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The Ecoparc Project in Neuchâtel (Switzerland)

Sustainable regeneration of an urban wasteland

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Abstract

The increasing importance of sustainability in town planning and architectural design is strongly questioning the actual logic of built environment dispersion. The peripheral extension of cities is indeed leading to irrational uses of ground, growing environmental impacts and important infrastructural costs. Looked at from that point of view, the goal of the Ecoparc project is the regeneration of an urban wasteland, located next to the station of Neuchâtel (Switzerland). Associating notably sustainable architectural design, sociocultural revitalization and synergies promotion, the project consists in the development of a new urban area, including industrial building transformations and new multifunctional constructions (housing, training and working spaces).

Conference topic : case study

Keywords : urban wasteland regeneration, sustainable architecture, environmental high-quality design

THEORETICAL BACKGROUND - SUSTAINABLE POTENTIAL OF URBAN WASTELANDS

Built environment and sustainability

The vision of equilibrium implied by the concept of sustainability encourages the search for solutions being technically appropriated, environmentally undamaging, economically viable and socio-culturally valuable. For the specialists engaged in the modification of built environment, this approach has a lot of implications and is notably questioning the actual logic of dispersion [1]. The peripheral extension of cities into a juxtaposition of undefined spaces, characterized by chaotic configurations and separated activities, is indeed leading to multiple negative effects :

The constructions spreading corresponds to an irrational land use, which constitutes a certain waste for this resource and a potential damaging pressure on the landscape.

The spatial segregation of urban functions leads to increasing environmental degradations, notably due to the augmentation of distances and the importance of individual transport [2].

The dissociation of housing, working and leisure areas makes a lot of people strongly dependent on their private car, generating important energetic consumption, urban congestion, noise problems and atmospheric pollution [3].

The urban sprawl induces also an augmentation of environmental impacts and infrastructural costs for the construction and maintenance of town mains [4]. In spite of the efforts made to extend these networks, the peripheral areas are generally less equipped than the urban center, which contributes to amplify certain disparities and social fragmentation [5].

Towards urban wastelands regeneration

Considering this issue, territorial development should now foster strategies based on densification principles, using the broadly unused potential existing within the already built areas [6]. For example, in Switzerland, it has been estimated that the potential of these reserves should satisfy the demand for housing and working space for more than twenty years [7]. The acceleration of changes within the localization of activities, notably industrial, tends to generate a lot of deserted buildings and areas. This situation produces a stock of urban wastelands, that are often located near the center of towns and directly connected with existing urban networks.

Concurrently to these quantitative aspects, the valuation of these urban fallow lands should also assume a lot of qualitative issues. The realization of densification strategies involves urban and architectural projects that integrate coherently the multiple dimensions induced by the act of *building the city on the city* [8]. Looked at from that point of view, the goal of the Ecoparc project is to provide a concrete demonstration of urban densification principles, associating notably environmental design innovation, socio-cultural revitalization and an attractive quality of life.

HISTORIC OF THE PROJECT

The potential of the station area in Neuchâtel (Switzerland), situated at the strategic crossing of the axes Geneva-Zurich and Bern-Paris, was brought to the fore in 1990, when Bauart Architects won the competition to design and build the Swiss Federal Statistics offices as well as the densification of the surrounding fallow land.

In 1994, the authorities of Neuchâtel officially confirmed the vision of the architects, conferring the specific status of *strategic development pole* on this portion of the city.

General urban guidelines were established at that time for the whole area [9].

Since 1996, Bauart Architects has been mandated by land owners for the elaboration of an architectural project to ensure a coherent development of this strategic area. Concurrently, the Swiss Federal Statistics Office is recognized as an example of ecological construction and sustainable architecture.

Considering the potential of this situation, Bauart invited fifteen key figures (representing notably the Canton, the City, the University of Neuchâtel, the Swiss Federal Statistics Office, the Swiss Railways Company and the Swiss Federal Institute of Technologies in Lausanne) to collaborate for the development of this sector with sustainability as a guiding theme. From this emerged the concept of Ecoparc, which consists simultaneously in a *pilot project* of sustainable regeneration and a *competence center* that aims at tackling issues on built environment sustainability [10].

