

## Working in harmony with nature. Green office buildings in a present-day city

Dorota Wiśniewska\*

*Faculty of Architecture and Urban Design, Gdańsk University of Technology  
ul. Gabriela Narutowicza 11/12, 80-233 Gdansk Poland  
\*architon80@gmail.com*

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### Abstract

Metropolis - as main point of people's migration, mostly because of work, have to face sustainable development as a strategy for the near future. This article describes possible ways leading to the best office building concepts in the design process. Searching for a workspace in harmony with nature is one of the aspects of a balanced development. The challenge is to create functional, compact, environmentally friendly and healthy workspace which corresponds to the present-day city scale and natural resources left. Sprawling cities leave strong ecological footprints. On the other hand urban density can not be achieved at the cost of losing climatically healthy and energy efficient space for habitats and working space. Nevertheless, recognition of practical problems, whether related to urban growth, complexity of environmental conditions or technology development justifies the conclusion that guideline designing ecological office building and should be formulate from the early stages in the sense of integrated planning. The main problems that have to be resolved are: reduction of water and energy usage, reduction of waste (especially e-waste), reduction of CO<sub>2</sub> emission.

*Key words:* green office; bioclimatic approach; green metropolis; evaluation methods

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### 1. Introduction

The present-day city is a complex entity. Composed, like a patchwork, of physical, biological, economical, organizational, social and cultural resources. Nowadays 70 % of the population live in cities and the number is increasing daily. Efficient occupancy indicators of workspace and housing are rather low and that is why urban development seizes more and more area of natural resources arounded older

cities and violates its life cycle. Increasing world's population and urbanization growth have a strong impact on the environment.

In a contemporary metropolis we try to modernize and adapt old office buildings to new requirements to create more humane, healthy, environmental sensible urban spaces. The new model of working in harmony with nature, represented in this study by green offices, is part of the knowledge-based

sustainability paradigm. Architecture is that great living creative spirit which from generation to generation, from age to age, proceeds, persists, creates, according to the nature of man, and his circumstances as they change.(Wright, 1937). Thinking about cherishing the space, we have to consider possibilities of land use, site planning selection, water and energy efficiency, lower CO2 emission, reducing e-waste, use appropriate and local building materials and improve indoor environmental quality.

## 2. Methods

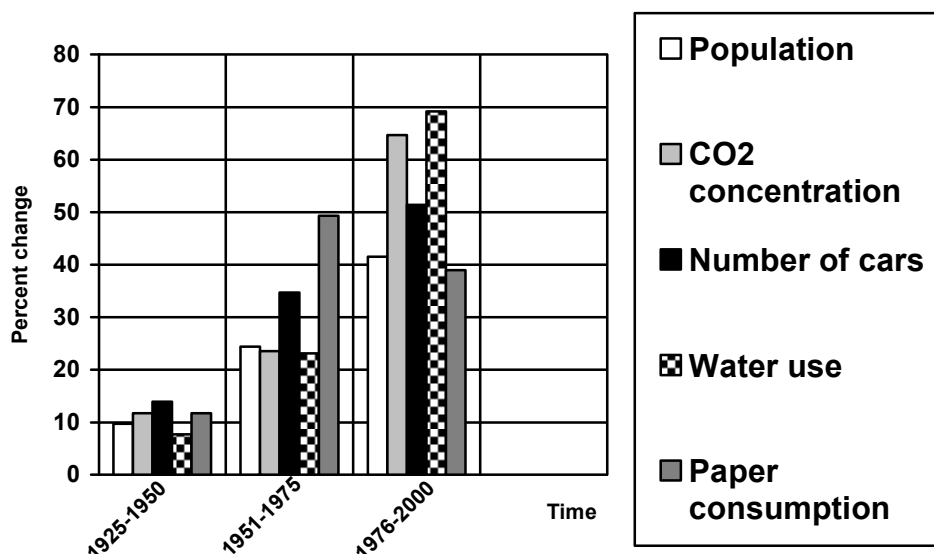
### 2.1 Ecological footprint indicator analysis

Population, resources and environment are the three determinants of human life. A great deal

of resources which are used for production, building process or consumption are not renewable. Western culture and it's legacy encourage us to conquer nature in order to achieve individual goals. It is the strong ecological footprint our civilisation has left the planet.

Recommendations usually follow evaluations. The diagrams below present a global change of human life and the impact it puts on the environment. Tools (something to work with) and resources (something that will work for us) have to be used in process of moving from overproduction to multifunctional and high efficiency usage. Clearly specified needs and opposition to strong marketing influence can help us to build a harmonious relationship between city spaces.

**Fig. 1 Ecological impact to the environment. Percent Change in Global Resources usage: 1925- 1950, 1951-1975 and 1976-2000** Source: International Geosphere-Biosphere Programme (Source: Stoffen et al 2004)



In the 21<sup>st</sup> century we are moving from distribution of goods to distribution of information. Knowledge resources are growing exponentially. We have to find the answers which are the best ways to create spaces for the new society. The answer could be niche marketing which reacts faster to actual needs and expectations – producing in harmony with the market. The “Cradle to Cradle”(Walter R. Stahel) products are

designed to reduce office ecological footprint. Ecological design requires the architect to regard and to understand the environment as a functional natural system and to recognise the dependence of the built environment. (Glass, 2002). Learning from nature is the biggest challenge in the design process.

