



Sustainable and energy-efficient urban development in Munich

„Energiegerechte Stadtentwicklung“ in München

Opportunities for existing building stock through new energy innovative districts in Freiham and Neuaubing

- brief summary -

Preamble:

The term “Energiegerechte Stadtentwicklung” hasen’t been used in German before – the project team chose this term to indicate that their approach is so far unique. One might translate it to “sustainable and energy-efficient urban development based on socially just provision of energy for inhabitants and districts.

„Extending the city“

New urban development on Munich’s western boundaries

The development of the new district Freiham to the west of Munich’s city centre is based on the principle “extending the city”. The intention is for Freiham to serve as a role model distinguished by its sustainable energy concept and contribution to climate protection. The plans were originally approved by Munich’s city council on 8 October 2008. The neighbouring district of Neuaubing, to the east of Freiham, is included in the plans for the 190 ha residential area, Freiham-Nord, designed for approximately 20,000 residents. Based on the proposals for Freiham, Neuaubing is a pilot project for energy efficient urban redevelopment. The master plans for the two areas have been harmonised and have matching energy saving targets.

The objective of the sustainable and energy-efficient urban development project is to link the construction of the new neighbourhood with the redevelopment of the existing district by taking account of structural, urban, economic and social criteria. The City of Munich’s Department for Urban Planning and Building Regulations, Munich’s public utilities Stadtwerke München (SWM) and the University of Applied Sciences / Hochschule für Technik Stuttgart (HFT) have worked together as partners in an interdisciplinary team on the research project “Sustainable and energy-efficient urban development in Munich Freiham/Neuaubing”. Planning procedures, such as district design concepts, urban development competitions and refurbishment schemes, were interlinked and contributed towards the formulation of the overall strategy for the whole area. The research project has been funded by the Federal Ministry for Transport, Building and Urban Development (BMVBS) as part of the National Urban Development Policy (NSP) programme.

Energy concept

The basic principle of Freiham’s energy concept is for buildings to have a low energy demand. All buildings must at least meet the requirements of today’s Efficiency House 70 (a government-subsidized KfW energy efficiency standard). The remaining energy demand is to be generated with as little impact on the climate as possible by taking advantage of the geothermal and photovoltaic energy sources available in the development area.

The conditions for sustainable and energy-efficient construction were set out in the urban design concept. Keeping the neighbourhood as compact as possible is not only favoured for space conservation reasons and short travelling distances, it also facilitates the setting up of an innovative low-temperature district heat network. The efficiency of the latter is determined by the heat demand, which, alongside the construction standard, is related to the compactness of buildings. In this regard, the advantages of high density with, in energy terms, a good surface-to-volume ratio must be weighed against the advantages of greater building separation allowing for more exposure to sunlight and capture of solar energy.

The use of environmentally-friendly ground heat from a depth of almost 3000 metres is one of the key aspects of the energy concept for the heat supply in the new district. Due to the good thermal insulation of buildings, the provision of heat is almost carbon-neutral. The construction of the geothermal power plant in Freiham is now almost complete. The location on the dividing line between the residential area Freiham-Nord and the commercial area Freiham-Süd offers favourable conditions for heat generation and distribution. The power plant transfers the heat from the thermal water into the grid and returns the cooler, but otherwise unchanged water, back into the ground. The more heat that can be extracted from the thermal water, the more efficient the system. It is for this reason that an innovative low-temperature grid has been incorporated in the new residential estate Freiham-Nord. Linking Freiham to the other suburbs on the western outskirts of Munich is a fundamental milestone for the success of the two projects, Ausbauoffensive Fernwärme and Fernwärme-Vision 2040, conducted by Stadtwerke München (SWM), which aim at the supply of district heating derived solely from renewable energy sources.

