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## Bike Model District “Alte Neustadt” in Bremen

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## Bike Model District “Alte Neustadt” in Bremen

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**Abstract.** How to transform existing urban structures into zero emission cities by 2050 - especially if money is rare? The School of Architecture Bremen (SoAB) at the City’s University of Applied Science have initiated an innovative and collaborative project for the further development of the university’s neighbourhood, the “Alte Neustadt”. SoAB participated in the national climate protection by bicycle traffic competition and was granted funding for the transformation of the district into Germany’s first bicycle zone. In cooperation with the city district, NGO’s, cultural institutions, and other neighbourhood organisations, a network of bicycle streets in connection with new bicycle highways will be installed. By 2020 comprehensive new bicycle parking areas will be finished, as well as new cyclist and pedestrian friendly crossings over the main roads. The campus’ main street will be transformed into an “Open Campus” for the university and the neighbourhood. A multifunctional “Bike Repair Café” with cargo bike sharing and bike rental facilities will enhance the district’s transformation even further, thus creating a space to reflect environmental problems to be solved. The bike model district “Alte Neustadt” is just a small step in the right direction, but a huge improvement of the district’s quality of life.

### 1. Introduction

Bremen was among the first cities in Germany to establish own cycle paths (Froitzheim & Lüers, 1988). The idea of bicycle boulevards – roads on which cyclists have the right of way – found its origin here and spread all over Germany.

Today, the people of Bremen use their bikes for one in four journeys. This means that the proportion of journeys made by bicycle in Bremen is well above the average of comparable cities such as Dresden, Dusseldorf, Frankfurt am Main and Leipzig ( SUBV, 2013). Looking at the top ten list of bicycle friendly cities 2017, however, Copenhagen, Utrecht and Amsterdam lead the list, whereas Bremen is not even mentioned. A recently carried out study by the German Cyclists' Federation (ADFC) illustrates the German bicycle dilemma: Bremen is rated as the most bicycle friendly German City, compared to other Cities with an equivalent number of inhabitants (ADFC, 2018). Rated according to the German school grading system Bremen reaches a 3,5, which means something between “satisfying” and “enough”, far away from “excellent” or just “good”.

Things, however, are starting to change: in 2016, one of Bremen’s central districts “Alte Neustadt”, applied for funding to become Germany’s first bike model district on an initiative by the School of Architecture Bremen (SoAB). The application was supported by the municipality, NGO's such as the General German Bicycle Association, cultural institutions e.g. the local swimming pool, and other neighbourhood organisations.



