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Abstract

## Impacts of cycle highways on sustainable community, urban and regional development

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### Anschrift

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Cycle highways (Radschnellverbindungen) = rapid cycle paths with highest quality in Germany  
State road (Landesstraße) = a type of regional roads – secondary roads, managed by the federal states

## Task and objective

Due to their independent traffic importance and construction standards, cycle highways are high-quality bicycle traffic facilities, which are aimed at commuter traffic and training commuter traffic in the distance range of up to 30 km. They represent an alternative to using the own car and are considered a key element in the promotion of cycling.

Although numerous research projects have been carried out so far and guidelines regarding cycle highways have been developed and even applied, in Germany cycle highways have only been implemented on sections of connections in a range between 10 km and 100 km, such as the RS1 "Ruhrschnellweg" or the cycle highway between Frankfurt and Darmstadt. Compared to the planned cycle highway projects, only a very small part of the projects has been opened to traffic.

The focus of the present research work "Impacts of cycle highways on sustainable community, urban and regional development" was on the following questions:

- Presenting the current status of cycle highway implementation in Germany
- Determination of the traffic impacts of cycle highways
- Analyses of the interactions between bicycle traffic and urban planning / urban development
- Identification of success factors and risks of cycle highway planning
- Clarification of the contribution of cycle highways to sustainable community, urban and regional development

## Research methodology

The methodological basis consists of an analysis of available documents (in particular feasibility studies) and data on cycle highways in Germany as well as a large number of interviews with representatives of road administrations and responsible authorities of cycle highways. For the determination of the effects on traffic, own explorative scenarios were developed. The contributions from the digital conference on September 27, 2022 were included in the success factors and challenges.

### Desk Research

Information on the planning status, construction costs and project specifics were taken from completed feasibility studies or publicly available data sources on the Internet (newspaper articles, interviews, (interim) presentations). For projects that are

already in a more advanced planning phase, the information from the project-related websites was used.

### Interviews

Another important source of information is provided by around 40 individual interviews with the responsible authorities of the selected cycle highways. The purpose of the interviews was, on one hand, to update key information on the respective project and planning status and, on the other hand, to gather up-to-date background information that is not contained in the freely available documents. In addition, the cost estimates presented in the feasibility studies and the current planning status were queried and revised if necessary.

### Digital conference

An important milestone in the research project was the digital conference held on September 27, 2022, which was attended by a large number of the experts interviewed and consulted during the assignment, among others. The aim of the conference was to present the preliminary results of the research work, to record comments on them and to enable an exchange of opinions and experiences in four working groups on the aspects of planning processes, public participation, quality standards and urban design. In total, more than 40 people took part in this digital conference.

## Results

### Implementation status

Regarding the implementation status of cycle highways, a distinction is made between projects according to the phase of implementation:

- **in feasibility study** (project idea, feasibility study in progress, or not yet completed)
- **in planning** (feasibility study completed, responsible authorities have started official planning)
- **in operation** (individual sections have been handed over to traffic, but other sections are still in the feasibility study/ planning phase)

Of the 31 studied cycle highways with a total length of 757 km, five are in feasibility study and 18 are in the planning phase. Sections of eight cycle highways are already in operation. At the current stage of processing, none of the 31 cycle highways had been fully implemented along the entire route. The 31 cycle highways are spread over almost all federal states of Germany and cover different spatial types and regions.

As the analyses and interviews show, 9% of all route sections were in operation at the time of analysis (end of 2021). By the beginning of the 2030s, the experts stated that just under half of the 757 km of sections of the 31 cycle highways studied will be

in place. For the other half, the achievement of all works after 2031 was mentioned or it was not possible to specify a completion date (for more details, see Table 1).

**Table 1:** Implementation status of the 31 selected cycle highways (as of 2021)

implementation status	route length [km]	route length [%]
Implemented by 2021	68 km	9,0 %
Implementation until 2025	120 km	15,9 %
Implementation 2026 to 2030	184 km	24,3 %
Implementation after 2031	65 km	8,6 %
Time of implementation unclear	320 km	42,2 %
<b>Total</b>	<b>757 km</b>	<b>100,0 %</b>

Source: own evaluations

### Traffic impacts of cycle highways

Based on an explorative scenario, the traffic impacts of cycle highways in Germany were determined. Here, it was shown that the contributions of cycle highways to changing the modal split in favor of cycling can be demonstrated on a local scale.

For the year 2040, the share of bicycle kilometers traveled on all cycle highways is 4.3% of the total cycling kilometers in Germany. The shift effect from car to bicycle caused by cycle highways, is in 2040 less than one per mille in relation to the estimated car driving performance in Germany for 2040.

On a local scale, however, cycle highways can have a significant impact, especially if they are linked to cycle highway networks and other mobility stations (public transport, car sharing, taxi). Due to the high quality standards of cycle highways, they also have a further effect of bundling bicycle traffic. In this case, model calculations have shown that within the catchment area of cycle highways (2 km on both sides of the cycle highway), up to a quarter (25%) of all bicycle-kilometers are performed on cycle highways.

Regarding modal shift effects, cycle highways are not expected to be the solely drivers of the mobility transition. This applies to the Germany-wide perspective and the local level. The traffic data of bicycles and cars are so far apart that the effect will hardly be quantitatively verifiable.

