within a certain distance of a cycle route, or who work in a certain location. To do this, you will need some basic information about travel patterns."[74]

73 Following paragraphs taken from Urbanczyk (2010)

74 National Cycling Strategy Board (UK) (2004): Marketing Cycling Handbook

Another example is the promotion of bike and ride solutions. Promotion measures can be focused on commuters living within certain distances around public transport stations. Also bike to school programmes may target those groups of pupils living within a certain radius of their school.

5.2.4 By mobility styles

Research has shown that the choice of a certain means of transport is not based upon reason alone but that emotion and symbolism are also important – maybe even more so. During the last 15 to 20 years, research has been conducted on how emotions affect transport behaviour. One sociological approach is to look at aspects related to a life style (or way of life), as they include the emotional and symbolic dimension. Lifestyle models are based on the understanding that within different social groups similar values, norms, orientations and attitudes are shared. Basic life style orientations comprise patterns regarding e.g.:

- Traditionalism/modernity (family orientation, individualism, hedonism)
- Religious beliefs, world views,
- Risk affinity or
- Affinity to new technologies.

These orientations are also described by socio-demographic and economic characteristics of the social groups.

From there, the characteristics of belief and action (behaviour) can be taken to describe possible consumption and behaviour patterns. Life style models help us to understand which other factors (besides e.g. time, money and rationality) have to be considered, they help explain behaviour: the understanding of personal choices also implies:

- Motivations for fun, fitness, speed
- Risk affinity, technic affinity
- Values like traditionalism or modernity etc.

Most lifestyle models focus on basic orientations but are not very specific. More helpful are mobility-style models which include lifestyle orientations as well as specific mobility orientations and values.[75]

However, communication measures in the field of bicycle promotion should address orientations and attitudes which are specific for different lifestyle groups. In order to filter from all appearing life styles those ones which are realistic to reach by targeted communication measures, one has to look explicitly to the orientations which suggest an open mindedness for cycling and possible alliances of motives.

Note

In the following we describe three main target groups based on mobility style research. Their empirical basis is Germany/Western Europe (WEC). There the three groups cover almost 50 % of the population over 16/18 years. As we doubt (but have no empirical basis) that they have the same coverage in Central and Eastern Europe (CEEC) we decided to link them to a general lifestyle model for CEEC (see further text).

Target groups basing on mobility-styles

Three main-target-groups can be distinguished (as a result of different studies on mobility styles and travel behaviour[76]). Groups who already use the bike as an everyday means of transport are excluded here. They are not a core target group as they cycle already. But nevertheless, they have to be acknowledged in their behaviour even if they should not be the focus of attention of communications measures.

Mobility styles with high potential for everyday cycling:[77]

➔ **Fun and Performance-Oriented:**
- Adventure and movement through dynamism, velocity, risk-affinity

➔ **Nature- and Health-Oriented:**
- Adventure and movement through sport, nature and health

➔ **Avid Culture-Oriented:**
- Adventure and movement through muse & pleasure, discovery and curiosity

75 Ohnmacht et al. (2009); Götz et al. (2002)

76 Götz et al (2002) and Ohnmacht et al. (2008)

77 Götz/Deffner (2008b)

Fun and Performance-Oriented

Mobility orientations	Lifestyle orientations
• Adventure, velocity, risk • Self-controlled and individual means of transport (car, bicycle) • Car-driving is fun • Vehicles as an important lifestyle-symbol • Walking is boring	• Individualism • Technology-affinity • Active leisure: Entertainment and thrill-orientation (dancing; partying, going out) • Sportive • Adventure and have fun with friends
Socio-demographic description	**Travel behaviour**
• Often younger people and men • Often singles • High educational achievements	• Average car use • High public transport use • Low bicycle use and walking

Nature- and Health-Oriented[78]

Mobility orientations	Lifestyle orientations
• Combination of adventure- and family-orientation • Sporty • Willingness to spend money for nature-adventure and environmental friendly traveling • Explicit interest in protecting the environment to use it for oneself	• Culturally interested and socially involved • Explicit sense of responsibility (sustainability) • Technology-affinity (information and communication technologies)
Socio-demographic description	**Travel behaviour**
• Balanced proportion between men and women • Average age distribution between age groups • Larger households	• Slightly more than average: car use • Average public transport use • Bicycle use is slightly higher than average

Avid Culture-Oriented

Leisure time and holiday-orientations	Lifestyle orientations
• Enjoyment of cultural diversity • Looking for authenticity • Communicative and open-minded towards new impressions and knowledge	• Cultural interest • Preservation of bodily and mental fitness • Social involvement • Open-mindedness and tolerance • Rejection of traditional values
Socio-demographic description	**Travel behaviour**
• „Best Agers“(50 plus) • Educational achievement above average • Higher than average 1 and 2 person-households	• Average car use • Lower than average: public transport use • Slightly higher than average: bicycle use

78 This type is know from other research also as Life style of Health and sustainability (LOHAS)

Figure 12: Example for a cycling campaign poster addressing the Fun and Performance-Oriented
Source: City of Nuernberg

Figure 13: Example for campaign poster addressing the Nature- and Health-Oriented
Source: City of Nuernberg

Figure 14: Example for campaign poster addressing the Avid Culture-Oriented
Source: City of Nuernberg

Link to Central and Eastern European Lifestyle findings

In a survey carried out 2005 by GFK general orientations and lifestyles of the Eastern European population were investigated.[79] The GFK investigated general orientations of the population which might also contribute to cycling behaviour and consumer needs in our field (trend dimensions). East European consumers:[80]

- attach high importance to the family
- say that they are environmentally conscious
- are more safety oriented and risk averse
- are more puritanical than hedonistic
- prefer a timeless aesthetic to a fashionable one
- pay attention to the ambiance
- want to enjoy leisure time with friends
- think more about tomorrow than to enjoying life here and now
- put more emphasis on basic benefits than on additional product features

The GFK lifestyle model is called Euro Socio Styles (see Figure 15). It is developed around the dimensions reality, change, permanence and appearance (mirage). A direct linkage between the three mobility styles and this life style model is not possible. The following four lifestyle groups refer mostly to the mobility styles.[81] Within this CEEC-life style model between 21 % and 30 % can be seen as having a potential cycling affinity. The potential can be triggered by target group oriented communication measures and infrastructure improvements:

➔ **Authentic World:**
- Rational, moralistic cocooned- families with good incomes who are engaged and on seeking a harmonious and well-balanced life.

➔ **Cosy Tech World:**
- Active, modern couples in their middle ages with mainly more expensive household equipment, seeking individual self-fulfilment.

➔ **New World:**
- Hedonistic, tolerant intellectuals with a higher standard of living and seeking individual harmony and social engagement.

➔ **Crafty World (partially):**
- Young dynamic and opportunistic people with humble beginnings in search of success and material independence.

79 11 countries, sample: over 12.000 inhabitants, see: Kofler/GFK (2005)
80 Ibidem
81 Kofler/GfK 2005

