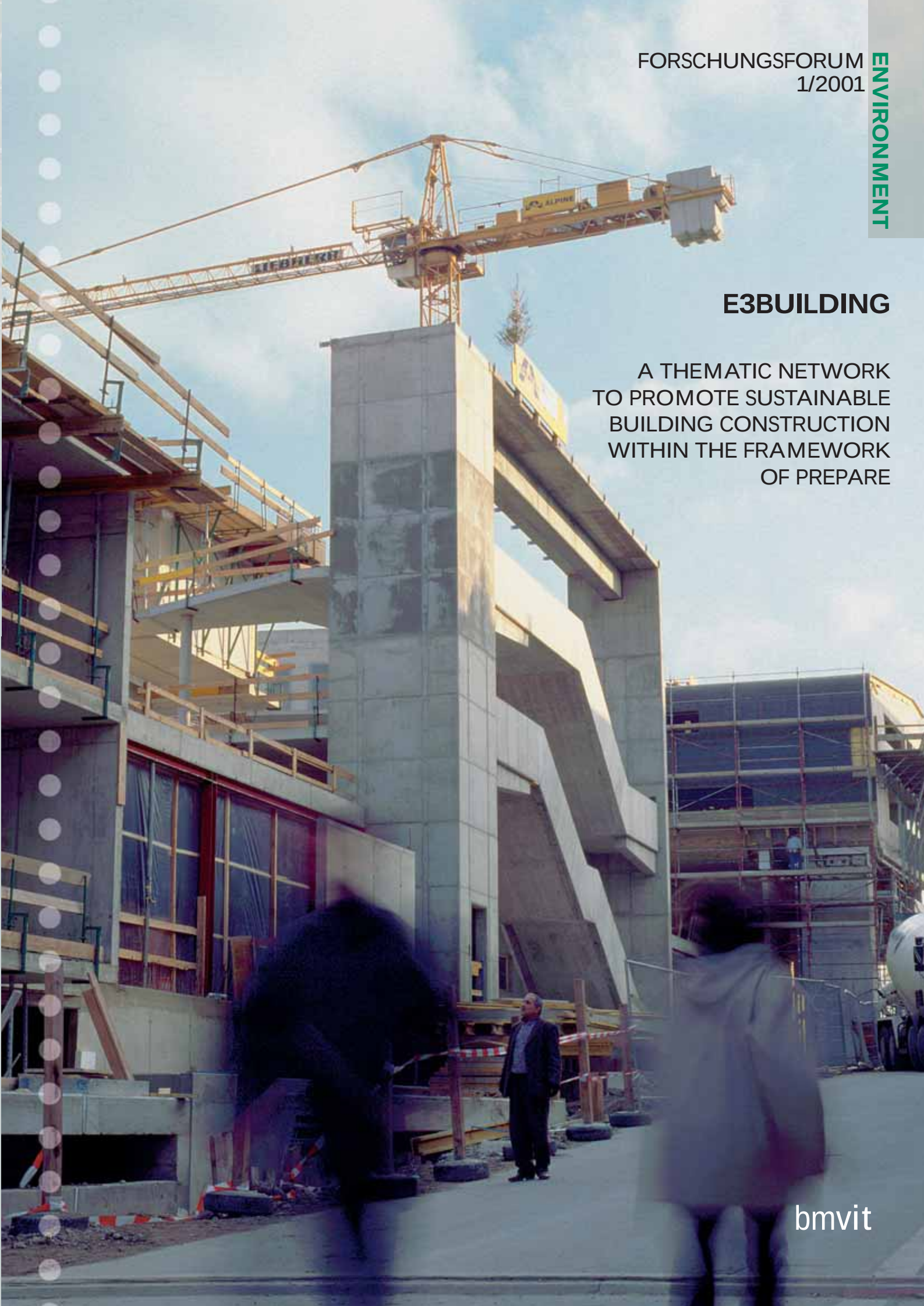
FORSCHUNGSFORUM
1/2001

ENVIRONMENT

E3BUILDING

A THEMATIC NETWORK TO PROMOTE SUSTAINABLE BUILDING CONSTRUCTION WITHIN THE FRAMEWORK OF PREPARE



bmvit

E3BUILDING – ECOLOGY, ECONOMY, AND EFFICIENCY AS ASPECTS OF SUSTAINABLE BUILDING CONSTRUCTION

The issue of "sustainability" forms part of future-oriented fields of research and development in today's international discussions. Strategies toward sustainability do not only take into account goals of ecological policy but also open up comprehensive opportunities of innovation for Austrian enterprises. An ecoefficient management can result in intelligent solutions and greater cost-efficiency and, in the long run, secure the competitiveness of the Austrian economy.