Sustainable and energy-efficient urban development in Freiham

The urban and landscape design competition for the first construction phase Munich-Freiham was held in 2011. The energy-related requirements for the competition were determined during the course of preliminary research and used as a basis to evaluate the results. The competition area was divided into two sections: the first focusing on the district centre, a school and a sport centre, and the other on residential buildings. The first prize for section A was awarded to Ortner & Ortner Baukunst, BSM and Topotek1 from Berlin. Their vision was to separate the area into three sections each with its own distinctive character and pleasant atmosphere. West 8, from Rotterdam, was awarded first prize for section B, which focuses mainly on housing and the planning of a neighbourhood centre. The design is characterised by a dense, but loosely arranged property development, contained within a green landscape.

Detailed studies of the heat demand and investment costs for the spaciouly laid out development illustrate that it is not so much the density of buildings, but the compactness of the individual volumes, that is the dominant factor for meeting the targets of energy standards: structures that are less compact with roof terraces and setbacks increase the heat demand and investment costs by almost 10%. On the other hand, in compact buildings not using the roof areas for other purposes, the area available for the installation of photovoltaics is more than double that for the variant with terraces and fewer full storeys.

Munich's city council determined the make-up of the development plan for the first construction phase Munich-Freiham in March 2012. The planning for building approval, which involves coordinating and further developing the two award-winning designs to form a single common master plan, is currently underway.

Sustainable and energy-efficient urban redevelopment in Neuaubing

In the case of Neuaubing, the full range of measures necessary to reduce energy consumption was examined as part of the research project. In addition, the conflicting goals between energy objectives and other aspects, such as social acceptability and urban design, were identified at an early stage. The aim was to designate a redevelopment area in which energy efficiency upgrades could be conducted in a socially acceptable way with a fair apportionment of investment costs.

Based on heat requirement calculations for the existing building stock, a variety of utility supply and refurbishment strategies were developed for the residential buildings in Neuaubing. In line with the energy-related targets used by the City of Munich, the years 2030 and 2050 were determined as appropriate time horizons to assess the effectiveness of the selected scenarios. Whereas the climate protection goals for 2030 will be fulfilled by executing the planned measures, it will not be possible to meet the Federal Government's requirements for climate neutral urban districts by 2050. This expresses the need for further effort, in addition to the already very ambitious measures, in order to reach the climate protection goals in the project area Neuaubing by 2050.

A comprehensive survey was conducted in the project area Neuaubing to assess the quality of buildings, rental prices, including current heating costs, the type of energy supply systems and corresponding greenhouse gas emissions. Following on from this, various upgrade strategies for the building envelopes and energy supply systems were determined and carefully analysed for the three pilot areas. The most important recommendations for Neuaubing-West are based on the results of research performed in the pilot project areas. The results not only refer to structural and energy-related aspects, but also to the social acceptability, in terms of the selection of energy-efficient building standards and protection of sites of architectural interest. The continuous participation of residents in the refurbishment planning is an important feature throughout the process.

Energy roadmap

Taking into account energy-related, urban design and socio-economic considerations, model energy concepts have been drawn up and coordinated for the new development area and the existing districts. In line with the integrated approach, these plans have been harmonised and combined to form a comprehensive energy roadmap for both districts covering the following key issues:

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- identification of criteria to assess the importance of different courses of action within the scheme of an integrated approach towards sustainable and energy-efficient urban development
 - determination of carbon savings potential applicable to the new development and existing areas
 - linkage of urban design, local heat supply and energy standards
 - local acceptability and economic implementation of high energy standards
 - prevention of social polarisation between existing and new districts.

General recommendations

The research project has highlighted the need for a fully coordinated approach among the utility companies, authorities, residents and owners in the case of energy efficient urban upgrades. Furthermore, the positive effect of scientific support throughout the planning process has been underlined; the purpose being to ensure that results from latest developments and studies are fed into the design. The exchange of information and the cooperation of key players has been improved significantly in Freiam and Neuaubing. The method developed in the research project to determine the heat demand of existing districts according to building type and standard of refurbishment, which included surveying and mapping on site, is more accurate than former methods that relied only on area typologies. The recommendations for the future are therefore to use the approach employed not only for preparatory investigations in the context of the German Urban Development policy (Bundesrecht Städtebauförderung – Vorbereitende Untersuchungen), but also for the development of other urban district design concepts.

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