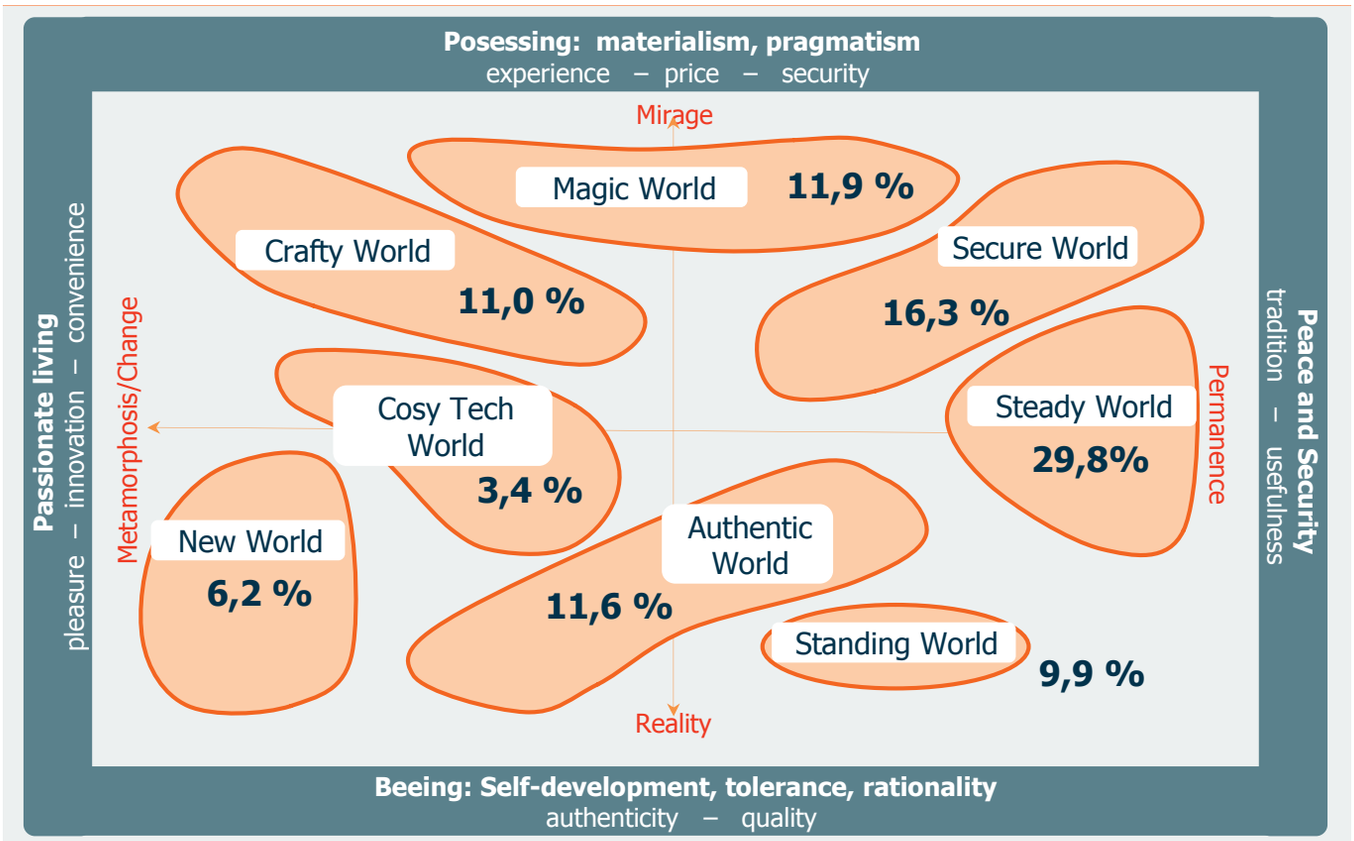

Figure 15: Euro Socio Styles of GFK for Central and Eastern European countries
Source: Kofler/GfK 2005

Further reading:

Segment (http://www.segmentproject.eu/).

FGM-AMOR (Publisher) (2011): How to run a cycling action. LifeCycle Implementation Manual.

6. Examples for marketing campaigns and other communication measures

In the following a variety of communication measures is described. They range from

- Broad image and motivation campaigns over
- Programmes and actions to motivate specific groups to
- Other cycling promotion activities and measures that are not necessarily set up the way campaigns usually are.

These promotional options raise people's awareness about cycling as a mode of transport, positively influence general attitudes towards cycling and improve people's skills and confidence so that they can re-examine their current transport habits and choose healthier and more effective ones.[82]

6.1 Broad image and emotionalising campaigns and actions

A broad image campaign is intended to motivate those who currently do not cycle, and to create a positive image for cycling among the public in general. As in other product marketing, e.g. in automobile advertising, emotions are used to convey the symbolic as well as material benefits and a certain lifestyle feeling that goes with cycling. This creates an attractive atmosphere for the "idea".

Broad cycling image campaigns are appropriate in climber cities and champion cities. In starter cities the first investment should be in infrastructure and education measures rather than promotional activities. There should be something new and positive to promote to potential cyclists. It is not appropriate to invest in a motivation campaign unless there are some reasonably good cycling conditions.[83] In the early stage, promotions about a new infrastructure are more appropriate.

6.1.1 'Brain on: engine off' campaign in Germany

In Germany, the first nationwide campaign to promote walking and cycling was launched in 2009.[84] Its aim was to make people rethink their travel behaviour and make more trips on foot and by bike. The target group consists of those who take the car for distances they could easily cover on foot or by bike (short distances up to 6 kilometres). The campaign was composed of various modules and supported by several well-known Germans who gave their comments. The different modules of the campaign follow the steps of the transtheoretical model which is used in psychological research (see chapter 4.2).

Figure 16: Outdoor poster of the German motivation campaign - 'Big thank you! to all Dortmund' cyclists
Source: fairkehr Agentur GmbH

The messages are funny but also provocative. Media such as outdoor billboards, posters and banners were used to specifically reach car users travelling short distances. The campaign also included events, brochures and a website with information on short trips, including a CO_2 calculator informing about the benefits of cycling and walking. However, in order to reach people in their daily environment as well, the messages were disseminated through humorous cinema spots, on shopping trolleys in supermarkets, and on vending machines for car parking. As the financial budget for the whole campaign was limited, the marketing agency decided that the content of the campaign could be conveyed cost-effectively only with verbal-messages and short frequencies of advertising rather than locally adapted images/photos and layouts. Besides setting the main focus of the campaign on messages, the campaign adapted three different colours according to the three different steps of the transtheoretical model.

82 Taken from Urbanczyk (2010)
83 PRESTO consortium Factsheet on Broad promotional campaigns
84 Chapter 6.1.1 taken from Urbanczyk (2010) and edited

Figure 17: Outdoor poster of the motivation campaign "Kopf an: Motor aus" - 'Why not burn calories instead of fuel?'
Source: fairkehr Agentur GmbH

In 2009, a nationwide competition took place to select the cities in which the campaign would be launched. Four cities (Dortmund, Bamberg, Halle and Karlsruhe) were chosen to adapt the campaign to their local situation. An evaluation was carried out by FORSA and Wuppertal Institute. The results showed a high awareness of the campaign: 76 % of all interviewees in the cities had noticed the campaign. 96 % of those who had noticed it welcomed its general idea. 26 % even claimed the campaign caused a positive change in their attitude towards more cycling and walking (Reutter 2010).

After a second call in 2009, five other cities were selected for the adaptation of the campaign in 2010 (Berlin, Braunschweig, Freiburg, Herzogenaurach and Kiel).

Further reading:

Urbanczyk, Rafael (2010): PRESTO consortium Cycling Policy Guide. Promotion of Cycling.

www.kopf-an.de (in German).

Bikeminded (http://www.bikeminded.org/) and (http://www.cyclingcarma.com/english/index.php).

Campaign: Radlhauptstadt München (http://www.radlhauptstadt.muenchen.de/).

6.1.2 Bolzanos corporate cycling system

The city of Bolzano in northern Italy with about 100.000 citizens managed it in about 10 years to raise its modal share of cycling significantly. The trigger of this development was a broad corporate cycling scheme developed by the city of Bolzano together with the Ecoinstitute Alto Adige starting in the year 2000. The four elements of Bolzanos corporate cycling system are:

- A coherent cycling network
- Bicycle parking areas
- Information and communication
- Marketing

Of course the last two elements are most relevant when discussing communication towards behavioural change. But it is also important to emphasise that in Bolzano cycling was developed as a system and therefore the first two elements are strongly interrelated with the last two.

In the years following the completion of the infrastructural planning, the city of Bolzano carried out systematic marketing measures and investments in the bicycle infrastructure co-financed by EU-projects (EMOTIONS, VIA NOVA, Trendy Travel).

As explained in chapter 4.3 all promotion activities are framed by a consistent corporate design with the brand BiciBolzano (CyclingBolzano) featured by the logo. The logo (see e.g. Figure 18) is found on every kind of bicycle related information material as well as on bicycle infrastructure facilities, rental bikes, signposts and Infopoints and selected bike parking facilities.

Figure 18: Guidance system in Bolzano (Italy)
Source: Deffner 2011

Other measures like the installation of a guidance system as an infrastructural measure were also aimed at communication: it shows safe routes to core destinations all over the city. And it transports the message that cycling in Bolzano is feasible, easy, aesthetic and attractive.

One of the key elements relating to information and communication in Bolzano is a newly designed foldable pocket sized bicycle map. It shows all routes in Bolzano. Another element is the installation of special Infopoints alongside the cycle routes (see Figure 19). These Infopoints show the cycle route map of Bolzano and the current position as well as other bicycle related local information.

Figure 19: Infopoint in Bolzano (Italy)
Source: Deffner 2006

There was also pure marketing like a broad campaign with huge outdoor posters, banners, advertisements on buses, postcards, cinema spots and bicycle promotion festivals. All these marketing efforts try to motivate people to cycle and at the same time to convey the picture that cycling is something pretty. Careful attention is paid to the aesthetics and the Italian understanding of beauty in everyday design.