From the point of view of a demand-oriented research and technology policy the fields of building construction and dwelling are of paramount importance. In the development of sustainable forms of building construction as many potential future needs as possible have to be considered and the quality of life and health of occupants have to be in the center of all considerations. Of the many requirements a "Building of Tomorrow" must fulfill, energy efficiency and intelligent use of ecological (renewable) materials and of renewable forms of energy are particularly important.

In order to let visions of a "Building of Tomorrow" come to life and promote concrete development, the Austrian Federal Ministry of Transport, Innovation, and Technology (BMVIT) has initiated numerous projects and, within the scope of the stimulation program "Sustainable Development", resulted in a special subprogram entitled "Building of Tomorrow". This five year research program aims to find sustainable solutions for building parts and components in the field of residential, office, and commercial building construction. The objective is to support innovative RD&D projects and demonstrate their feasibility by means of concrete projects. Another important goal consists in the dissemination of results and measures improving the exchange of information.

■ In compliance with these research policy objectives, the BMVIT supports a project conducted by the Austrian Institute for Applied Ecology aiming at the organization and management of the thematic network "e3building". "e3" represents three important aspects of sustainable building construction: ecology, economy, and efficiency. The network was founded in 1999 within the scope of ***PREPARE*** as international platform for the exchange of information with the objective to intensify the dialog and the cooperation between clients, architects, engineers, consultants, building contractors, manufacturers of building materials and components, researchers as well as representatives from politics and the administrative bodies.

Buildings of tomorrow should

- be designed for economic efficiency and minimum input of resources
- consume only a minimum of energy during use and be ecologically sound
- be adaptable to changing requirements of future users
- remain competitive in the market on a long-term basis

The network aims at bringing together all those involved in the building process in order to identify future requirements and trends in the different trades and to jointly promote innovative development. In addition, the information platform serves as stimulating instrument for demonstration and pilot projects as well as for cooperation in the building industry.

To date, four workshops on selected themes involving experts from all sectors of the building industry have already been organized within the framework of "e3building". While the first workshop defined the objectives of the network, key tasks, and approach, the subsequent **workshops dealt with the following topics:**

- "Renovation of buildings constructed in recent decades" (Feb. 1999)
- "Building certification – greater value, improved environmental quality, and less damage with 'Total Quality Management'" (June 2000)
- "Built in 2020 – home dreams of tomorrow?" (December 2000)
- "Beyond demonstration concepts towards widespread implementation (PREPARE Workshop, May 2001, Sweden)