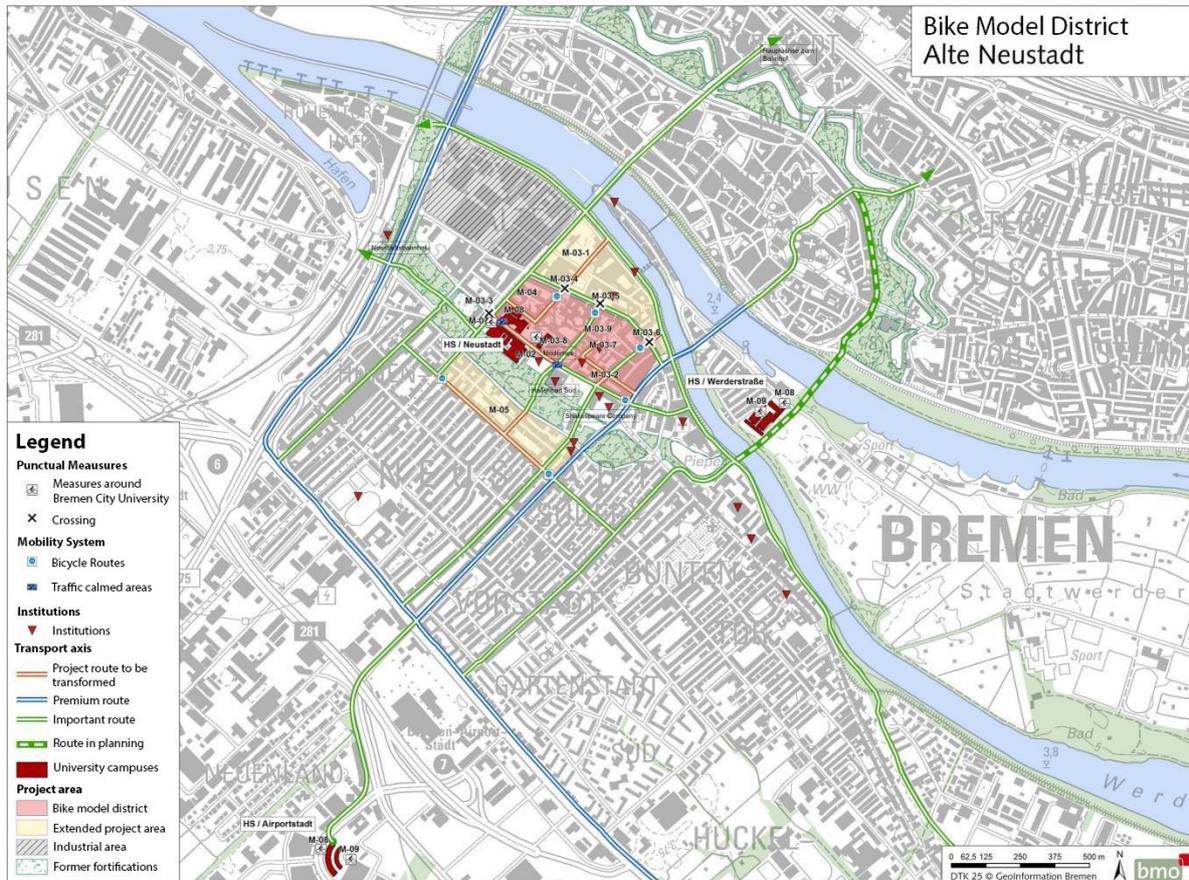


Figure 1 Bike-Model-District “Alte Neustadt” Bremen

## 2. Bike Model District “Alte Neustadt”

### 2.1. Objectives of the Bike Model District

The transformation of “Alte Neustadt” (Figure 1) into a bicycle zone aims to bring improvements not just for cyclists, but for all road users and residents by offering a coherent network of bicycle lanes, parking facilities, uniform signage and other facilities in order to make cycling the preferred mode of transport.

### 2.2. Ten Measures to be taken

In order to achieve equal mobile coexistence of the different traffic and interest groups in the district the following individual urbanistic and structural measures have recently been realized, constituting the new bike-model-district:

- *Bump-free Cycling*

Bumpy cobblestone streets get a paved strip or are completely redeveloped. Driving becomes quieter, safer and more comfortable for everyone.

- *Bicycle Boulevards*

Within the bike model district, a network of bicycle lanes becomes a cycling zone where bicycles are given priority over motorized private transport. Cyclists are allowed to cycle side by side, the general speed limit is 30 km/h, and car parking is clearly marked.

- *Network of Premium Bicycle Routes*

Bremen's traffic development plan for 2025 suggests several premium cycling routes within the city area. These will connect the city districts over long distances, making them more attractive for cycling. The "Alte Neustadt" will be well connected to this premium route network, motivating especially students to come to university by bike (Figure 2).

- *More space and safety due to pavement enlargements*

Sidewalk enlargements at intersections and junctions and intersections make crossing safer for everybody, especially for younger children or slower people, by providing a better overview. At the same time, they keep the junctions free for larger vehicles of the fire brigade, refuse collection and delivery traffic (Figure 3).

- *Safe and Easy Crossing of Main Roads*

The crossing of the main roads on the edge of the bicycle zone will be facilitated for pedestrians and cyclists by measures such as pedestrian refuge islands, traffic signals and speed limits.

- *Bicycle Parking*

In the residential streets new bicycle parking facilities provide safe parking. At the City University's 3 campuses easily accessible and partly covered bicycle parking spaces will be created. In total, over 600 secure bicycle parking facilities will be installed.

- *Bicycle Repair Café*

A bicycle repair café will be built on the City University's Neustadtswall Campus. Housing a serviced workshop, a café, and space for small events, it will be the highlight of the bike model district. Addressing not only the students, but all interested people and cyclists, it connects the university campus with the neighbourhood (see 0for more detail).

- *Remodelling Neustadtswall Campus*

The main connection between the different university buildings, Neustadtswall, will be the centre of a redesigned campus. A raised road surface, the renovation of the sidewalks and a traffic-calmed area ensure an accessible and pleasant environment for more than 10,000 students and employees.