A FIRST REALIZATION : THE SWISS STATISTICS OFFICE BUILDING

Influence of the site topography

Built between 1993 to 1998, the Swiss Federal Statistics Office is characterized by a precise volumetric insertion in the site, inspired by the geometry of this artificial plateau, rectilinear on the railway side, curved on the lake side [11]. The proximity of the station allowed an important reduction of the underground parking demand (only 110 park places for almost 550 working spaces). This office building, corresponding to an energetic reference surface of 25'000 m², contains technical areas on the basement floor (notably the calculation center), public areas on the ground floor (media library, exhibition hall), cellular offices on three floors and large capacity areas on the top floor (conference rooms and restaurant). This clear functional partitioning, associated with the creation of several central atria, has largely facilitated the integration of concepts and devices linked to energy consumption, ecological materials and user comfort [12].

Integrated approach of energy consumption and user comfort

The environmental high quality design is essentially based on the study of a global energetic concept (realized in collaboration with Sorane SA in Lausanne) and on the life-cycle analysis of the main used elements (realized in collaboration with Büeler AG in Flawil).

A consequent reduction of the heat demand is obtained by a high thermal quality of the sheathing, a favourable typology towards passive solar gains as well as a heat transfer from the calculation center to the rest of the building (using corridors and atria as ventilation shafts). The resulting heat demand reaches only 100 MJ/m²y, being satisfied for almost 50 % by an important solar energy unit, including both solar captors on the roof (1'200 m²) and a seasonal stock under the building (2'400 m³).



Figure 1. South façade of the Swiss Federal Statistics Office building (Photo Ruedi Walti).

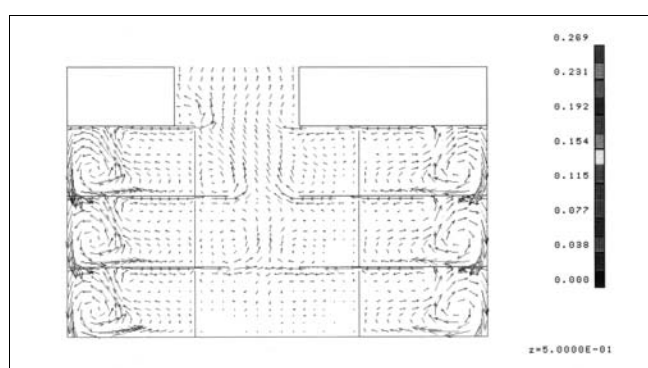


Figure 2. Simulation of the natural ventilation (Doc. Sorane SA).



Figure 3. North façade of the Swiss Federal Statistics Office building (Photo Ruedi Walti).

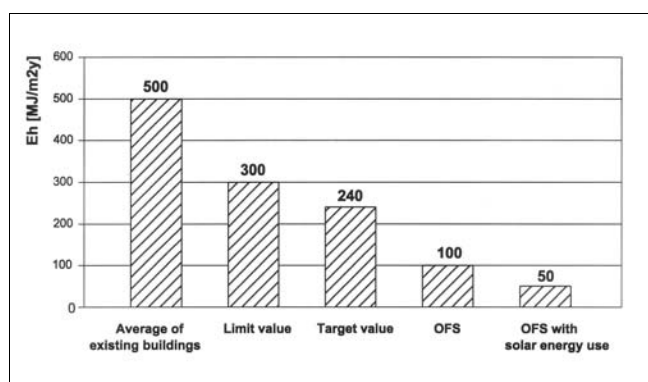


Figure 4. Measured annual energy use for heating, in comparison with Swiss references (Data Sorane SA, January 2002).

The reduction of heat consumption is associated with an important reduction of electric energy use for artificial lighting and summer cooling devices. This strategy consists in the maximal use of natural light and ventilation. Summer comfort is obtained without air conditioning, thanks to the thermal mass of the building, natural air circulation through the atria and the solar ventilation shafts that emerge above the building roof [13].

The use of night cooling effect has required numerous simulations and architectural considerations to determine the exact sizing of the significant elements (protected opening windows in facade, opening elements between offices and corridors, necessary thermal mass, height of the solar ventilation shafts). A constant monitoring of the building ensures the correct functioning and the optimization of its real performances [14].

An extension of the main building, with the addition of a 15 storeys tower, is presently in progress. This tower aims at creating 250 supplementary working places as well as providing an urban landmark for the station area. Its conception and realization globally follow the sustainable principles of the main building, with the integration of new parameters associated with the typology of a high building. The project is characterized by a double-skin facade, that allows the use of natural ventilation and night cooling during the major part of the year (protection of openings and blinds).