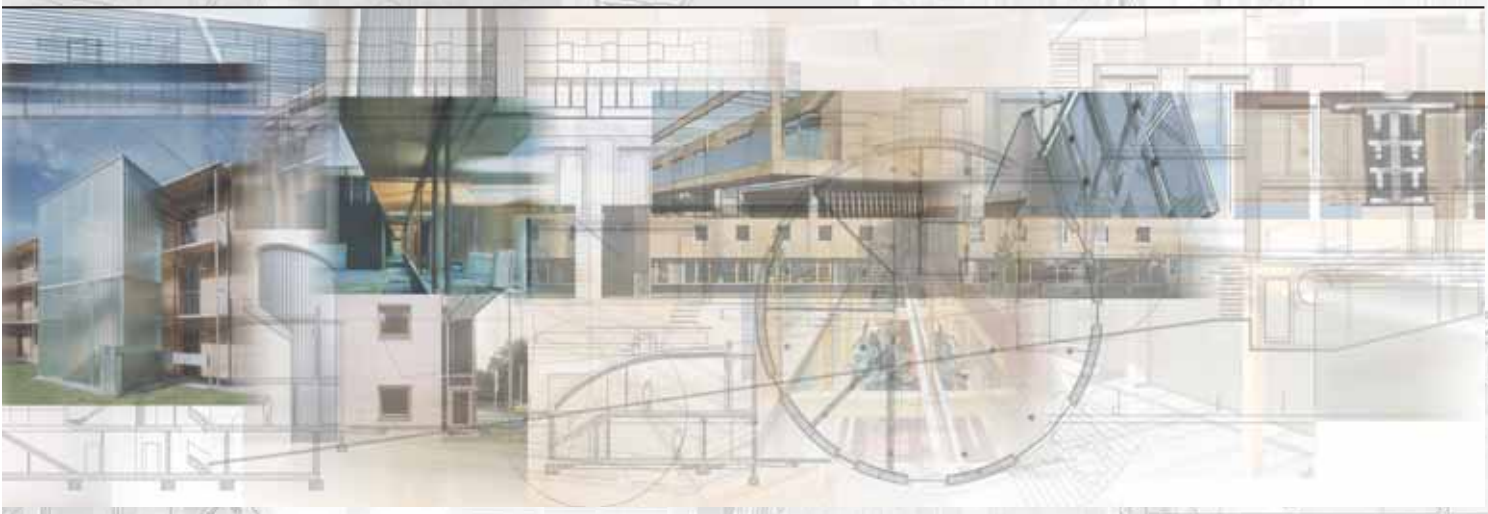
The results of the individual workshops have been published at www.e3building.net

Concrete projects realized by "e3building" participants will be presented below. The projects "Wohnträume" and "HY3Gen" as well as an example taken from practice (the innovative logistics concept of "Mischek" company) are to demonstrate the objectives of the network.

PREPARE

is a European initiative for the promotion and implementation of preventive environmental protection in industrial production. Key tasks include the promotion of activities and development in the fields of Cleaner Production and sustainable product development as well as the stimulation of practice-oriented research and development for the industry. Since 1997 an increasing number of thematic groups have been established within the scope of PREPARE, which deal, in the form of networks, with specific themes and initiate pilot projects. In 1999 a thematic network entitled "e3building" was initiated.

PILOT PROJECT HY3GEN – A MODULAR SYSTEM FOR RENEWABLE BUILDINGS



One of the future-oriented building projects initiated by one of the project teams of the e3building network is called "HY3GEN" – the renewable house". This innovative building concept was developed within the scope of the BMVIT subprogram "Building of Tomorrow" and is currently being realized by the contractors "Domizil Bautraegergesellschaft mbH" ,"SEG Stadterneuerungs- und Eigentumswohnungsgesellschaft", and KALLCO Bautraeger GmbH. The idea behind the concept, which was awarded a "Building of Tomorrow" distinction, will be elaborated and put into practice in an interdisciplinary planning and building process.

This process will involve clients, architects, energy consultants, special experts as well as representatives of the building industry, the trades, and the real estate sector. The planning process will take into account social, ecological, economic, and functional aspects.

The concept of the hybrid house was originally developed and realized in the form of multi-functional buildings at the end of the 19th century, already. The second generation of hybrid buildings was developed with the goal to optimally adapt parts and components of a building to the individual needs of users and to offer maximum flexibility. The **"third generation of the hybrid building (HY3GEN)"** broadens this approach by including other aspects such as the conservation of resources in the construction and operation of the building as well as the use of renewable raw materials and energy sources.

HY3GEN, the "renewable house", is characterized by a modular structure of the building. Flexible floorplans and different variants of equipment with standard supply points and connections are designed as a modular system, which meets the various requirements of different users and which can be adapted to changing conditions of use.

The objective is to realize a building concept, which, in its entirety flexibly adapts to the requirements of its surroundings (environment, users, market):

- The building is **ecologically optimized** by conservation of resources, use of renewable raw materials and by minimizing emissions during construction and operation.
- It is **user-friendly** through flexible floorplans and equipment, thus adaptable from time to time to individual needs.
- On account of low running costs the building has a **high market potential.** The building should be economically efficient and stable in value over its entire life cycle – for proprietor and users alike. This is accomplished by a calculation considering all costs accruing over the whole lifecycle of the building and by a broad spectrum of additional services in the fields of information technology, mobility, and facilities in the building.

