# osModell Kronsberg - Sustainable Building for the Future

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## 1. GENERAL INTRODUCTION

Lying to the southeast of the city of Hannover, Kronsberg is the largest homogenous area for building development in the state capital of Lower Saxony. Various urban development concepts had been proposed since the 1960s, but it was the World Exposition that enabled the municipality to implement them. The Kronsberg development was itself a World Exposition exhibit, addressing the EXPO 2000 themes of 'Humankind – Nature – Technology' through its exemplary vision and design quality.

By the year 2000 almost 3,000 dwellings had been built, and the final plan foresees a total of 6,000 homes for 15,000 people. Three children's day centres, a primary school, a district arts and community centre, a health centre and shopping centre are in operation, all built to high ecological standards. Post-utilisation of the World Exposition grounds will develop extensive commercial areas; by the end of 2000 around 2,500 jobs had located next to the new residential area.

Figure 1 Primary school

## 2. CONSTRUCTION PRAXIS

The Kronsberg city district was built applying all the most modern expertise on ecological construction and habitation in the spirit of Agenda 21. Ecological objectives had overriding priority in planning and constructing the district; urban planning targets of space-saving development layout, environmentally friendly transport, good open spaces and the proximity of homes and jobs were consistently pursued.

On Kronsberg there was a deliberate decision not to engage a single major property developer. Instead, homes were built by around 30 different housing developers and project managers with very varied concepts. Their projects evolved in detailed consultation with the municipality. This 'cooperative planning procedure' was headed by a specialist department within the City's Planning division (J/2000). The City administration was in its turn supported by a planning advisory board.

## 3. ECOLOGICAL CONSIDERATIONS

On environmental issues, the municipality's environmental planning group for the World Exposition, K/2000, was given the task of drawing up very high standards for soil management, water management, and waste and energy policies, and guiding and monitoring their applications throughout the construction phase.

A special 'Kronsberg Standard' was devised for all residential and commercial buildings and open spaces, applied to the entire district and incorporated in land sale contracts, development plans and other regulations. All stakeholders thus had to meet high expectations in their planning and construction processes.

The City of Hannover's 'Ecological Optimisation at Kronsberg' project was recognised as one of the Expo 2000 decentral 'Projects around the World'. As well as the Expo Corporation, the German Environment Foundation and the European Union also contributed to funding for innovative projects.

In the front of planning and implementation, environmentally compatible energy provision systems were combined with environmentally sound construction and conservation of natural resources.
The project content was divided into:

- energy efficiency optimisation
- water management
- waste management
- soil management
- communications, skilling and qualification measures

## 4. ECOLOGICAL OPTIMISATION AT KRONSBERG

### 4.1 Energy efficiency optimisation

The central concern of energy efficiency optimisation at Kronsberg is to reduce $CO_2$ emissions by at least 60% compared to current standards for conventional residential buildings. Reduction of energy consumption is achieved through Low Energy House building methods with appropriate quality assurance measures, optimised energy provision by a differentiated district heating system fed by two decentral cogeneration plants, and specific economy measures on the consumer side.

A further 20% reduction in $CO_2$ emissions is achieved by integrating wind power projects (two wind turbines of 1.5 and 1.8 megawatts are erected at Kronsberg), the 'solarcity' solar power project with a superinsulated 2,750 $m^3$ seasonal storage tank and other innovative technology such as passive houses, photovoltaic plants at the primary school, the arts and community centre and the shopping centre, and a microclimate zone, where the inner courtyards are roofed with an extremely light double chamber transparent film, creating a stable, mild climate in the courtyard area.

Figure 2 Decentral cogeneration plant in residential block basement

**4.2 Water management**

Although the construction projects cover large areas of ground the balance of natural water resources on Kronsberg has been largely maintained using a newly-devised method of rainwater management. All precipitation on built-up and paved areas is absorbed, collected and gradually released. There have been no adverse effects on groundwater regeneration in nearby woodland, and water levels in the existing ditch system have remained constant.

On the public streets, rainwater is fed into the 'Mulden-Rigolen-System' soakaway trenches. On private open space, rainwater from roofs and paved areas is also collected and gradually released; in the residential areas it is often used as a design element to feed open ponds or watercourses.

Rainwater management has had a shaping influence on the design of the district and helped to create good quality open space. Making the theme of water visible has been a priority, to raise public awareness of the crucial importance of this element.

Equipping all apartments with water-saving taps has helped reduce water consumption. Residents are also encouraged to economise on drinking water by exhibitions and information material.