Figure 20: Bicycle racks with BiciBolzanos logo, Bolzano (Italy)
Source: Deffner 2011

Bolzanos systematic plan to promote cycling and to change people's behaviours and attitudes towards cycling was so successful that between 2002 and 2005 the modal share of cycling increased from 18 % up to 23 %. In particular Bolzano's corporate design, the guidance system for cyclists and the marketing concepts are models for other cities that want to increase cycling levels through systematic cycling promotion measures.[85]

Further reading:

Ökoinstitut Südtirol/Alto Adige (no year): Toolkit for the implementation of a corporate cycling system. Bicycle friendly Bolzano/Bozen.

PRESTO consortium Factsheet on broad promotional campaigns.

85 Rinner (2006)

6.1.3 Bicycle events, testing and festivals

Bicycle events are a good way to raise attention and create interest for and acceptance of cycling.[86] Bicycle events are usually open-air events such as exhibitions, bicycle marathons, bicycle flea markets, car free days, or special occasions such as the inauguration of bicycle routes, parking areas, public bicycle schemes etc. Ideally, they can be combined with popular annual celebrations such as European Mobility Week, seasonal festivals or the anniversary of the city or a street. A bicycle testing track (e.g. for pedelecs, electric bicycles, recumbent bikes or tandems) can get the public actively involved by allowing them to personally experience the benefits and joy of cycling. Such events can provide good press coverage and address many different target groups.

If such an event is planned, it is a good idea to involve as many stakeholders as possible to increase your coverage. The involvement of bicycle retailers is a crucial factor for the success of such an event since they are closer to the cyclists and those who are already interested in cycling, and since they know best their needs and constraints. They should also be given the opportunity to promote and sell their products. The event should be broadly announced in newspapers, online, with posters etc. at an early stage. Other local stakeholders like health insurances, sport clubs, tourist associations are useful to win as partners of festivals, too.

Further reading:
PRESTO consortium Factsheet on bike events and festivals.

Case study: Poznan (Poland) Bicycle greeting of spring

The first "The Bicycle Greeting of Spring" took place in 1993. The event takes place once a year, at a weekend as close as possible to the first day of spring. Every year the event attracts numerous groups of single-track vehicles' fans. Together they pass through the city center on their bicycles and drown non-standard Marzanna (kind of a dummy; according to Polish folk tradition Marzanna symbolizes winter and it should be drowned at the first day of spring) which symbolizes one of the problems connected with bicycle traffic. For example one year the Marzanna symbolized the city budget with no money for bicycle roads, another one - high curb, cobblestones or the button on traffic lights, which make crossing much more difficult for cyclists. Marzanna is thrown into Warta River, but always with a string attached, which makes it possible to get it back out of the water - in order not to pollute the river.

Usually, some representatives of the city authorities are participating in The Bicycle Greeting of Spring. Their presence gives an opportunity to discuss bicycle roads in the city. Some competitions are organized for the participants - for example choosing the most beautifully adorned bicycle, looking for the youngest participant; and there are also some competitions on knowledge about traffic safety.

The event is very popular with inhabitants and mass-media. It provides an incentive to get bicycles from cellars and garages and to use them for everyday transport. For politicians and decision-makers it is an opportunity to familiarize themselves with needs of cyclists and to intensify their actions in support of cyclists.[87]

Figure 21: Bicycle greeting of spring 2009
Source: Beim 2009

86 Taken from Urbanczyk (2010) and edited

87 Beim (2008)

6.1.4 Bicycle counters

Bicycle counters are electronic detector devices which can be used on any surface. They detect bicycles (but not pedestrians or other road users).[88] They consist of a sensor and a display. The counter registers approaching cyclists and sends the data to the system. The display shows the total number of cyclists on a day and/or in whole year. Bicycle counters can also be equipped with add-ons such as a free public bicycle pump for the convenience of cyclists. The aim of counters is:

- Keeping a highly visible count of the number of cyclists in a city serves to raise awareness of cycling as a real transport mode for daily purposes.
- Showing the wider public how numerous cyclists are in a city and thus raises awareness of cycling as a serious mode of transport. The basic idea is to encourage more people to ride a bike by showing how many are already doing it;
- To capture data about the number of cyclists per day, in peak hours, on weekends etc., which can otherwise be a difficult, expensive and labour-intensive task. Counters thus provide the basis for monitoring bicycle usage;
- And also to encourage cycling and serve as a publicity tool by offering prizes to the 5.000th cyclist to pass on a given day or the millionth in a given year, for example.

Bicycle counters are appropriate for climber and champion cities which have a moderate or high cycling modal split (probably at least 10 %) and offer bicycle paths. The low numbers that would be displayed in cities without an established cycling culture would not play a positive role. It is not wise to install a barometer until it is relatively certain to obtain cycling numbers that will surprise and/or impress the general public. Otherwise people may question the expenditure.

However, if a city does not yet have cycling numbers that should be displayed, it might consider purchasing one or more counters without a display mechanism to begin collecting data on certain routes. The information gathered will offer valuable baseline data for before-and-after comparisons and to monitor progress as the city begins to implement cycling infrastructure and promotion programmes. The information gained from well-placed bicycle counters can serve as a powerful tool as cycling trips start to increase.

A bike counter is not a stand-alone measure. It needs to be implemented among a range of other measures to increase the cycling modal split in your city.

Bicycle counters address two target groups

The general public: For the general population, counters show how many bicycles travel through the streets of their city on a daily basis. This serves both to develop a certain sense of pride in the number of bikes in the city, and also to offer food for thought (What would the city look like if all of those trips were taken by car?). Non-cyclists may be encouraged to "join the gang."

Current cyclists: Regular cyclists are validated in their transportation choices while inexperienced or infrequent cyclists can be encouraged to cycle more by linking a reward programme to the barometer (by offering prizes to the 5.000th cyclist to pass on a given day or the millionth in a given year, for example) (reference to the transtheoretical model again).

Success factors and barriers

The choice of location is a key factor. A counter needs to be highly visible and placed at a location where many cyclists regularly pass.

Cost might be a barrier to implementation in some cities. If this is the case, sponsorship might be an option. Space for a name or logo on the counter display attached to the idea of sustainable transport is a valuable commodity that could be offered in exchange for financial support.

Further reading:

PRESTO consortium Factsheet on bicycle barometers (counters).

Figure 22: Bicycle counter in Copenhagen (Denmark)
Source: Cycling Embassy of Denmark

88 Taken from PRESTO consortium Factsheet on bicycle barometers and edited

Figure 23: Bicycle counter in Bolzano (Italy)
Source: Deffner 2011

"The 'bicycle barometer' is first and foremost a marketing strategy geared towards promoting the bicycle as an everyday means of transport that perfectly fits mobility needs in the city."[89]

6.2 Programmes and actions to motivate specific groups

If thinking of specific groups (mobility style groups, demographic groups or others) campaigns can focus on a targeted audience. The key is finding the right time and setting, where your communication measures are most likely to be noticed (e.g. at work/on the way to work) and to formulate messages that address the needs and attitudes of the target group.

6.2.1 School and kindergarden programmes

School cycling programmes are about working directly with pupils, parents and school staff to help them promote cycling to school.[90] The aim is to make cycling a safe, fun, and a normal mode of transport for children and others in the school community. This includes teaching safe cycling skills, incorporating cycling into the curriculum, hosting cycling activities and events, making appropriate infrastructure adaptations on and near school grounds, and developing school travel plans.

Parents need to have a certain degree of peace of mind before allowing their children to go out alone on their bikes, and children need to know that cycling is an option for them. Children should perceive cycling as a valid (and fun!) means of transportation. It is also intended that parents consider it as a safe and healthy choice for their children. The school administration demonstrates support for the choice through infrastructure and other cycling-related initiatives.

How to introduce a bike-to-school campaign? Two different approaches are shown in the case studies.

89 Rinner 2006, Eltis case study
90 Taken from PRESTO consortium Factsheet on targeted cycling campaigns – schools and edited

Case study: Cycling School in Lithuania

Siauliai, Lithuania is traditionally named Bicycle City as it has the largest bicycle factory in the Baltic States, Baltic Vairas. However, many children in Siauliai have difficulties in accessing bicycles and must learn to cycle on their own. Surveys in Siauliai also showed that people don't believe cycling to be a cool or popular means of transport. As part of the Baltic Sea Cycling project, "Bicycles Making Urban Areas Attractive and Sustainable", Siauliai was able to begin an innovative and positive "Cycling to School"-programme for children. The aim of the project was to provide cycling opportunity for children who have no bicycles at home and to engage a larger number of children in the sport.

