A BUILDING AS A GARDEN - A GARDEN AS A HOUSE

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Abstract

This paper discusses the issue of urban development in the near future from the perspective of garden design and landscape architecture. It is a response to the deteriorating situation related to the population growth and the human separation from nature. Attention is mainly devoted to a detail - a building. The author suggests a solution in the form of a house and a garden being combined. This paper describes the positive impacts of such a combination from the environmental, ecological, hygienic, and economic perspectives. Further, garden forms appropriate for this vision are presented. The solution is documented using a study created in cooperation of Filipi and Damec.

Keywords: a building as a garden, futurist visions, sustainable development, roof garden, vertical garden

Introduction

As described in the book of Genesis, Adam and Eve lived in the Garden of Eden from their creation until their expulsion. With some exaggeration, one could say that a human being actually comes from the garden. Nowadays, the situation is dramatically different. People do not go naked any more, most people live in an urban apartment without a garden. They know what an apple looks like, but they cannot tell an apple tree.

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The data of the World Bank (2014) confirm the tendency to move to urban areas and leave the countryside. Researchers have observed the trend of increasing populations in the vast majority of the world's cities. According to the data of the World Health Organization (2014), the majority of the world population lives in cities and this proportion is still increasing. In 2050 it is expected that 7 out of 10 people will be living in the city.

As catastrophic prognoses predict, large building complexes will become a regular part of the urban area so that the cities could absorb large numbers of people. The human scale will be suppressed. Green areas in lucrative positions will have to give way to the new development. The boundaries of the urban area will move ever further into the surrounding suburban landscape until they reach boundaries of another city. The journey from urban centers to the countryside will become difficult and time-consuming. This will result in a complete separation of humans from nature.

Naturally, architects and urban planners respond to the situation outlined. The visions which are provided in the form of perfect visualizations and simulations appear almost daily in various media, professional journals and architectural competitions. In many cases they show futurological plans implementation of which would depend on the development of new energy sources and new materials. It is not a problem "to plant and make greener" any place or building using computer technology. So we can see endless green towers, levitating vegetation or artificial floating islands that are full of happy people and children. However, the reality is still different. The time when humanity will live in mushroom- or seaweed-shaped buildings rising from the sea is still far away. In spite of this, these ideas are very

important. They give us the opportunity to realize what makes these images so attractive - even for an average layman. It is the vegetation that helps architects to document these green visions. As a green thread, vegetation connects almost all emerging futurological plans.

It is difficult to describe vegetation as a technical term. Many people perceive it as a green colour in the described visualizations. Unfortunately, this is practically way some architects use it in their projects. Only after the vegetation is composed in a particular shape and the spirit of the garden is implanted can people identify with the place and imagine its future practical use.

A garden already represents a specific place filled not only with vegetation but also functions. In itself it is a process of life and the cycle of substances. In connection with the described futurological visions, we can see a possible solution – interconnection of buildings and gardens into a complex. In this context, Professor Damec (2014) defines the phrase "building as a garden" as the ideal relationship between a building and a garden.

Until recently we met with studies that have shown the negative effects of vegetation on the building and its construction. Impacts of vegetation on buildings are divided by Blanc (2008) to hazardous and destructive. We have to admit that vegetation can have these negative impacts. However, in most cases, error is caused by improper foundation or choice of unsuitable plant species. Roots or other parts of plants which penetrate the building structure have a major impact on functions or stability. These problems can be prevented only by close cooperation of specialists in the design and implementation.

Modern technologies allow for a creation of projects where the garden becomes a natural part of the building. Computer simulations specify the parameters necessary for the design load. Quality materials resistant to weathering and decomposition ensure durability and functionality. Under these conditions projects that represent the concept of the building as a garden can be implemented.

The basic prerequisite of this connection is the balance of the two components - buildings and gardens. The building provides the carrier matrix, basic social functions and facilities for residents. The garden is a natural component of this connection, extending the living space with extra areas with additional functions. The building provides support and necessary technological background for the garden. The garden in turn creates an outdoor covering or facade of the building. Individual components should not impede existence of the other, on the contrary, they should complement each other.