The exemplary aspect of this pilot project consists, above all, in the organization of the cooperation between all participants coming from all kinds of different trades. Apart from the interdisciplinary cooperation in the development of suitable building components and construction technologies the transfer of information between builders and users of the building is of crucial importance. Innovative models of organization and building management for the individual stages (planning, construction, management, use) are to be developed within the scope of the project.

The pilot project HY3GEN is at the planning stage. Up-to-date information is available at www.e3building.net. (under "Results") and from Robert Korab, raum und kommunikation, korab@gmx.at.
Information on the BMVIT subprogram "Building of Tomorrow" at www.hausderzukunft.at.

TRANSPORTATION BY RAIL – A NEW CONCEPT OF BUILDING SITE LOGISTICS

One example of efforts towards sustainability in the building industry consists in the new concept of building site logistics developed by "Mischek" company; this concept was put into practice, for the first time, as a pilot project in the construction of a housing development in Vienna. The goal of this future-oriented project was to transfer a great part of the heavy traffic from truck to rail.

The building and construction industry accounts for approx. 30% of the materials and energy consumption of the Austrian national economy. In the construction of a building excavation works and erection of the structure are responsible for the largest portion of mass flow with approx. 40% for each stage. An environmentally sound organization of the heavy traffic from building sites would thus contribute to the cities' relief of truck traffic and, consequently to a massive reduction of CO^2 emissions and other air pollutants as well as to energy savings.

New solutions for the removal of excavation material and the delivery of pre-assembled units in this "Mischek" project brought about a massive reduction of truck movements. Construction of this housing development involved the removal of 11,000 t of excavation material. The whole housing development "weighs" about 15,000 t, of which approx. 10,000 t can be attributed to the shell of the buildings, and of these some 5,300 t to precast concrete slabs. A great part of transportation was transferred to rail. The project has thus shown that innovative logistics can bring about a massive reduction of heavy traffic in the building and construction industry.

EXCAVATION LOGISTICS

Excavation material was loaded to containers and transported to the nearby Suedbahnhof train station. From there, the containers were transported by rail, and the excavation material was subsequently used to refill a ballast pit outside Vienna. The distance building site – train station and back is 1.6 km, the distance train station – ballast pit is 40 km. The entire excavation material (except for the last day of excavation works) amounting to 7,400 m^3 was moved by rail. This means that 94% of 11,000 t were transported by rail. Total distance covered by rail was 2,280 km versus 3,914 km by truck. Conventional removal of the material would have resulted in 36,080 km by truck. A comparison of the new concept with conventional methods shows the great savings potential: Diesel consumption was reduced by 13,100 l (i.e. by 91%), while CO^2 emissions were reduced by 81% (approx. 35.4 t).

ASSEMBLY UNIT LOGISTICS

A total of 1,500 assembly units (overall weight approx.5,300 t) were produced for this housing development in Vienna. Transportation was also realized by rail from the production site (Gerasdorf near Vienna) to the train station nearest to the building site (Suedbahnhof). 66% were delivered using this method. Delivery of the pre-assembled units by rail instead of by truck, again, resulted in a considerable reduction of diesel consumption (7,710 l, i.e. minus 67%) and CO^2 emissions (22.6 t, i.e. minus 66%) and other air pollutants (not calculated).

The excavation logistics used in this project is being further optimized technically and economically and will be tried (and evaluated) again in practice. On account of the positive experience with this concept, which already is costeffective, it has meanwhile been applied to numerous other projects. The logistics concept constitutes an innovative approach to the development of sustainable product-service strategies and was awarded first place in the category "Sustainable products and solutions" of the ECODESIGN-competition 2001.