Siauliai focused on two areas of bicycle promotion for children. In their first activity the city established a cycling school with access to free bicycles for children to practise bicycling during a summer camp or in their leisure time. The cycling camp was free of charge and covered detailed information on cycling, safety, lifestyle, and routes to school in a fun way. The camp also staged several sporting events including competitions and excursions for the children. In the second part of the campaign the city aimed to promote and encourage cycling as environmentally friendly transportation and as a part of a healthy lifestyle. The city organised a competition of drawings and writings among seven primary schools to promote and build a positive view of cycling.

The cycling school took place at a park in the southern part of the city. 30 new bicycles were bought and a 2-week summer cycling camp was organized. Siauliai's summer cycling camp was a success with 60 children (age 7-17) participating. In a promotional campaign, students created 230 drawings and 50 texts on the theme "Me and My Joyful Bicycle". The best drawings and written entries from each school were turned into a poster promoting road safety rules. The posters were exhibited in the primary schools and in an exhibition organised by the city's bike museum.[91]

Case study: Beauty and the Bike: cycling project for adolescent girls (City of Exeter, UK)

The aim of the "Beauty and the Bike" project is to provide a series of prestigious (and fun) sessions for secondary school girls to help overcome the negative images they have of cycling and to inspire and empower them to start cycling to school. The concept came about as a direct response to the prevailing situation that a far greater proportion of boys cycling to school than girls.

It is one of a range of activities being developed as part of Sustrans' Bike-It project in Exeter, UK. It gives positive messages about the health and fitness benefits of cycling to girls aged 7 to 9, by offering sessions that are run during school time on health and beauty advice and practical solutions related to looking and feeling good when arriving by bike. Each session comprises two professionally lead workshops as well as social and health education or guidance lessons on the following topics:

- looking good (delivered by the Body Shop or other partner)
- feeling good (delivered by the Bike It Officer/ or another female role model)

Furthermore, Bike-It places emphasise being "prestigious". Girls attending have to obtain a 'ticket' from the teacher who is promoting the event, and numbers per session are limited. It has proved useful to have some girls in each session that already cycle to school as they also act as peer role models. The inclusion of a cosmetics retailer and skincare is primarily a "hook" to gain girls' interest. It gives them some special treatment and a positive, fun and different experience. In Exeter, the Body Shop agreed to support Beauty and the Bike events through its community work programme.

The project also provides facilities and equipment to create special changing and storage areas for use by girls who cycle to school. Beauty and the Bike was rewarded with 12.500 Euro at Shimano Cycling Concept Award 2007. As a result there is funding for gift bags and for the upgrading of special changing areas (within school buildings). Upgrades could be for example hair dryers, large mirrors and storage lockers to store books, cycle helmets, clothing, etc.[92]

91 Moore Levene (2011): Cycling School in Lithuania (Eltis case study)

92 Van Uytven, Annemie (2008): Beauty and the Bike: cycling project for adolescent girls (City of Exeter, UK) (Eltis case study)

Case study: Mobility Management at Kindergartens to promote cycling (Austria)

As many other countries, Austria has a dramatic decrease in the physical activity among children. This is compounded by the fact that many children are driven to kindergarten in their parent's car.

Kindergarten-age is the perfect age to raise children's enthusiasm for cycling and walking and to influence their future mobility behaviour. Children who have a positive attitude towards these means of travel tend to 'educate' their parents to use bicycles more often because they are affected in an emotional way.

Within the LIFECYCLE project a kindergarten programme was developed that consists of:

- Cycling lessons: Every group received special bicycles (no pedals, no training wheels but pure bicycle scooters) to assist children to learn to cycle.
- Story telling: Children were also told stories about cycling and a special picture book was developed.
- Achievement certificates for those children that learned to cycle- "I can bike"
- Motivating activities for parents to reduce car trips to kindergartens.

In the Austrian City of Graz 46 public kindergartens (involving 115 children groups) implemented the programme. In the following year private kindergartens also participated and a total of 133 kindergartens participated, involving a total number of around 8.700 children. The main goals of this kindergarten programme were to:

- Motivate children to learn how to cycle
- Train employees of kindergartens on how to implement the action
- Provide emotional context and material
- Turn the kindergarten environment into a reduced car area
- Reduce the number of parents driving their children to kindergarten

At the end of the programme, a creativity competition among all participating kindergarten groups took place. They had to design a sculpture on cycling, with the best sculptures receiving prizes.

In the first year of the project 115 kindergarten groups were involved and approximately 1.500 children learned to cycle (53 %) while the rest was already able to cycle. In the following year, when the private kindergartens were also included, more than 8.700 children participated, and again more than 50 % of them learned to cycle.

A survey among parents whose children participated in the programme found that

- Cycling among parents rose by 71 %, which demonstrated how the children had influenced their parents' behaviour.
- The 'status' of cycling improved significantly in terms of indicators such as 'fun', comfortableness', 'speed' and 'health'.
- 62 % of the parents indicated that they talked about the programme to their friends and families (multiplier effect).

Following this initial success, the programme will be offered to kindergartens as a regular annual event. This programme is easy to apply and has a very good cost-benefit ratio. The approach to combine emotional elements (story telling) and training of skills (e.g. balance) proved to be successful. The method can easily be transferred to other cities.[93]

93 Braun (2010): Mobility Management at Kindergartens to promote cycling in Graz (Austria) (Eltis case study)

6.2.2 Bike to work campaigns

Encouraging local companies and organisations to make their workplaces cycle-friendly and at the same time encourage staff to cycle to work can both significantly increase the share of cyclists in a city and also reduce car trips related to daily commuting.[94] In addition bike to work schemes can be integrated into the companies' mobility management. It is good to accompany such measures by communicational measures.

It is not just the companies' role to encourage its staff to cycle to work. Local authorities can initiate special campaigns aimed at a more general level to communicate the benefits to communters and companies , e.g. healthier and fitter staff, lower business travel costs (if using a bike for business trips), lower parking costs, reduced time lost due to traffic congestion[95] and active staff in a good mood.

Case study: "We Bike To Work" (Denmark)

The goal of the campaign "We Bike To Work" is to get more people to bike. Biking is a healthy mode of transportation - both for the cyclist and for the environment. When you participate in the campaign you are improving your own health and thus the population's health in general - and you are also reducing environmental pollution.

In the biggest Danish campaign for health "We Bike To Work" colleagues get together to form teams to compete against other teams from all over the country. The more days of cycling - the bigger chances for winning. Every team has a leader who is responsible for giving information and handing out campaign material to the team. The team leader is the one who registers the biking days on the web. There can be a maximum of 16 colleagues in a team. The participants are allowed to use another means of transportation part of the way or one way which is a perfect option for new cyclists. Teams who often cycle have a bigger chance of winning.

The campaign is coordinated by Danish biking organisations together with two big firms. In 2007 the campaign focused on "The best team spirit".

The campaign takes place every year during four weeks in May. The participants are offered supporting materials such as a website, a calendar, a registration tool and articles, illustrations, background information, logos, photos, newsletters etc. Of course, the fun aspect of cycling is not neglected. The campaign offers ring tones for cell phones, postcards and a CO_2-calculator.

Each participant pays 5 Euro to take part in the campaign. The firms pay an increased part of the participants' payment. In 2007 the firms took over 67 % of the payment. There are locally sponsored prizes for the winning firms. In 2007 the main prize was a trip to Canada, and also bikes, bike helmets, sun glasses etc.

In 2007, the campaign was evaluated. More than half of the participants are more motivated to do daily exercises as a result of the campaign. The main target group for the campaign are women 36-55 years. Most of the participants cycle for exercise purposes. 52 % said that as a result of the campaign they were more motivated to exercise on a daily basis. Most of the participants are regular cyclists. However, last year 8.000 people started cycling again because of the campaign - and they continued afterwards.[96]

94 Taken from Urbanczyk (2010) and edited

95 Dekoster, Schollaert (1999)

96 Adams Rasmussen (2008): We Are Biking To Work (Denmark) (Eltis case study)

Case study: Bike to work campaign in Hungary

Hungary's Bike-to-Work campaign "Bringázz a munkába!" promotes bicycling as transport by engaging companies and individuals in a friendly contest to see who can log the most cycling kilometers in four to five weeks worth of commuting. Having started in 2007 as a pilot project focusing on Budapest, it today covers all of Hungary and is held twice a year, in spring and again in autumn. Coordinated by the environment ministry in co-operation with the Hungarian Cyclists Club, it is becoming more popular with each new occasion. In recent years about 10.000 people participated in each campaign.