TOWARDS A NEW URBAN AREA IN NEUCHÂTEL

Key aspects of the site

This first realization constitutes a strong impulsion and an emblematic construction towards the project of a new urban area in Neuchâtel. This site also benefits from many other important key aspects. In terms of localization, it is situated on an artificial plateau, which offers a perfect orientation and a panoramic view. In terms of mobility, it constitutes a strategic position, already connected with the existing public transport networks (trains, buses and urban funicular) and the pedestrian network (joining towards the lake and the university). In terms of building potential, this area gives the opportunity for the construction of almost 85'000 m² (including the Swiss Federal Statistics Office) and the development of many innovative synergies between public and private investors.

Urban density and activities mixing

Located next to the city center, the Ecoparc project represents an opportunity to revive an important geographical area, that is in expectation of a new identity since the fall of industrial activities. Contributing to sustainable urban development, this regeneration process simultaneously aims at urban densification, better use of existing infrastructures and implementation of various activities. The planned functions are very diversified, including lofts in old industrial structures, different new housing schemes (social mixing), administrative spaces, schools and a center for firms specialized in sustainability issues (functional mixing).



Figure 5. View of the station area in Neuchâtel. The east part is characterized by the presence of some industrial buildings that will be transformed in lofts (Photo Bauart Architects, September 2001).

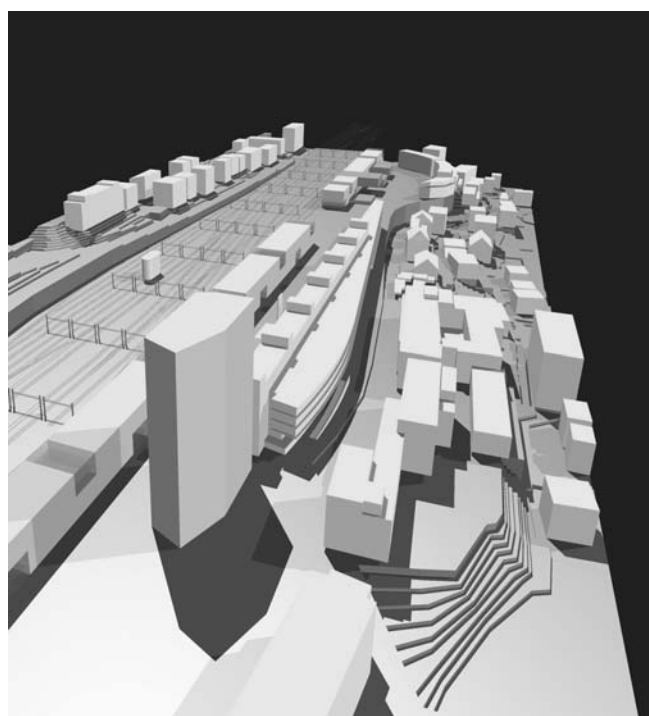


Figure 6. Virtual view of the future Ecoparc area, with the Swiss Federal Statistics Office building at foreground (Document Bauart Architects, November 2001).

INTEGRATION OF SUSTAINABILITY CRITERIA INTO THE DESIGN PROCESS

Beyond these territorial and functional aspects, the integration of sustainability criteria into the design process involves the development of a holistic approach.

Based on a multidisciplinary monitoring of different project phases, operational steps are taken to give a global quality to the project. This objective is pursued through the application of the following main principles :

- visualization of the impacts of the buildings, not only as isolated objects, but also as elements participating to the equilibrium of an urban and territorial whole,
- coordination between the multiple parts of the constructions, especially in order to optimize the global performance of buildings sheathings and technical installations,
- conception based on a constant optimizing research between environmental, sociocultural and economic criteria [15].

In concrete terms, the main criteria taken into account in the actual conception phase of the Ecoparc project concern notably :

- *environmental issues* such as the reduction of energy consumption, the potential research of renewable energy use, the optimal management of resources (ground, water, materials) and the limitation of environmental impacts (emissions, wastes),
- *socio-cultural issues* such as the value of built heritage, the contemporary architectural expression for new parts, the quality of life, the user comfort, the activities mixing and the social mixing,
- *economic issues* such as the viability of the project, the optimization of maintenance charges, the reduction of external costs and the indirect contribution to the regional economic development through the creation of a center for specialized firms [16].

The simultaneous consideration of these multiple issues is realized by a first evaluation for each criterion. This is followed by a multicriteria synthesis leading progressively to a dynamic integration into the design process. The elaboration of an indicators system, conceived as a tool supporting the decision making process, is now in progress. A sustainable approach requires indeed a multi-phases monitoring of the adopted solutions. This methodology will allow to constantly verify the pertinence of the operated choices and to ensure the optimal functioning of the finally realized options.

A constant communication with the different project partners, the local authorities and the interdisciplinary planners also appears as an essential condition for the development of such a complex operation [17].

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