## 2.2 Evaluation methods analysis

The complexity of the world's contemporary offices characterizes the present-day metropolis market. Green buildings represent the idea of connection with the environment. Climate and natural resources remark the necessity of preventing upgrowth expansion progress. A new strategy for office buildings during the designing and rebuilding process as well as organizing the office work is to reuse, recharge, use renewable resources and to recycle. Sustainable design process helps to prepare building models and evaluate construction as well as technology assortment, also presents advantages of using renewable materials. Furthermore in this method the new object has to be integrated with the natural and built environment. A green office should stay in harmony with the environment as well as with human nature. Furthermore, it has to be cost effective. The life cycle of the building has to be considered carefully. It should be an architecture of multi-dimension, flexibility, mobility and occupancy efficiency, adaptable and complex. Despite the comprehensive search service the volume of scientific methods and availability varies are rather difficult to apply.

The programmes which guarantee sustainable management have to become mandatory since management and business rather direct attention to standard solutions. The keynote, that we borrow resources from future generations, should divert us to think about ecological design methodologies as a common practice issue rather than an alternative approach. The certification is a way to popularize the green buildings standards. Building eco-labelling schemes, called eco-points, are assessment tool for office designs and investors, which can encourage to involve in a green initiative. The two main known specification systems are: The Building Research Establishment Environmental Assessment Method (BREEAM) and The

Leadership in Energy and Environmental Design (LEED).

## 2.3 Bioclimatic approach to the space shaping

The diagram below presents the architectural problems we have to consider during the sustainable designing process. Looking for the possibilities to lower the entropy we have to better understand the exergy. Energy saving designs and responsible management help to reduce the ecological harmfulness and building-related greenhouse gases. Daylighting, passive heating, shading, ventilation and cooling, water spraying and evaporation, green roofs and pathways are the bio-climatic approach of the office building system.

## 3. Case study

The case study puts special attention to the infill development spatial policy which considers social and economic profits from existing green city spaces which work together with the designing building. On the basis of the diagram this case study presents the preliminary design of Public Radio Station in Bydgoszcz. Main problems and questions were how to emphasize connections between existing old city structure, small park, main river bank and designed building. Main issues were to increase the quality of life in a city and to design energy efficient building. The design strategy was to divide the design process into three stages: analyse of daylighting, analyse of urban and green areas connection, as well as an analyse of people's movement in a building space to find the cost effective connections together with high quality of life factor. Research helps to find design and auditing method of present-day city office building providing a platform for improved urban scenario.



**Fig. 2 Evaluation chart of green buildings design process** (Author's interpretation on the basis of "Ecological circle" of buildings and building technology (interactions relevant to cooling) The technology of ecological building, K. Daniels)



#### 4. Results

Results and recommendations following the case study are:

(1) Genius loci of urban scenario. Dialogue between architecture landscape and built environment: integrating environment and building; shapes - complex, preservation of urban density; function - appropriate site planing; streets - wide green pedestrian area, bicycle roads; sun as the important architectural factor;

(2) Efficient green buildings. Architecture of quality: buildings in means for regeneration and renewal; compact building for different facilities; efficient green buildings-green roofs, HVAC systems, plenty of daylight; reduce, care of resources- intelligent light systems and water supply; renewable energy systems, efficiency improvement, recycling; façades- special glazing for each site, clear glass for maximum north light, sunshades control south light for maximum natural light and minimum heat gain.

**Fig. 3 Analysis of possible infill development urban scenario** (Source: author's design)



## 5. Conclusion

According to the theory of three levels of knowing: simplicity is represented by a child or uninformed adult who is unaware of what lies beneath the surface. Complexity is characterized by awareness of complex systems without clarifying patterns and connections. Finally informed simplicity, which is an enlightened view of reality with the ability to create clarifying patterns within complex mixtures, building many competing and frequently nebulous design considerations (Frederick 2007). The sustainable design process which considers problems as presented in the last level of knowing requires well educated and aware architects.

The idea of planning for flexibility not obsolescence (Ehrenkrantz E., 2002) is the framework to provide office buildings that are going to meet future requirements of space and environment in a way to lower the costs of building, as well as long term maintenance and possible demolition. The costs of rebuilding existing objects are high but it should be considered in a long term perspective as a need for the future. This kind of approach is more important since more special funding have been made available. Exploring new options that optimize flexibility in planning, organization and servicing, leads us to the conclusion that office buildings in a contemporary city have to be designed to respond to their environments, have a high occupancy factor and an easy access to new

network solutions (Rogers R. 1995). Actually we are looking for technologies to mimic nature, to better understand everything we can find around us. The design strategies show synergy and dispersion. How to create the space for different social interactions? How to manage economic viability and resource conservation? The questions are still open. Open to the “spirit of modernity”.

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