Bringazz a Munkaba works with a web platform (www.kamba.hu), where participants register and give details such as the name and address of their company or school, the number of employees (or students) and the proportion that regularly commutes by bicycle. They also enter individual data concerning their commuting distance and their weight (which is important for the automatic carbon-savings calculation).

Each day a participant bikes to work, he or she needs to log onto the site and indicate this in their "transport diary". The system records these data, and keeps a running tally of distance ridden, the carbon emissions saved, the savings in petrol costs and the kilometres ridden collectively and individually by the participants and their company or school teammates.

The website keeps an up-to-date ranking of all the companies and school teams involved in the contest, according to the sizes of the companies. It uses other input data to compare companies with respect to their share of cycling commuters.

In recent iterations of the contest, participants could also earn special credit for taking their children to school by bike or wearing a dress or suit while commuting. Company teams have also been encouraged to organise challenges between participating firms within the same industry or sector.

With the help of corporate sponsors, several prizes are given out to winners in several categories. And all participants are posted a completion certificate and a small gift.

To generate interest and enthusiasm, organisers host related events, including an opening event and multiple cyclists breakfasts, where volunteers pass out sweetrolls and bottled water to bike commuters. Each contest also includes a closing party with entertainment provided by bike-friendly musicians and actors.[97]

6.2.3 Safe cycling campaigns

Safe cycling campaigns are intended to improve the physical safety of cyclists – and those around them – and to prevent cycling accidents.[98] The focus of a campaign can be a specific user group (for example senior cyclists – see part III Services for cyclists 6.2), or a specific behaviour (the use of bike lights). Safe cycling campaigns can entail short-term or on-going action. They can take a variety of forms and can address issues including:

- The ability of the cyclist to cycle safely
- The visibility of the cyclist to other road users
- The roadworthiness of the bicycle itself
- The safety of the environment around the cyclist

Safe cycling campaigns involve encouraging and supporting safe behaviour on a bicycle. The most common safe cycling campaigns focus on children's routes to school, on visibility or on the roadworthiness of the bicycle itself. Campaigns can provide information, education, and enforcement of regulations or ideally a combination of those three.

97 Spencer (2011): A long-lasting Bike-to-Work campaign in Hungary. (Eltis case study)
98 Taken from PRESTO consortium Factsheet on safe cycling campaigns

'Cities Fit for Cycling' campaign of The Times newspaper

The Times newspaper of London kicked off a cycling safety campaign in early February 2012 with a front-page article decrying the hazardous conditions of UK roads and a clarion headline: "Save Our Cyclists."

Explaining the campaign's title, the newspaper's editor James Harding noted, "It is still the case that cyclists need to be fit to ride in cities, but that cities are not fit for cyclists."

The Cities Fit for Cycling campaign involves dedicated coverage of urban cycling – political developments, government initiatives, readers stories, traffic crashes, etc. – which are featured in the paper's news pages and website. The campaign also includes an eight-point "manifesto for cycling safety" addressed to public authorities and other stakeholders; a web facility urging readers to take up the issue with their MPs, and an online registration form where people can declare their personal support.

Because it is a newspaper campaign, its default audience is the broad, reading public. However, the campaign's messages aim at a few more specific target groups: First and foremost are elected officials. Every point of the manifesto calls on political leaders to take action, whether it be to lower speed limits in residential areas; regulate lorry traffic; invest in safer road infrastructure or make a national audit of traffic crashes involving bicyclists. These calls are aimed not only at MPs but also at local authorities with competence in traffic matters.

The campaign also brings a message to drivers, raising awareness of how they can modify their conduct so that cars and cyclists can share road space safely. Special attention is paid to drivers of lorries and other heavy goods vehicles, pointing out the disproportionate share of cyclist injuries and deaths that involve trucks.

The campaign has won plaudits from cycling groups throughout the UK and abroad for its recognition that cycling safety cannot be achieved by cyclists alone. Although safe riding skills and helmet use are mentioned, the larger message is aimed at public authorities to create a safer atmosphere for cycling.

In the words of one commenter, current conditions in London are such that "one tiny mistake as a cyclist can cost you your life because cyclists are given so little room."

Despite generally favourable reviews from cycling advocates, the campaign has been criticized for creating a sense that cycling is a dangerous activity that people should avoid. In an otherwise laudatory article, a blogger for the Guardian newspaper, James Randerson, wrote, "There is much discussion about the dangers and anecdotes about collisions but not enough about the joy of getting around on two wheels."

Nonetheless, The Times' campaign is clearly good for the cause of urban cycling in Britain. Pressure groups may play a key role in advancing the utility-cycling agenda, however their power of influence cannot compare to that of a mainstream media outlet such as The Times, with its broad audience, credibility and influence among politicians.

Though the campaign was little more than a month old at the time of this writing, it had achieved an enormous impact. Results included:

- 30.000 readers registered in support for the campaign
- 1.700 letters sent to MPs
- Public declarations of support by several prominent athletes and politicians including British Prime Minister David Cameron, London Mayor Boris Johnson as well as the other leading candidates in the 2012 capital's mayoral election
- 77 MPs attending a February Parliamentary debate on the campaign (including 35 Conservatives, 29 Labour politicians and 13 Liberal Democrats.
- A letter calling for implementation of The Times manifesto points sent to all local councils in Britain by Norman Baker, Transport Minister, and Mike Penning, Road Safety Minister.

For cycling advocates, whether working for public administrations or civil-society organisations, the main lesson of the Cities Fit for Cycling campaign is that the support of mainstream media can be enormously helpful. It behoves advocates to cultivate their contacts with reporters, editors and others in the media to harness this power.[99]

99 Spencer (2012): Cities fit for cyclists. Case study

Case study: Peterborough (UK) – Be bright, use a light

The Peterborough city council (through its Travelchoice programme) together with the Cambridgeshire Constabulary carried out a campaign aimed at reducing the number of people cycling without lights in Peterborough. The city wanted to encourage people to cycle throughout the winter, but to make sure that they were visible to all road users. The campaign aimed to highlight that it is not acceptable to cycle in the dark without lights, without discouraging people from using their bikes. Peterborough's campaign ran for two weeks in early November. Fines were handed out to more than 40 cyclists, but a number of local cycle shops participated in the campaign by offering deep discounts on cycle lights. Roughly 15 % more lights than usual were sold during the campaign and police feedback indicated an increase in cyclists using lights. The campaign also received significant positive media coverage and the overall impression – both of cyclists and non-cyclists – was very supportive.

Peterborough is a starter city with a cycling modal split of approximately 2 %.[100]

6.3 Other cycling promotion activities and measures

Besides broad image and emotionalising campaigns and those targeting specific groups there are a variety of other measures to promote cycling. The following examples describe internal and external communication measures fulfilled by a bicycle commissioner, different sorts of communication measures as well as "push" measures like incentive programmes by state or local authorities.

6.3.1 Local bicycle officer or spokesperson

One means of bicycle promotion is installing a bicycle office or officer.[101] It offers a contact person both for citizens and for staff of other administration departments. Their task is to coordinate all related activities with regard to cycling. Whether a bicycle officer is successful in implementing measures strongly depends on the support received from political level and administrational embedding (duties and rights of the office/er).[102] The task of the bicycle officer is to make her or himself 'needless' as the bicycle officer, Frans de Baan of the city of Zürich once said in an expert interview. This usually takes several years or decades. So the main tasks of a bicycle officer cover:

- Constituting the single point of contact for citizens
- Establish a coordination point at the municipality for all bicycle related matters
- Introducing a reception point for ideas and remarks to be passed on
- Planning/supervising bicycle strategies, infrastructure, route plans, signalisation, events etc.
- Networking with other stakeholders (e.g. police, transport operators etc.)
- Assisting in public relations (supported by the PR office of the administration), organise regular presence in public
- Acquisition of financial sources for infrastructure, promotion and education

A bicycle officer can be appointed at a local, regional or national level (…). They are recruited in many European cities including starter, climber or champion cities (e.g. in Wroclaw or Gdynia (PL), in Helsinki (FI) or in Odense (DK). In Germany, at the moment about 80 cities have a bicycle officer or office (depending on the size of the city).

Certainly, in cities with low cycle use, appointing a bicycle officer who combines and overlooks all activities is the first step to move onto a cycling culture. Another step can be to outsource the task as a mandate with supervision to an external consultant. One example where this was the first step for 5 years, is the city of St. Gallen in Switzerland.

Any city aiming to increase cycling levels benefits from recruiting a bicycle officer who is, if possible, employed fulltime. Ideally, this person has experience in cycling planning and also in cycling. The local bicycle officer should make sure that the interests of cyclists and all aspects of cycling are visible and considered at all levels of local government in all departments related to cycling (e.g. planning, environmental, or transport departments).