- *Rental Stations for Bicycles and Cargo Bicycles*

All three university campuses will be provided with rental bike stations that are connected to a city-wide rental bike network. The bikes, along with cargo bikes available at the Bicycle Repair Café, can be rented by everybody.

- *Air Pump and E-Bike Charging Stations*

Air pumps and e-bike charging stations will be built at all three university campuses, integrated into the covered bicycle parking facilities.



Figure 2 Network of Premium Bicycle Routes

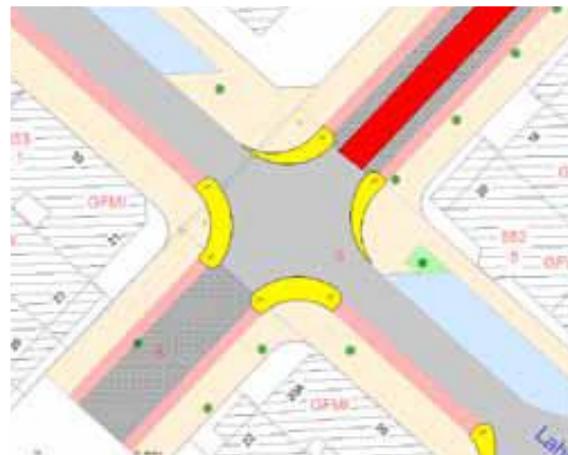


Figure 3 pavements enlargements at crossings

This bundle of measures is expected to increase the percentage of students and university staff that come by bike every day as cycling will be far safer and thus more attractive in the future. Especially the cargo bikes provided at the Bicycle Repair Café will help to reduce the number of journeys usually carried out by cars, e.g. when students need to buy beverages for the next campus party.

### 3. The Bicycle Repair Café at Neustadtswall Campus

#### 3.1. Intention

The heart of the Bike-Model-District will be the new Bicycle Repair Café at the City University of Applied Sciences' Neustadtswall campus. It will be completed by summer 2019. It will primarily serve as a meeting point for cyclists, not only for the university itself, but the surrounding neighbourhood as well. Visitors will find professional assistance for minor bicycle repairs. In addition, the Bicycle Repair Café will serve as a place for research and teaching, as well as an object of investigation for sustainable architectural concepts.

#### 3.2. Design and construction principles

The building's design and construction reflect the ideas of sustainable building, especially in its geometry, structure and the choice of construction materials. The gross floor area of the wooden structure will be approximately 140 square metres. A compact building core containing ancillary and technical rooms divides the building into a café and a workshop area. Both areas can also be used as event rooms. The characteristic structural elements are the funnel-shaped wooden roof, made of prefabricated BSP-elements, as well as the transparent facades, which ensure a high degree of connection to the outside space.

#### 3.3. Historical context

Situated in front of the university's historic main building (Figure 4), the historical context also had to be taken into account for the building's design. Since the neighbouring buildings are under a so-called "ensemble protection", the city's highest monument authority along with the city's design advisory



Figure 4 Situation of the new bicycle repair café in front of the university's historic main building

