



# FACT SHEET H-01 – DEVELOPING A CYCLING NETWORK AND GENERAL DESIGN STANDARDS FOR BICYCLE INFRASTRUCTURE

## Network planning

Bicycle network planning is a vital part of developing a bicycle transport strategy. The bicycle network is an element of a city's comprehensive mobility plan and takes into consideration the connectivity of various activity centres (e.g. residential, education, jobs, public transit, shopping etc.) in order to promote destination-oriented daily cycling. As an element of an integrated (bicycle) transport strategy, the bicycle network is part of supply-oriented planning and needs to support the goals developed by the municipality and stakeholders as laid out in the strategy. It should encourage cycling demand.

After preliminary considerations as to the planning area and the origins and destinations of potential cyclists (the activity centres listed above), an analysis of the current street network can be completed. This includes documenting:

- Quality of existing streets and intersections along with planned changes
- Current demand on roads and

intersections (from traffic counts)

- Traffic volumes along origin-destination relationships

Routes between origins and destinations should be developed primarily along existing network elements, for example through speed 30 zones or along roads with existing facilities or recreational cycle paths independent of streets. By comparing the preferential network of destinations and origins with the analysis of the existing network, gaps and areas for improvement can be determined.

For the comparison (and cycling strategy in general) it is useful to break the network down into hierarchical categories based on function. The functional categories determine desired cyclist speeds and the maximum acceptable delay due to cyclists having to stop and wait. An urban cycling network can generally be divided into three categories, which can be found in Table 1.

The route function relates to what is being connected and not to the type of cycle facility that should be provided. For example, a main bicycle route in

a speed 30 zone will still allow cyclists to ride at 15-20 km/h and at the same time not require cyclists to stop and wait at traffic lights.

However for safety reasons, cycle facilities should be available along all main streets, regardless of their role in the bicycle network. The factors influencing choice of facility type are discussed in Fact Sheets H-02 and H-03.

## Network hierarchy

The function of **main bicycle routes** in general is to provide connections between all major activity centres (including residential, education, job, shopping, transit centres etc.) in an urban area. These routes provide the base form of the cycle network. If these routes run along main streets, bicycle facilities are either off-carriageway, e.g. as bicycle paths parallel to the carriageway, or in the form of bicycle lanes, which have been shown, through research and crash analyses since the 1980s, to provide a higher level of safety and comfort. It should be em-

Category	Connects	Desired riding speeds (km/h)	Resulting max. acceptable delay due to stopping and waiting
main bicycle routes (high-speed links)	main centre–intermediate centre intermediate centre–intermediate centre	15-20 (up to 25)	45 s (30 s)
secondary bicycle routes	intermediate centre–neighbourhood centre neighbourhood centre–neighbourhood centre	15-20	60 s
local routes	-	-	-

Table 1: Route hierarchy and characteristics (based on FGSV (2010) p.10)

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phasised that main bicycle routes do not necessarily need to be along main streets. In fact, the use of speed 30 zones or existing greenways can increase the attractiveness of the cycle network.

**High-speed links** (also known as bicycle highways) are a special element of main bicycle routes and can increase the attractiveness of cycling by providing a direct connection between popular activity centres, e.g. popular commuter routes from main residential areas to central business districts. Infrastructure along such routes is often physically separated from motorised vehicles, either as bicycle paths or greenways, and delay through stopping and waiting is reduced by minimizing the number of crossings along the route. Routes may be made more direct by providing infrastructure through green areas such as in parks, along rivers or old rail rights-of-way.

**Secondary bicycle routes** serve to fill in the gaps between main routes as well as between main routes and neighbourhood centres. Neighbourhood centres may include residential complexes, schools, libraries or local shopping districts amongst others. Bicycle facility types will vary widely depending on the local situation.

**Local routes** are generally along residential streets and provide access to the greater bicycle network. In most cases, these routes are in speed 30 zones and, as such, do not require special infrastructure.

### Network quality

The objectives for maintaining or increasing network quality should be to [FGSV (2010), p.10, p.15]:

- Fulfil main design requirements for safety (e.g. visibility, sight-lines, recognisability) and quality (e.g. space for passing, avoiding unnecessary stopping, optimized signal-timing) in bicycle transport (see in particular Fact Sheets H-02 and H-04)
- Minimize detours: maximum detour factor 1,2 compared to the shortest possible route, maximum 1,1 compared to parallel main street
- Maintain a mesh width of the network of main bicycle routes (200 to 1000 m) so that 90 % of residents live within 200 m of a main route
- Provide winter service on main routes
- Avoid unnecessary inclines

### Space requirements

The comfort and attractiveness of the cycling network can be improved in large part through appropriate design standards. According to German guidelines, a single cyclist will need a minimum riding width of 0,80 m. Thus whenever overtaking should be enabled, the width of the path should be at least 1,60 m, however a width of 2,00 m is recommended.

It is important to consider the increasing use of cargo bikes and bicycles with trailers. To accommodate these bicycles, a path width of 2,30 m is recommended, allowing cyclists to overtake and ride side by side.

For reasons of traffic safety, cycling facilities should generally be separated from adjacent traffic areas by a safety buffer. This buffer is not part of the cycle path width and should be distinguished through its construction or other traffic device. Buffer zones accommodate required safety distances for cyclists as well as street fixtures, e.g. traffic signs.

### Best Practice: Leipzig Cycling Transport Strategy

Leipzig's Cycling Transport Strategy 2010–2020 was developed on the basis of the Cycling Action Plan 2002, which foresaw the development of a base network of cycle routes. For the new cycling strategy, an analysis of existing bicycle infrastructure was completed in 2010. A network of routes, including existing, desired and potential supplemental routes, was developed and categorized according to function in the network hierarchy. From these two maps, an analysis of route deficiencies was completed showing deviations from design standards divided into three levels of severity. As a result, a list of over 200 measures was created for filling in gaps and improving current conditions. Most German cities today have such bicycle concepts

**Lessons learned:** Bicycle network planning should be part of comprehensive mobility planning. Routes should be planned which utilize existing infrastructure, including speed 30 zones and greenways, while filling in gaps in the network. Attractive cycle networks with well-connected routes spur demand for cycling. A high network quality can be achieved by enhancing safety, maintaining a small mesh width, minimizing detours and maintaining high design standards.

For further resources, links and best practice examples visit the Sustainable Urban Transport Project website: <http://www.sutp.org/>

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