Without a bicycle officer real bicycle policy cannot be spoken of. Its deployment is a brilliant starting-point to make public and signalize the take-off toward becoming a cycling-friendly city.

100 PRESTO consortium Factsheet on Safe Cycling Campaigns
101 Urbanczyk (2010)
102 Ministère des Transports (2008)

Further reading:

GIZ (2011) - Planning for Cycling in Germany. Cycling Coordinators and Offices.

6.3.2 New media for marketing

Alongside traditional marketing channels **internet based marketing** measures to promote cycling have gained increasing importance in recent years. Many current cycling promotion campaigns include web-based services and information together with marketing measures. The range of services goes from simply providing a webpage with information for cyclists, to the presence in social media such as Facebook or Myspace, blogs, online video clips on Youtube or services such as online cycle route planning or CO_2 calculators.

The significant contribution of internet based services and marketing is that it provides a interactional platform for users and planners (see introduction to the handbook: feedback as communicative success factor of mobility culture). For example the city of Frankfurt/ Main in Germany allows cyclists to report littered or damaged cycling infrastructure and facilities on the internet page of the bicycle office. It is even possible to mark spots (for example a bush hanging in the cycling path) directly on an interactive map. Everybody who makes an entry will get a response within a given time stating what will happen to solve the problem.

Internet based services also offer a relatively easy way for users to access information. For information providers this of course means that all provided material must be kept up to date which can require a lot of work.

Many current cycling promotion campaigns use their internet pages to give information about events, spotlight local projects and to provide local cycling information on a single site. The examples in Figure 24 to Figure 27 show some ways to use the internet as an information and marketing channel to promote cycling in an emotional way.

A special way to promote cycling involves advanced ways of using **ambient media marketing**. This relates to unusual carriers of marketing tools. In the 'Kopf an: Motor aus' campaign the promotion was done by the distribution of coaching packs for car drivers, with floor graphics, small banners on shopping carts, giveaways like postcards and innovative outdoor ads including on stairs (see Figure 24). Another example was the distribution of water bottles emblazoned with messages to passing cyclists on cycle routes in the citiy of Arhus.

Figure 24: Kopf-an campaign marketing on stairs in Dortmund, Germany
Source: fairkehr Agentur GmbH

Further campaign examples

Figure 25: Screenshot of bikeminded website
Source: www.bikeminded.org

Figure 26: Screenshot of "Fietscalculator" CO_2-Calculator
Source: www.heelnederlandfietst.nl

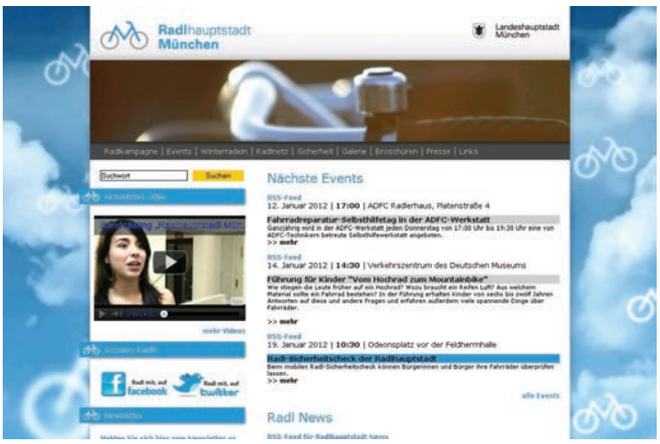

Figure 27: Screenshot of Radlhauptstadt München campaign
Source: www.radlhauptstadt.muenchen.de

Promoting cycling as an everyday mode of transport should also take into account that cycling itself – including bicycles and bicycle accessories – can be an expression of a certain lifestyle. Cycling information and marketing should convey the message that cycling is modern and stylish. Good examples of this are the many "cycle chic" webpages that show how stylish cycling can look. Figure 28 shows a screenshot of the first cycle chic webpage from Lublin. In the meantime the cycle chic concept has been adopted in many other cities, for example in Vienna, Munich, Graz and lately also in Poznan, Gdansk, Lodz and Czestochowa.

Figure 28: Screenshot of Lublin Cycle Chic homepage (Poland)
Source: http://lublincyclechic.blogspot.com/

Further reading:

FGM-AMOR (Publisher) (2011): How to run a cycling action. LifeCycle Implementation Manual.

National Cycling Strategy Board (UK) (2004): Marketing Cycling Handbook.

PRESTO consortium Factsheets on bicycle promotion.

Urbanczyk, Rafael (2010): PRESTO consortium Cycling Policy Guide. Promotion of Cycling.

6.3.3 Motivation by financial incentives

More and more EU countries are supporting the purchase of a bicycle with tax breaks or subsidies.[103] In January 2009, the Irish government introduced a benefit-in-kind tax break which supports employers in providing employees with bicycles to cycle to work. The tax break offers savings of up to 50 % on a bike supplied to the employee through the employer.[104]

In England, to promote more healthy trips to work and to reduce pollution, the 1999 Finance Act introduced an annual tax exemption allowing employers to loan cycles to employees as a tax-free benefit. The exemption was one of a series of measures introduced under the government's Green Transport Plan. Employers of all sizes including the public, private and voluntary sectors can implement a tax exempt loan scheme for their employees. A "cycle to work scheme implementation guide" published in October 2009 by the Department for Transport in London explains how companies can take advantage of it.[105]

In 1997, the Belgian government introduced a law that allows employers to pay their staff a tax-free sum for every kilometre cycled. The introduction led to an increase of more than 50 % in the number of cyclists in the companies which made use of this tax break. Similar schemes are already fixed by law in many European countries such as the Netherlands (where employers can give tax-free bikes to their employees).

In Germany the bike to work" scheme "Mit dem Rad zur Arbeit" initiated by a health insurance company rewards cyclists who cycle at least 20 days to work in a given period of time). The reward is the chance to participate in a lottery where all kind of prices can be won (more details see case study above).

103 Urbanczyk (2010)
104 Bikes4work (no year)
105 DFT (2009)

Paris recently launched a programme for granting up to 25 % of the purchase price of a pedelec (up to a maximum of 400 Euro). Inspired by the national car scrapping bonus, Mannheim(Germany) subsidises the purchase of every new bicycle with 50 Euro. Italy's Ministry for the Environment grants between 180 Euros and 1.300 Euros for every new bike purchased, depending on whether it is an e-bike, a pedelecs or a standard bicycle.[106]

Case Study: "Cycle and Win" rewards cycling in the Netherlands

Fietsberaad, the knowledge centre on cycling management in the Netherlands, has developed a reward system, Fiets-en-Win (Cycle and Win), as a new marketing tool to encourage the use of the bicycle. Cyclists who use a free guarded bicycle shed in the cities of Apeldoorn or Eindhoven, can win prizes. Other municipalities or provinces are encouraged to implement this system too.

Fiets-en-Win is an easy reward system for cyclists. Participants have a pass that grants them access to the bicycle sheds in the city which they scan when storing or picking up their bike. Upon scanning this pass, users receive one or more digital lottery tickets. In Apeldoorn this 'pass' takes the form of a special key-ring and in Eindhoven the personal city pass is owned by all city residents. To win a prize, participants have to register on the campaign website where they can see how many lottery tickets they have and what prizes they can win. The municipality in Apeldoorn is also able to use the data from the scanned passes to ascertain how the bike sheds are being used and therefore how they can be improved for cyclists.

The start-up costs of developing the technology for the system were high and the process time consuming but the running costs of the campaign will be considerably lower. A municipality with about four bicycle sheds requires an investment of approximately €15.000 with additional costs for promotion and prizes.

Fietsberaad has, together with Apeldoorn and Eindhoven, invested a lot of time and government money in the technology of this reward system. Other authorities, municipalities or provinces can now implement this system for a lower cost of €5.000. For this money they get the website structure, a registration system for bicycle sheds that can also be used as an access control system for bicycle paths or underpasses, a uniform look-and-feel (logo, house style, name) with the possibility of local adaptations and a clear segmentation of ownership and tasks.[107]

Figure 29: Fiets en win campaign poster from Eindhoven (Netherlands)
Source: www.cyclingcarma.com

106 Volschenk (2009)

107 Canters (2011): "Cycle and Win" rewards cycling in the Netherlands (Eltis case study)

7. Evaluating effects of promotion

When implementing promotion measures for cycling it is important to evaluate the effects of these measures. “Evaluation allows you to compare the theory (what you were aiming to achieve) with the practice (the actual outcome). It allows you to work out exactly how far you have moved towards your original objectives. It also helps to demonstrate the wider value of the project to the community”.[108] Therefore evaluation should be an essential part of every cycling promotion policy.