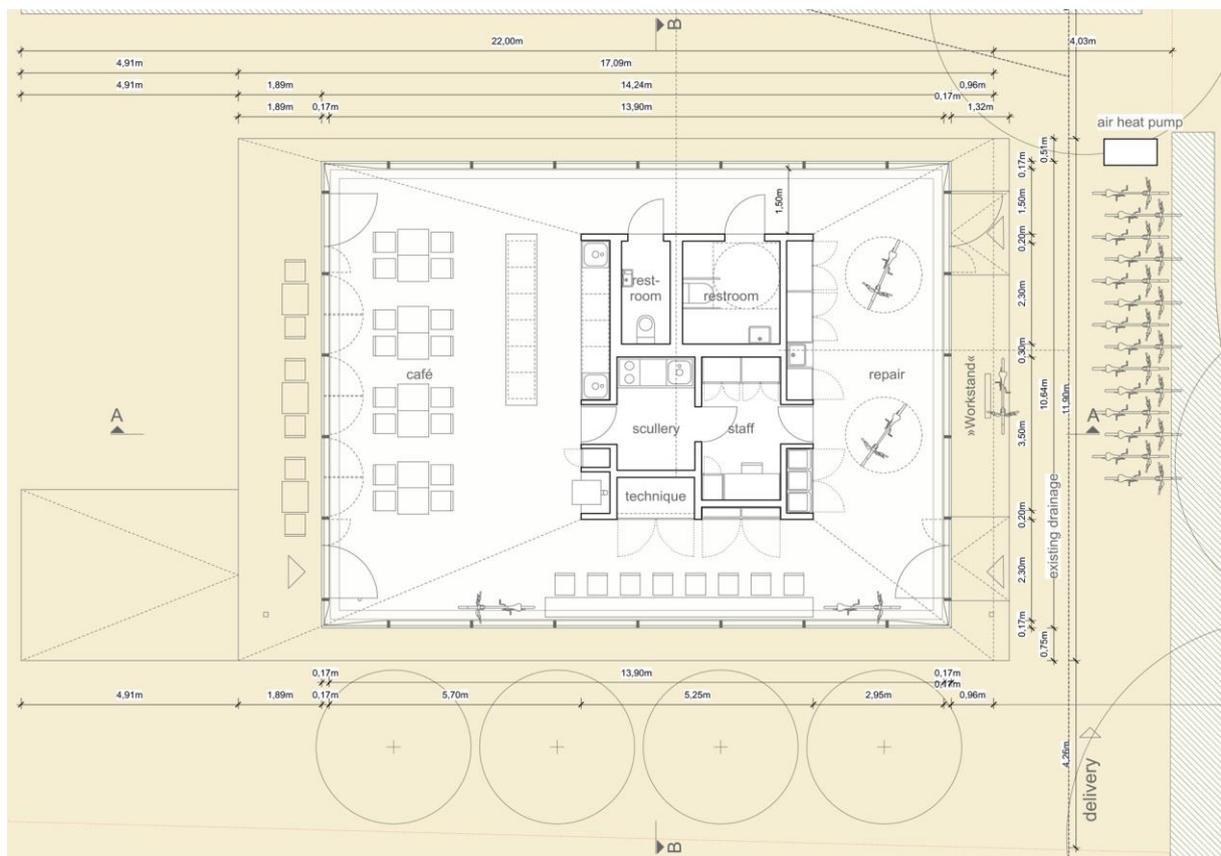


Figure 5 Section (above) and floorplan (below) showing the technical and structural core of the building, defining the usage areas

board were involved in the whole process. This means that monument protection and cityscape/urban planning requirements always had to be weighed against the requirements for an energy-optimized building.

The preservation of the trees on the forecourt of the listed main building was mandatory and maximum of transparency was desired. This stands in contrast to an energy-optimized building, because in summer too much energy is expected from direct solar radiation and in winter too much heat loss is expected from large glass areas. However, a careful analysis of the location, including detailed shadow studies for example, allowed both concerns to be combined and taken into account in the planning. In summer, large parts of the building are shaded by the neighbouring buildings and the existing trees. A further contribution to the shading of the north-west façade is made by the preserved ornamental apple trees.

### 3.4. Sustainability Concept

The overall intention is to reduce CO<sub>2</sub> emissions over the whole life cycle of the building, wherever possible. In addition to using materials from renewable resources or recyclable materials and an ambitious energy concept (3.4.2), the folding roof geometry also contributes to the sustainability of the building. It allows to use slimmer material cross-sections and thus saves material.

Furthermore, the Bicycle Repair Café will serve as a meeting point for students, university staff and neighbouring residents, opening up the campus to its neighbourhood, thus contributing also to the social aspects of sustainability.

#### 3.4.1. Building envelope

The building envelope meets passive house standards ( $\Psi < 0,01 \text{ W}/(\text{m}^2\text{K})$ ,  $n_{50} < 0,6/\text{h}$ ). The four facades are fully glazed with three-pane safety glass ( $U < 0,6 \text{ W}/(\text{m}^2\text{K})$ ,  $g < 0,4$ ). The facade columns behind them are made of untreated tubular steel and are therefore easy to recycle. The wooden roof construction is designed as a warm roof construction ( $U < 0,1 \text{ W}/(\text{m}^2\text{K})$ ) and carries a retention roof that regulates the climate both in the urban space and in the building. In summer it protects the building from strong heat input via the roof and in heavy rain it relieves the public sewerage network by absorbing part of the rainwater.