PREPARATION 10-04-00


EXCAVATION 11-04-00


LOADING 11-04-00


DISPATCH 11-04-00


LOADING UNITS 25-05-00


ASSEMBLY UNITS 25-05-00


UNLOADING UNITS 26-05-00


COMPLETION 17-11-00

P R O J E C T

WOHNTRÄUME: USER-SPECIFIC QUALITY CRITERIA IN INNOVATIVE HOUSING DEVELOPMENTS

The Austrian Institute for Applied Ecology conducted two research projects within the scope of the BMVIT subprogram "Building of Tomorrow" (supported by the developers ÖSW, Mischek, Wiener Heim, and Wien Süd), which dealt with the future perspectives of innovative building construction. While the project "gebaut 2020" dealt with the future of building construction on the basis of the analysis of trends and prognoses, which were subsequently discussed and assessed by a group of experts, the project "Wohnträume" concentrated on the perspective of the users of future-oriented housing developments.

The market of innovative housing frequently has to cope with problems concerning the acceptance by potential users. Therefore, many contractors refrain from developing innovative concepts and often use marketing problems as an excuse for the realization of conservative housing projects. From the vantage point of contractors, to observe the market and take into account the desires and expectations of potential users constitutes an essential necessity. Problems related to marketing can be avoided only if the housing project under development is optimally adapted to the subjective expectations (quality criteria) of future users as well as to the objective framework conditions (financial background, formal requirements for access).

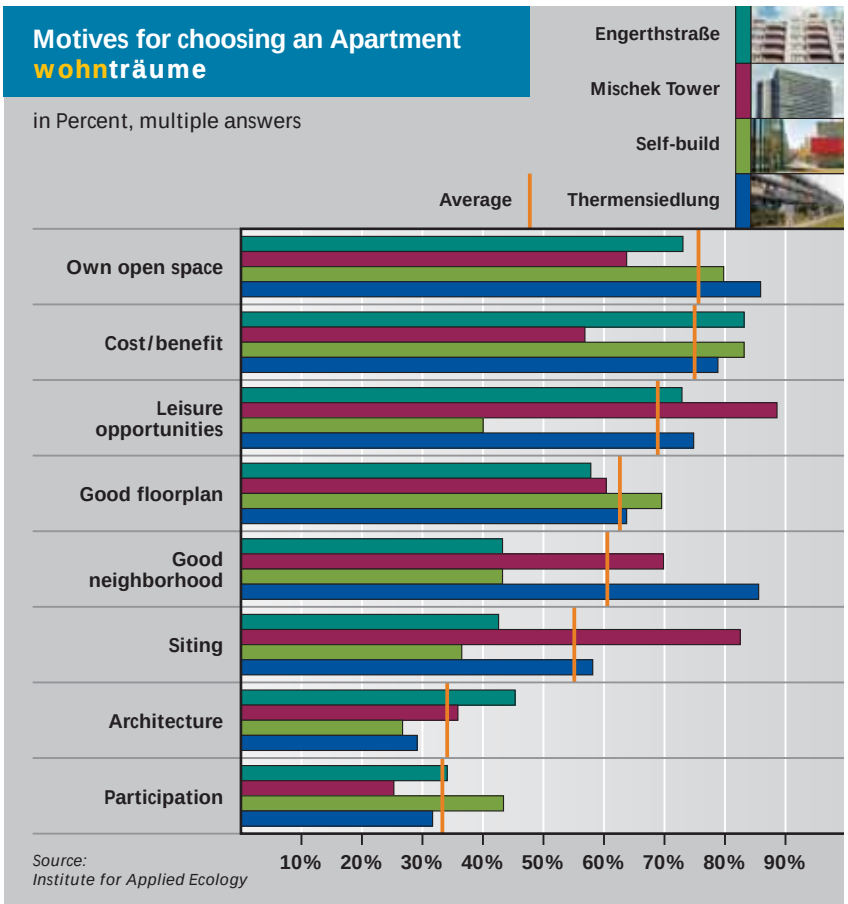
The project "Wohnträume" deals with existing innovative housing developments and occupants' satisfaction, experience, and expectations. The project aims at developing practice-oriented criteria and guidelines, and at proposing concrete measures to sponsors and clients, thus contributing to improved acceptance and a greater market potential for innovative housing projects.