7.1 Effectiveness of promotional activities

An evaluation of promotion impacts assesses the changes that can be attributed to a particular intervention, such as the launch of a promotional campaign, a training or information programme.[109] It quickly becomes apparent that it can be quite challenging to measure the impacts of “soft” interventions such as campaigns or programmes in order to determine their return on investment.

Many organisations do not even monitor or evaluate the impacts of the individual programmes in terms of their effects on travel behaviour (e.g. shift in modal split) since they are aware that changing travel behaviour is a long-term process, and that assessment measures can sometimes be misleading (and the process expensive).

But there are examples of evaluations which have shown that information and motivation campaigns and awareness programmes can lead to changes in people’s attitudes and travel behaviour in favour of cycling, walking or the use of public transport. Of course, the success criteria also depends on the defined aims.

There are also a number of key organisational, political, financial and cultural issues which influence the determination of the success of campaigns and programmes. Hence, changes can hardly be attributed to one single promotional activity. It is rather part of an integrated package of different interventions (including infrastructure) focussing on the whole cycling system. The question of what are the impacts of other interventions and political (or other) developments like rising energy costs etc. is difficult or even impossible to answer.

7.2 Methods of assessment

An evaluation of impacts attributed to specific promotional activities can be conducted in different ways depending on the chosen approach.[110] Whereas a programme aimed at a specific, predefined target groups or individuals can be relatively easily tracked (e.g. through questionnaires, interviews etc.), the impacts of a campaign targeted at a larger audiences are significantly more difficult to measure. Generally there are qualitative and quantitative evaluation methods.

Quantitative evaluation is describing change by key characteristics of cycling like

- modal share,
- number of cyclists,
- share of emissions or kilometres made by bicycles.

However, a comparative analysis of data does not always provide a clear connection to a specific promotional effort. One way of quantitative evaluation is counting. Installing counters on a bicycle lane or having people count cyclists can provide information on how many people are using a new cycle lane.

Counting can also be used to evaluate the success of a promotional event (e.g. a bicycle race, a car free day). In case fewer people attend an event or use a facility, try to find out the reasons and think of what you could do differently next time. If you have a website that is related to your promotional programme, install a counter that enables you to count the number of visits to the website, as well as to specific pages on the site. This gives you a good overview on which issues seem to be more interesting than others. A spike in “hits” soon after a programme is launched is a fairly clear indication that the promotion is responsible for the additional website visits.

Surveys asking about travel behaviour or recognition of a campaign etc. also describe quantitative facts. Included are a high number and standardised questionnaire guided interviews (face-to-face, telephone, online).

Open interviews with a guideline or focus group discussions are methods of qualitative evaluation. If you produce a leaflet, always include a way to respond, and if possible, even an incentive to respond (for example a prize draw). That way you can measure the qualitative success of your leaflet.[111]

108 National Cycling Strategy Board (2004)
109 Chapter taken from Urbanczyk (2010) and edited
110 Chapter taken from Urbanczyk (2010) and edited
111 National Cycling Strategy Board (2004)

Whatever your promotional campaign may look like, plans for evaluation should be well thought out at the outset and, as far as possible, incorporated into promotional programmes or campaigns. This might mean creating incentives for people to provide feedback about changes in their transportation choices (for example by offering prizes for participation in a survey). Depending on the kind of promotional activities you undertake, this will, of course, be more or less easy to do.

Evaluation of cycling promotion

The implementation manual to the EAHC funded project "Lifecycle" contains a readymade survey tool that can be used to evaluate cycling promotion actions.

Further reading:

FGM-AMOR (Publisher) (2011): How to run a cycling action. LifeCycle Implementation Manual.

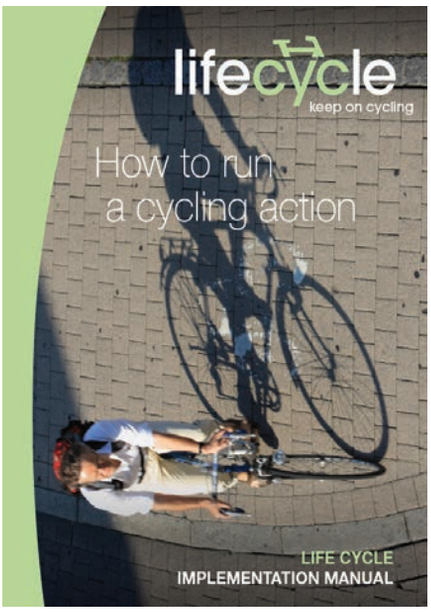

Figure 30: Cover picture of LifeCycle Implementation Manual
Source: FGM-AMOR 2011

8. References

Adams Rasmussen, Lene (2008): We Are Biking To Work (Denmark) (Eltis case study).

Adams, J.; M. White (2005): Why don't stage-based activity promotion interventions work? Health Education Research. Theory and Practice 20 (2): 237-243.

Andreasen, Alan R. (1994): Social Marketing: Its Definition and Domain. In: Journal of Public Policy and Marketing 13/1: 108-114.

Andreasen, Alan R. (2002): Marketing Social Marketing in the Social Change Marketplace. In: Journal of Public Policy & Marketing 21/1: 3-13.

Becker, Egon; Jahn, Thomas (Hg.) (2006): Soziale Ökologie. Grundzüge einer Wissenschaft von den gesellschaftlichen Naturverhältnissen. Frankfurt/New York: Campus Verlag.

Beim, Michał (2008): The Bicycle Greeting of Spring (Poznan, Poland) (Eltis case study).

Bikes4work (no year): One4all – bikes4work. URL: http://www.bikes4work.ie/index.htm (11.01.2012).

Bongard, J. (2003): Werbewirkungsforschung. Grundlagen - Probleme - Ansätze. 1. Auflage, Lit-Verlag, Münster.

Brandner, Monika (2000): Stadtmarketing – Eine Synthese geographischer und betriebswirtschaftlicher Positionen in Theorie und kommunaler Praxis. Erlangen-Nürnberg.

Braun, Margit (2010): Mobility Management at Kindergartens to promote cycling in Graz (Austria) (Eltis case study).

Bruhèze, A.A. Albert de la; Veraart, Frank C.A. (1999): Fietsverkeer in praktijk en beleid in de twintigste eeuw. Overeenkomsten en verschillen in fietsgebruik in Amsterdam, Eindhoven, Enschede, Zuidoost-Limburg, Antwerpen, Manchester, Kopenhagen, Han-nover en Basel. Den Haag, S. 47.

Canters, Ralf (2011): "Cycle and Win" rewards cycling in the Netherlands (Eltis case study).

City of Graz (2006): Radfahren in Graz. 21 Gründe, in die Pedale zu treten.

City of London Planning Division (2005): Bicycle master plan. A Guideline Document for Bicycle Infrastructure in the City of London. URL: http://www.london.ca/Reference_Documents/PDFs/BMP_Report.pdf (22.12.11).

Cycling England (2007): Valuing the benefits of cycling. A report to Cycling England, May 2007. URL: http://www.nici.org.uk/downloads/valuing-the-benefits-of-cycling-exec-summary.pdf (23.02.2012).

Cycling England (no year): Smart Measures Portfolio. Understanding the potential cycling market.

Cycling Promotion Fund (2012): Information on website. URL: http://www.cyclingpromotion.com.au/ (23.02.2012).

Danish Road Directorate (2000): Collection of Cycle Concepts. URL: http://www.vejdirektoratet.dk/pdf/cykelrapport/999Complete.pdf (22.12.11).

Davies, G. David; Young, H. L. (1995): Investing in the cycling revolution: a review of transport policies and programmes with regard to cycling. Cyclists' Public Affairs Group. Birmingham.

Deffner, Jutta/Konrad Götz (2010): The Future of Mobility in the EU. Note. Institute for Social-Ecological Research ISOE. European Parliament: Brussels.

Deffner, Jutta; Götz, Konrad; Knobloch, Bastian; Siegl, Christoph (2008a): Zentrale Modelle zur Verhaltensänderung und Empfehlungen für die ZEM-Kampagne „Kopf an Motor aus" (unpublished working paper).

Deffner, Jutta; Götz, Konrad (2008b): Identifikation von Zielgruppen und Empfehlungen für ihre Ansprache in der Motivations- & Imagekampagne Zero-Emission-Mobility. (unpublished working paper).