Table 1 Estimated U-values of building envelope

building component	U-value
opaque walls	0,1 W/(m <sup>2</sup> K)
transparent walls	0,6 W/(m <sup>2</sup> K)
doors	0,8 W/(m <sup>2</sup> K)
roof	0,1 W/(m <sup>2</sup> K)
Floor plate	0,15 W/(m <sup>2</sup> K)

#### 3.4.2. Energy concept

The main idea behind the energy supply is to ensure that as little CO<sub>2</sub> as possible is emitted as a result of the energy requirements of the Bicycle Repair Café for heating, cooling, ventilation and hot water as well as for general electricity. The building is not regarded as an autonomous unit, but as part of a regional overall energy system. The energy supply is adapted to the

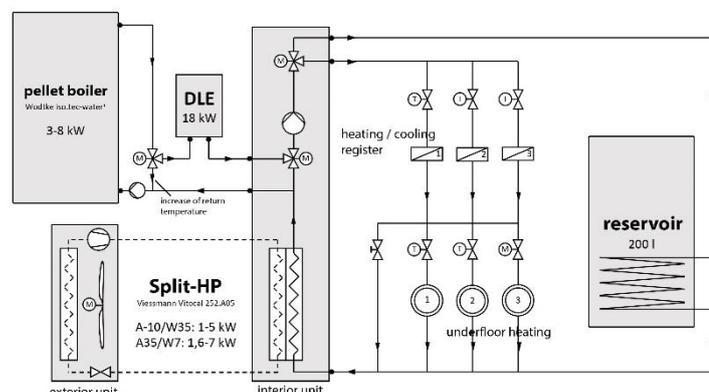


Figure 6 Hydraulic scheme

changing boundary conditions of the energy turnaround and takes into account the economic efficiency.

The energy concept pursued here for the Bicycle Repair Café is deliberately not based on current building definitions such as zero-energy or plus-energy house. These definitions allow an energy or CO<sub>2</sub> credit of the regenerative electricity generated at the building with its energy demand or CO<sub>2</sub> emissions in winter.

The Bicycle Repair Café is to be operated only from regionally available regenerative electricity. Heating and cooling are provided by an electric air heat pump. If there is a surplus of energy, this is stored in two battery memories and returned to the system when required. If no regenerative energy or stored energy is available, the pellet stove connected to the system is activated (Figure 6).

### 3.4.3. Materiality

For all components, two design variants will be compared before the execution, on basis of a life-cycle assessment, focussing in the primary energy demand (PE renewable, non-renewable) and CO<sub>2</sub> emissions.

Special attention is paid to the use of renewable raw materials. If the use of materials from non-renewable raw materials is necessary, easily recyclable materials or materials from recycled raw materials are used. Accordingly, the main construction is made of wood (BSP). The facade construction is made of untreated steel and is therefore easy to recycle. In general, composite materials are not used in order to ensure that recycling is as complete as possible. Foam glass is used for insulation materials, vacuum insulation panels in special situations, when thin, efficient insulation is necessary.

## 4. Expectations

The project is supported by various departments of City University of Applied Sciences Bremen. Several institutions contribute their individual expertise in the fields of climate-friendly architecture, building services engineering, building automation, structural design, etc. to the building development.

Table 2 Planning Team

	<b>Institution</b>
Justus Dietz Michaela Hoppe Steffi Kollmann Ingo Lütkemeyer Ulrike Mansfeld	School of Architecture Bremen, City University of Applied Sciences Bremen
Prof. Rolf Strauß	Nature and Engineering, Department of Mechanical Engineering, City University of Applied Sciences Bremen
Prof. Martin Speth	School of Architecture Bremen, City University of Applied Sciences Bremen / Drewes + Speth Engineers, Hannover

This involvement of several university teachers in the design and planning process ensures the integration of the experimental building into future teaching and research. Students will be involved in the post occupancy evaluation, e.g. recording the thermal behaviour of the building or mapping the resulting energy demand. The building will serve as a case study for life cycle assessments. Due to the easy accessibility of the technical components these can serve as practical examples for architecture and engineering students. Being open to the public, the building will also contribute to a better distribution of scientific outcomes to the public.

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