In a broader view, cycle highways also contribute to reducing traffic-related CO<sub>2</sub> emissions, improving traffic safety, and reducing emissions of air pollutants (such as particulate matter (PM<sub>10</sub>), nitrogen dioxide (NO<sub>2</sub>), and sulfur dioxide (SO<sub>2</sub>)).

## Interactions between cycle highways and urban development

As part of the analysis of the interactions between cycle highways and urban development, three examples from Dortmund, Hamburg and Munich were examined. These projects show that there are clear differences between cycle highways in built-up areas and those that are created in connection with new "greenfield" neighborhoods.

Regarding the 1.2 km section of the RS1 in the urban area of **Dortmund**, the biggest challenge was the elimination or rearrangement of car parking spaces. In addition, the decision to classify the cycle highway as a bicycle road broke new ground. In the actual planning and implementation, this led to uncertainties because the associated traffic rules did exist but were not familiar to all road users due to a lack of existing application cases and supporting communication. After completion, it became apparent that the redesign of the street space increased the quality of life and the quality of stay (reduction of motor vehicle traffic and more space for green areas).

The planning of new development areas in **Hamburg** (analysed for Wilhelmsburg and Oberbillwerder) vividly illustrates how traffic and urban planning/urban development can find integrated solutions if an independent project management entity is governing the planning process. It shows that the quality of the planning process has a significant influence on the quality of the result. In the functional planning for Grasbrook, the high social, environmental, ecological requirements and those regarding traffic have largely been met. Success factors are the available space, a professionally neutral project management and motivated and qualified planners and contractors.

Furthermore, four examples from **abroad** were examined. These show that problems regarding the availability of land which is required for bicycle traffic can also be solved by relocating bicycle traffic to its own plan-free route with elevated tracks, bridges and overpasses.

## Success factors

The following success factors have been identified for realizing cycle highways:

### Political backing

Clear and supporting decisions regarding the development of cycle highways made by the relevant committees and decision-makers are essential for an efficient planning process. It is also crucial that positive decisions are not withdrawn due to long planning periods.

### Experience and competence in administration and technical planning

Since there are several authorities responsible for the construction and the tasks of a cycle highway, there is often a lack of clear project structures and processes at the beginning. Therefore, it is advantageous to create a managing organization or to nominate project managers from existing authorities.

### Availability of land for the route

Planning and public participation are simplified if land is already available for the planned cycle highway. If this condition is met, participation is focused on the design and avoidance of undesirable effects. Moreover, there is no need for additional land acquisition.

### Choice of different guidance forms

Depending on the demand potential and available traffic areas, the guidance form is possible as a cycle highway or other comparable bicycle roads in Germany. These options are eligible for funding through various funding programs.

### As few as possible road administrations

For the planning of cycle highways, it is advantageous to keep the number of road administrations/ responsible authorities as low as possible. Various authorities being responsible for the approval of the planning within a project increases the complexity of planning, financing and approval.

### Rapid realization

Experience from previous cycle highway projects has shown that the planning phase can take many years, while the actual construction period is much shorter. For reasons of political and public acceptance, but also for cost and motivation reasons, efficient implementation is advantageous.

### Equation of cycle highways and state roads

In two federal States of Germany, cycle highways are legally equal with state roads. This leads to two advantages. Cycle highways have priority over lower-ranking road categories in crossings / junctions. Cycle highways can be financed solely from the state budget for street building.

## Challenges

### Topographical obstacles

Topographic obstacles and non-level crossings of rail lines, waterways, and the higher-order road network require engineering structures, therefore driving up costs, and narrow the options for cycle highway route alternatives. It makes sense to start the planning process as early as possible.

### Conflicts with environmental requirements

Conflicts with environmental protection issues (such as FFH areas, protected forests, agriculture and forestry, requirements for the preservation of historical monuments, or inner-city green spaces) result in more resources and time of all bodies involved. For some common conflicts (such as nocturnal fauna), solutions already exist, such as adaptive illumination.

### Land acquisition

Difficulties in land acquisition and complying with quality standards in order to meet the requirements for federal or state funding. It is necessary to check whether it is possible to undercut this standard (e.g. waiver of separate pedestrian path).

### Lack of specialized personnel

Lack of specialized personnel in the administrations, but also in the planning offices, additionally aggravated in the time of the Covid pandemic.

### Planning and financing agreements

Planning and financing agreements with the affected municipalities require technical coordination and corresponding political backing - this requires time and persuasion.

## Contribution to sustainable community, urban and regional development

Cycle highways, as a premium product of cycling infrastructure, are one element to make cycling more attractive and reduce the use of environmentally less advantageous transportation systems. In a hierarchical structured network of bicycle paths, cycle highways can accommodate bicycle traffic flows to the extent that they are linked to other bicycle paths and public transportation services. In this respect, their deployment cannot be at the expense of other sustainable modes of transport but must be integrated into an overall traffic concept - as it is practiced in many places.

In the planning process for cycle highways, which is predominantly taking place during the review of status quo, the responsible authorities encounter various reservations, which, however, decrease during the planning process and after completion. Accompanying measures (neighborhood garages, parking for residents) as well as a continuous communication also play an important role here.

So far, integrated planning approaches such as with housing or open space planning are still pioneer cases. However, the examples studied (from Hamburg and Münster) suggest that there are great opportunities here for both traffic planning and housing / local recreation / climate protection. In the future, urban development and bicycle traffic must be thought, planned and implemented together more than ever before.