Dekoster, J.; Schollaert U. (1999): Cycling: The Way Ahead For Towns And Cities: A Handbook for Local Authorities. URL: http://ec.europa.eu/environment/archives/cycling/cycling_en.pdf (22.12.11).

DFT – Department for Transport (2009): Cycle to work scheme - Implementation guidance. URL: http://www.dft.gov.uk/publications/cycle-to-work-scheme-guidance/ (08.01.2012).

Dufour, Dirk (2010): PRESTO consortium Cycling Policy Guide. General Framework. URL: http://www.presto-cycling.eu/en/policy-guidelines-a-fact-sheets/g-general-framework (23.02.2012).

European Commission (Publisher) (2011): Flash Eurobarometer. Future of transport. Analytical report. URL: http://ec.europa.eu/public_opinion/flash/fl_312_en.pdf (14.03.2012).

ECF - European Cyclist Federation (2011): Cycling facts and figures. URL: http://www.ecf.com/cycling-facts-and-figures/ (23.02.2012).

ECMT (2004): National policies to promote cycling. URL: http://www.20splentyforus.org.uk/UsefulReports/EuroCyclingComparison.pdf (22.12.11).

European Environment Agency (2006): Urban sprawl in Europe: the ignored challenge. URL: http://www.eea.europa.eu/publications/eea_report_2006_10/eea_report_10_2006.pdf (22.12.11).

Fairkehr GmbH (2011): Die Kampagne. Kopf an: Motor aus. Für null CO_2 auf Kurzstrecken. Bonn.

FGM-AMOR (Publisher) (2011): How to run a cycling action. LifeCycle Implementation Manual. URL: http://www.lifecycle.cc/docs/LIFECYCLE_Implementation_Manual_pdf.pdf (23.02.2012).

Fietsberaad (2006): Continuous and integral: The cycling policies of Groningen and other European cycling cities.

Forester, John (1994) Bicycle transportation: A handbook for cycling transportation engineers.

GTZ – Deutsche Gesellschaft für technische Zusammenarbeit (Publisher) / Godefrooij, Tom; Pardo, Carlosfelipe; Sagaris, Lake (Editors) (2009): Cycling-Inclusive Policy Development. A Handbook. Eschborn, Utrecht.

Götz, Konrad; Loose, Willi; Schmied, Martin; Schubert, Stephanie (2002): Mobility Styles in Leisure Time. Final Report for the Project "Reduction of Environmental Damage Caused by Leisure and Tourism Traffic". Commissioned by the Federal Environment Office. Short Version. Frankfurt am Main.

IFEU – Institut für Energie- und Umweltforschung (2008): Endbericht. Energiekonzept Mainz 2005-2015. Energie und Verkehr. URL: http://www.ifeu.de/energie/pdf/EK_MAINZ_080527.pdf (11.01.2012).

Keller, Stefan (1998): Das transtheoretische Modell. URL: http://archiv.ub.unimarburg. de/diss/z1998/0303/html/frame.htm (06.11.08).

Kofler, Angelika / GFK (2005): Consumers in Central and Eastern Europe 2005. Lifestyle, consumption and media preferences. Presentation. URL: http://szekedi.uw.hu/ad_7/Consumers_in_Central_and_Eastern_Europe_2005.pdf (23.02.2012).

Kotler, Philip; Roberto, Eduardo (1991): Social Marketing. Düsseldorf, Wien, New York.

National Cycling Strategy Board (UK) (2004): Marketing Cycling Handbook.

Liebert, T. (2003): Begleitende Materialien zur Vorlesung "Werbung als Typ öffentlicher Kommunikation". URL: http://www.kommwiss.de (19.11.08).

Ministère de Transports, Ministère des Travaux publics, Ministère de l'intérieur et de l'aménagement du territoire (2008): Mobilité douce. Nationaler Aktionsplan. URL: http://www.ivv-aachen.de/UserFiles/File/Nationaler_Aktionsplan.pdf (11.01.2012).

Möller, Thomas (2007): Cycling inspiration book. Örebro. URL: http://www.balticseacycling.com/ver02/fileDownload/BSC-InspirationGuide72.pdf (23.02.2012).

Moore Levene, Elizabeth (2011): Cycling School in Lithuania (Eltis case study).

National Cycling Strategy Board (UK) (2004): Marketing Cycling Handbook. URL: http://www.ciltuk.org.uk/download/Marketing_Cycling_Handbook.pdf (23.02.2012).

National Social Marketing Centre (2010): What is social marketing. URL: http://thensmc.com/content/what-social-marketing-0 (11.01.2012).

Öhmann, Michael (2009): Radverkehr im 21. Jahrhundert (Presentation held at ISW-Conference 24.09.2009 in Munich).

Ohnmacht, Timo/Konrad Götz/Helmut Schad (2009): Leisure mobility styles in Swiss conurbations: construction and empirical analysis. Transportation, 36, 243-265.

Ökoinstitut Südtirol/Alto Adige (no year): Toolkit for the implementation of a corporate cycling system. Bicycle friendly Bolzano/Bozen.

Pez, Peter (1998): Einstellungsmittelorientiertes Modell der Verkehrsmittelwahl, taken from Michael Öhmann (2009): Radverkehr im 21. Jahrhundert (Presentation held at ISW-Conference 24.09.2009 in Munich).

Planungsbüro VIA eG (2004): Radverkehr in der Praxis Kenntnisse und Beispiele aus dem In- und Ausland (Arbeitstitel). Köln.

Priemus, Hugo (2003): Changing Urban Housing Markets in Advanced Economies. URL: http://www.nhc.edu.au/downloads/2003/DayOne/15_Priemus_ppt.pdf (22.12.11).

Prochaska, James O. et al. (1994): The Transtheoretical Model of Change and HIV Prevention: A Review. Health Education & Behavior 21 (4): 471-486.

Rangan, V. Kasturi; Karim, Sohel; Sandberg, Sheryl K. (1996): Do Better at Doing Good. In: Harvard Business Review, Mai-Juni, 42-54.

Rinner, René (2006): Radverkehrsförderung in Bozen. URL: http://www.Nationaler-radverkehrsplan.de/praxis beispiele/anzeige.phtml?id=2059 (18.08.2011).

SILENCE project (no year): Information from project website. URL: http://www.silence-ip.org/site/ (05.02.2012)

Spencer, Greg (2011): A long-lasting Bike-to-Work campaign in Hungary. (Eltis case study).

TEMS – The EPOMM Modal Split Tool (2012): URL: http://www.epomm.eu/tems/ (23.02.2012).

TERM (2005): Indicator fact sheet on expenditures on personal mobility. URL: http://www.eea.europa.eu/data-and-maps/indicators/expenditures-on-personal-mobility-1/term_2005_24___expenditure_on_personal_mobility_final_version.pdf (23.02.2012).

Thiemann-Linden, Jörg; Theunissen, Johanna; Bracher, Tilmann (2010): Active Access. Stakeholder Involvement Plan. URL: http://www.nationaler-radverkehrsplan.de/active-access/downloads/aa-report-d62.pdf (23.02.2012).

Tejvan (2008): 10 reasons to take up cycling. In: Cycling info. Oxford. URL: www.cyclinginfo.co.uk/blog/314/cycling/10-reasons-to-take-up-cycling/ (05.01.2011).

Urbanczyk, Rafael (2010): PRESTO consortium Cycling Policy Guide. Promotion of Cycling. URL: http://www.presto-cycling.eu/en/policy-guidelines-a-fact-sheets/promotion-of-urban-cycling (23.02.2012).

Van Uytven, Annemie (2008): Beauty and the Bike: cycling project for adolescent girls (city of Exeter, UK) (Eltis case study).

Vermeulen, Joost (2003): The benefits of cycling and how to access them. CE. Delft. URL: http://www.ce.nl/index.php?go=home.showPublicatie&id=96 (23.02.2012).

Volschenk, Christoffel (2009): Ever more EU States support Bikes with Tax Money. URL: http://extraenergy.org/main.php?language=en&id=2441 (11.01.2012).

VTPI (2009): Transportation Cost and Benefit Analysis II – Travel Time Costs Victoria Transport Policy Institute. URL: http://www.vtpi.org/tca/ (23.02.2012).

WHO (2004): The top ten causes of death. URL: www.who.int/mediacentre/factsheets/fs310_2008.pdf (23.02.2012).

WHO (2006): Physical activity and health in Europe: evidence for action. URL: http://www.euro.who.int/__data/assets/pdf_file/0011/87545/E89490.pdf (22.12.11).

2012