TECHNICAL TRANSACTIONS | CZASOPISMO TECHNICZNE
CIVIL ENGINEERING | BUDOWNICTWO
5-B/2014

MAGDALENA CHUDY*

THE INFLUENCE OF ARCHITECTURE ON ENVIRONMENT – REGENERATIVE DESIGN

WPŁYW ARCHITEKTURY NA ŚRODOWISKO – PROJEKTOWANIE REGENERACYJNE

Abstract

Facing the climate change and scarcity of natural resources, it is essential to treat architecture and the whole urbanized environment as a part of one complex system creating nature. A building takes construction materials from nature and has an influence on water and soil conditions, biodiversity, air pollution, microclimate. Consequently, an existing building becomes a part of ecosystem having both beneficial and/or negative impact on nature. In order to construct an architectural object in compliance with current requirements, it is necessary to demonstrate a holistic knowledge of environmental conditions and foresee how they will be affected by a performing building.

Keywords: regenerative design, ecosystems, urban planning, architecture

Streszczenie

W obliczu zmian klimatycznych oraz kurczenia się zasobów surowców naturalnych konieczne jest pojmowanie architektury i całego środowiska zurbanizowanego jako części jednego złożonego systemu tworzącego środowisko przyrodnicze. Budynek czerpie ze środowiska naturalnego surowce potrzebne do konstrukcji oraz wpływa na warunki wodne, glebowe, bioróżnorodność, zanieczyszczenie powietrza, mikroklimat. W konsekwencji powstały budynek staje się elementem ekosystemu, który może działać na jego korzyść lub niekorzyść. Aby obiekt architektoniczny odpowiadał wymaganiom obecnie stawianym, należy posiąść holistyczną wiedzę na temat uwarunkowań przyrodniczych oraz przewidzieć, jak wpłynie na nie działający budynek.

Słowa kluczowe: projektowanie regeneracyjne, ekosystemy, urbanistyka, architektura

* M.Sc. Arch. Magdalena Chudy (Ph.D. Student), Faculty of Architecture, Cracow University of Technology.

1. Introduction

In the 1980s, in the face of climate change and the shrinkage of non-renewable natural resources, the idea of sustainable development emerged. According to this theory, natural resources should be used in such a way as to enable the existence and development of future generations. Within sustainable development, there are two approaches: technological and biological. The technological approach became a ground for the development of "Green buildings" and so-called eco-efficient design which are mainly based on the development of technology and engineering. The concept of *regenerative design*, meanwhile, is derived from the biological approach. Regenerative design is based on ecology and it uses in its theory the rules governing living systems.[1] The principles of sustainable design are now focusing on causing the "lesser harm"; that is reducing the usage of natural resources, energy consumption and, as a consequence, CO_2 emissions, whereas regenerative design goes a step further and concentrates on creating, combining and improving natural and artificial systems [2].

2. Case studies

2.1. Designer: Terrapin Bright Green, LLC. Project: 111 Eight Avenue, NY, USA

Eight Avenue is the best known project of Terrapin Bright Green, LLC using *Deep Ecological History*. The name of the project is the address of 87 year old estate situated in the western part of Manhattan, which was subjected to a regeneration. The problem of the building was an excess water usage in comparison to other buildings of the same size. In addition, in a building's basement sump pumps constantly pumped clear cool water. To find a solution to this problem, the designers used a map elaborated by Mannahatta Project. The map depicts the reconstruction of Manhattan's ecosystems just before the first contact with Europeans (1609). The historic map was created on the basis of old maps, soil and geology information to reflect the ecosystems in Manhattan during Native American domination. The map's analysis let the designers to estimate solar energy, water, coal resources and biodiversity on the plot of 111 Eight Avenue around year 1609. The historical data became guidelines for the regeneration project. Proposed solutions assumed a usage of storm water and the water pumped from the basement for the cooling tower. In consequence, the potable water and energy consumption should decrease radically. Deep Ecological History was used to investigate relations between natural ecosystems and the building, in order to improve quality of environment, architecture and economy [3].

2.2. Designer: Perkins+Will Canada. Project: Livind with Lakes Centre, Uniwersytet Laurentian, Sadbury, Ontario, Canada.

Canadian architectural office Perkins+Will develops its own regenerative design research program. The Living with the Lakes Centre project located in the surrounding of Lake Ramsey: the drinking water reservoir, and next to an industrial area which is responsible for air contamination; was designed in collaboration with the university's researchers and scientists. Thanks to the materials used, the building came into interaction with the surrounding and affected it in a positive way. Limestone, which is the main material on the façade and in the landscape neutralizes the acids contained in storm water [4].