Figure 3 Open pond in residential area

### 4.3 Waste management

The aim of the Kronsberg waste management concept is to replace conventional waste disposal strategies with preventative waste management planning. Consistent waste avoidance and recycling was practised from the beginning of the planning and construction phases. Within the construction waste concept, the City of Hannover reached a contractual agreement with developers to use exclusively environmentally compatible and healthy building materials. For the construction phase, the City's Waste Management Service's 'low waste building sites' model project was devised to sort building waste on site. Recycling rates of around 80% were achieved.

The main component of the domestic and commercial waste concept is setting up innovative collection systems. Attractively designed containers close to the houses and pre-sorting bins in the apartments promote comprehensive waste separation. A grants programme supports home composting in the gardens.

Figure 4 Waste collection point

Under the motto 'reparieren statt deponieren' (mend it, don't dump it) there is a close-knit network of repair and alteration services at Kronsberg. An advisory service on opportunities for low-waste consumer habits, waste separation, and a composting programme intended for both residents and businesses, completes the services strategy.

### 4.4 Soil management

By 2000 around 700,000 m³ of soil had been excavated from the Kronsberg development. The central concern of the ecological soil management programme was to reuse these quantities within the district for landscaping and environmental enhancement. This rendered unnecessary the transportation of around 100,000 truckloads, thus reducing the dust, noise and exhaust fumes they would have caused. Disposal and transit costs for developers were considerably reduced.

The excavated soil was used to enhance and create typical local biotopes, to raise two viewpoint hills on Kronsberg and a noise buffer embankment alongside a nearby motorway,

to seal an old landfill rubbish tip, and for landscape enhancement around the World Exposition grounds.

Figure 5 Northern viewpoint

**4.5 Kronsberg environmental liaison agency (KUKA)**

KUKA GmbH was jointly founded by the City of Hannover and the 'Förderverein der KUKA e.V.' trust whose membership is made up of institutions closely concerned with the construction of the new district. Further funding comes from the German environmental foundation, 'Bundesstiftung Umwelt'.

'Environmental liaison' is the general term for a carefully devised range of communications instruments aimed at conveying an appreciation of the environmental consequences of actions, raising environmental awareness and offering possible courses of action motivating people to more environmentally-responsible behaviour. In this spirit KUKA monitors and promotes the ecological development of the Kronsberg sustainable city district in the areas of energy, waste, soil, water, landscape, farming and mobility. It is the lead agency for public relations work and presenting the projects, organises specialist conferences, and offers guided tours and information on the district with targeted publications. Working with five cooperation partners, KUKA devised a comprehensive skilling and qualification programme of ecological advisory and training measures for planners, craft workers, and residents of the new district.

**5. EVALUATION**

In the early summer of 2000 Hannover City Council commissioned a study to evaluate the first energy consumption data; collation and analysis of actual savings and energy flows in the Kronsberg district should show whether the projected 60% reduction in $CO_2$ emissions had been achieved. The 1999 database had proven to be of little use because of distortion by the need to dry out the new buildings, temporary heating supply measures, and uneven occupancy of apartments. By 2000 all components of the energy concept were in place. Projected savings for 2001 are in the region of 50% compared to the control sample. Taken as a whole, a combination of LEH construction methods and district heating from a cogeneration plant represents a highly efficient means of reducing $CO_2$ emissions.

## 6. TRANSFERABILITY

In planning and building the new Kronsberg district it has been possible to apply the main aims of ecological construction and integrate them in an overall concept. This was made easier by the financial preconditions created by its status as an EXPO 2000 project. While making allowances for the economic preconditions and consequences, the experience gained at Kronsberg can also be of use in other projects.

Additionally, the City of Hannover has prepared a briefing package to inform construction companies and developers in good time about instruments of ecological planning and construction. This ‘Info-Paket’, coupled with expert consultation, should be seen as a service aiming to integrate issues of energy, water, waste and soil, but also nature conservation, more strongly in future construction programmes.

Hannover's Kronsberg project has taken shape in close partnership and consultation with other European agencies and intiatives, particularly as regards innovative energy concepts. Partners include Parque Expo, Lisbon, ParcBIT, Mallorca, and Leidsche Rijn, Utrecht within the EU-THERMIE 'expocities' project, which promoted energy-saving initiatives exceeding the Kronsberg standard:

- ecological building materials with low embodied energy
- electricity-saving measures
- building technologies for the future
- integration of renewable energy sources and
- exhaust heat technology.

As the largest project, Hannover played a leading role in exchanges and consultations.

In 2001 Hannover took part in the 'Energy Saving Oscar' competition in Linz, Austria. As one of 1,260 entrants from 83 countries the Kronsberg settlement took second prize.

Figure 5 Kronsberg aerial view