The focal point of the project consists in the compilation and analysis of user-specific quality criteria. Taking selected housing developments based on different concepts as examples the decision criteria for a certain location and the evaluation of the housing developments from the occupants, point of view have been ascertained and documented. For this purpose quantitative surveys as well as qualitative interviews have been conducted with individual occupants.

Five housing developments in Vienna have been selected as reference projects. Innovation (social, economic, and ecological innovation) in connection with users, satisfaction constituted a central criterion in the selection of projects:

- The **Thermensiedlung Oberlaa** (ÖSW and GEWOG) was part of the first Vienna Contractors, Competition (1995)
- The multistory **Low Energy Building Engerthstrasse** (1993, Wien Süd GmbH) was a pilot project initiated by the City of Vienna and, at that time, the largest low energy building in Europe.
- The **self-build project Leberberg** (GEWOG) was initiated by the City of Vienna in 1995 as a subsidized apartment house; this project was to test the savings potential in building construction through work input by the future users. It also constitutes a model for comprehensive participation of tenants.
- The **Car-Free Housing Development** (Domizil Bautraeger GmbH) features a number of joint use facilities, which were financed by financial means otherwise needed for a car park.
- The **"Mischek" Tower** completed in the year 2000 is the highest multistory housing in Austria.

Questionnaires were sent to a total of 1087 households; the response rate was 33%. The results of the survey were subsequently analyzed and put into context by experts participating in several workshops. Comprehensive information on the projects and on the selected housings can be found at: www.iswb.at/openspace



RESULTS OF THE ”WOHNTRÄUME“ PROJECT

The results of the survey were documented within the scope of the project and yielded guidelines for the target group of developers and institutions granting subsidies.

As far as motives for choosing a certain apartment are concerned some criteria – so called ”hard locational factors“ – show again and again and have a decisive influence on the selection of an apartment. Persons looking for an apartment attribute the highest priority to the urban background of the residential area as well as to high-quality service facilities. Nearby recreational and leisure facilities, and access to public transportation are equally important. These criteria are surpassed in importance only by the characteristic ”good floorplan“ and the financial aspect, i.e. the requirement of a reasonable cost-benefit ratio.

Additional features of the individual housing development (such as low energy concept, common rooms or special service facilities) have a bearing only after the abovementioned criteria are fulfilled and are rather considered a ”bonus“. At first sight, ”architecture“ does not seem to be of great importance, however, functional aspects such as infrastructure, parking facilities, storerooms, and materials used in the living space do have a high priority. But hese aspects – often criticized in some developments – are not associated with the term ”architecture“. This is to show the necessity for planners to pay more attention to user-oriented aspects in addition to esthetic criteria.

The building sector in general and, in particular, the housing sector are in need of a greater commitment to innovation. The ”Wohnträume“ project has shown that a user-oriented conception of the term ”innovation“ is particularly important. This conception may differ considerably from the definition of the term from the point of view of planning or technology. In addition to the abovementioned criteria, the exchange of information between planners and future users is of great importance for the acceptance of innovative housing developments.

FORSCHUNGSFORUM in the Internet:
http://www.forschungsforum.at
in German und English

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The *”e3building“*-network is being organized and managed by the Austrian Institute for Applied Ecology on behalf of the BMVIT. The project forms part of the European PREPARE initiative.

The projects *”Wohnträume“* and *”gebaut 2020“* are being conducted by the Austrian Institute for Applied Ecology, the *”HY3GEN“* project by the developers ”Domizil“ and ”SEG“ within the scope of the *”Building of Tomorrow“* subprogram. The projects were commissioned by the BMVIT. ”Mischek Bau AG“ is responsible for the building logistics project.

PUBLICATIONS

Further information, reports, and workshop documentation are available at the addresses below:

... on the BMVIT subprogram ”Building of Tomorrow“:
www.hausderzukunft.at

... on the ”e3building“-network:
Austrian Institute for Applied Ecology
A-1070 Vienna, Seidengasse 13,
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www.e3building.net

... on the projects “Wohnträume“ and ”gebaut 2020“:
www.isbw.at/openspace

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