2.3. Designer: Perkins+Will Canada. Project: Van Dussen Botanical Garden Centre, Vancouver, Canada

The project used the knowledge of the influence of building materials on human health and the environment. The list of dangerous substances called 'Precautionary List' was first created by Perkins+Will researchers and then developed by scientists at the Yale University. Precautionary was the main strategy of the project. Materials used to construct the building were as little processed as possible, to be sure that they didn't contain any dangerous substances and to enable its recycling [4].

2.4. Consultants: Regenesis Group. Project: Loreto Bay Villages, Agua Viva, Mexico

The aim of the project was to regenerate former estuary which degenerated into dry lands over the last 300 years. The project involved the private investors, the government of Mexico, designers, local inhabitants and Regenesis Group as the regenerative solutions suppliers. The plan of land development consisted of several phases. The task for the Regenesis Group was to help the designers understand 'genius loci' and the *Story of the Place* which meant to be regenerated. Restored mangrove, oceanic and river ecosystems should coexist and exchange the energy. Designed river channels should top up the web of public spaces and create friendly and healthy environment for people [5].

2.5. Designer: 606 studio. Project: Regeneration of the south – east part of Los Angeles, California, USA

The designer's proposal for the south-east part of the city, which is struggling with social issues such as unemployment, limited access to public services and transportation, as well as, ecological problems (alarming air contamination and heat island caused by excess usage of cars) was to start processes aiming at the regeneration of the neighborhood. The most important actions included using empty sites for mini-parks, recreation spaces for local community and mixed-use zones (including such functions as: commercial, office, public services, industrial and residential). Part of environmental issues were addressed along with transportation difficulties. Stops of the newly-designed cable railway were placed at the strategic city spots. At the same time, pedestrian and bicycle paths were created to minimize air contamination. Additionally, an urban forestry program was started (it is volunteer-based planting of trees along main roads).The problem of the heat island was solved by introducing refinery and using filtered water for watering new vegetation and supplying ponds in parks. Greenery and water in public spaces are supposed to improve microclimate through increased humidity and reduced temperature [6].

3. Conclusions

The concept of regenerative design, which goes beyond the scope of sustainable design, seems to be a bold and reasonable alternative to the mindless urban development. Its basis – the idea of harmoniously combining not only the landscape, but also the environmental aspects of the site, with the tasks faced by an architect or a planner, can be a remedy for the expansion of cities onto new still undeveloped areas. The question arises whether a person

is actually able to create a system fully replacing the natural processes. Perhaps regenerative design best meets its role in repairing degenerated, already urbanized areas, as was the case with the previously discussed projects: 111 Eight Avenue and regeneration of the south-east part of Los Angeles. In both projects, the authors focused on initiating recovery processes of degraded buildings or areas, in order to gain the objects for the benefit of the environment. The proof of the fact that, in certain cases, the introduction of people together with buildings to the degenerated areas can also be beneficial for the environment is a settlement Loreto Bay Villages, Mexico. Reintroduction of plants, animals and people to the dry basin shows that regenerative design, which is intended to protect ecosystems, also refers to humans as a part of the natural system. Health and human living conditions are prioritized, along with other living organisms.

Paradoxically, it can be stated that the challenge for regenerative design is to look beyond the ecology and functioning of ecosystems, as once dared to look beyond the land where the building is designed. Consideration of all infrastructure networks (research centers, factories, vehicles and all of the positive and negative impacts related with their functioning), that allow for the creation of buildings, and attempt to balance them could complete the concept of regenerative design.

References

[1] Mang P., Reed W., *Designing from Place: Applying the Ecological Worldview and Regenerative Paradigm*, BRI Draft, 2011, 2, http://www.yestermorrow.org/assets/Uploads/PDFs/Designing-from-Place-Applying-the-Regenerative Paradigm.pdf, access: 08.09.2013.

[2] Lake David, cyt. za Nicolette M., *Beyond LEED: Regenerative Design*, In Landscape Journal nr 31:1-2, University of Wisconsin Press, 229, http://www.biblos.pk.edu.pl/, access: 01.07.2013.

[3] Browning B., Terrapin Bright Green, LLC, *Letting Deep Ecological History Determine Building Performance Metrics*, Beyond LEED Regenerative Design Symposium, UTSOA, 2012, http://soa.utexas.edu/beyondleed/index.html, access: 15.07.2013.

[4] Busby P., Richter M., Driedger M., *Towards a new relationship with nature. Research and regenerative design in architecture*, [In] AD, John Wiley & Sons Ltd., 2012, 95-96, http://www.biblos.pk.edu.pl, access: 05.07.2013.

[5] http://www.regenesisgroup.com, access: 25.08.2013

[6] Lyle J.T., *Regenerative Design for Sustainable Development*, John Wiley & Sons Inc., New York 1994, 127-129.