A comprehensively designed building that uses the principles of "a building as a garden" enables the designer to bring ecological and environmental aspects into the urban space. Primarily, it provides conditions for the life and development of animal and plant communities. Many species from the wild disappear fast and gardens can provide a potential living space, which essentially they will share with human beings. Related to the sustainable development of the life on the planet Earth, the idea "a building as a garden" is a big step forward. A new link between a garden and a building allows input of natural substances directly into the city center from where they have disappeared or have only survived in fragments. It will naturally relate to the green spaces of parks and streets and together they will create a united complex. Garden areas as parts of new buildings help to compensate for the lands lost in consequence of the building development. They make up for the built-up areas and allow growing crops or creating relaxing spaces. This trend is evident in contemporary cities but in most cases only on a small scale. First of all, on balconies and terraces many tenants attempt to use each centimetre of free space. Large amounts of crops or ornamental plants spread over the railings. If it works on a small scale, why not try further develop this concept?

A potential introduction of "a building as a garden" principles in the standard building development is also justified from the economic point of view. A green area provides a place

for human self-realization and at the same time is capable of producing crops. Vegetation in the form of a garden enhances the exclusivity of the place. Experienced developers should realize the great potential of such buildings. From the economic point of view, the positive impact of gardens and vegetation on the building itself is the most important. Conclusions of many models and studies show the positive influence of vegetation on the thermal environment of buildings. This fact is measurable even if the walls are just covered with climbing plants. If we add more technological layers required for the establishment of gardens to the vegetation cover, energy saving effect will significantly increase. As reported by Perini et al. (2011), the heating up savings climbed to 6.3% and air-conditioning savings reached 43%. The internal space of the building is protected from the heat loss in winter. Conversely, the presence of gardens and vegetation prevents overheating of the interior in summer. As evidenced by the aforementioned research, savings can reach nearly half the costs. It is an amazing number for the sustainable development of the world population.

Implementation of a garden instead of a usual roof or wall eliminates the costs of traditional architectural design, which uses expensive materials, technology and maintenance. The initial cost of these buildings may be the same or even lower than when traditional methods are used. The final price depends on the form of the garden, purpose and use. In the case of a public space, the corresponding costs of maintenance need to be taken into account. However, a large part of the maintenance costs of a classical building are only moved to the maintenance of gardens.

The "a building as a garden" concept assumes a comprehensive approach. A garden in this case is not simply a decoration stuck to the building, but they create a full cycle together. The difference from a classical garden is mainly the fact that these gardens are created on an artificial structure and there is no connection with the ground. However, it is also an advantage. It is possible to regulate and control all inputs, such as rainwater. Important and relatively easy is to capture rainwater and reuse it for watering. Water can be collected into a tank hidden in the building structure or into a reservoir which is a natural part of the garden. Moreover, the wastewater system may also be involved in the water cycle. Instead of discharging the wastewater into the sewer system, it can be collected in a special container based on biological treatment by plant roots. After the treatment, this water can be reused for watering or for the needs of the residents. The cycle closes and the building becomes partially self-sufficient.

Vegetation planted in the garden can also perform other hygiene functions. It assists in removing air pollution caused by the building operation. Plant leaves absorb small particles such as dust and other substances released from various materials. At the same time, vegetation muffles noise caused by the building operation, such as air-conditioning and ventilation. The purifying power is mainly exercised by large vegetation areas and appropriate plant species need to be selected.

In a broader view, the ideal connection of a building and a garden assumes a close link between the people using the building and the garden, especially on the environmental level. A garden, based on its type, provides various products and performs various roles. These are mainly recreation, food, water, building material, biomass, etc. In return, it demands maintenance and a supply of energy in the form of nutrients. These need not come from artificial fertilizers; they can be supplied by composting organic remains after human usage. The system of the building as a garden is then not only a connection of a garden and architecture but the inhabitants themselves are involved. Together, they create systems that are presented in the architects' plans mentioned above.

The idea of the building-garden connection into one unit is not new - we would surely find parallels in distant history. For example, the Hanging Gardens of Semiramis are in fact roof gardens. However, the topic is current now as the search for new possibilities of town

and city development with respect to the landscape and nature is topical. The search for a new path of an urban being to nature. The nature will be increasingly suppressed with the growing population. A garden that is a part of a building should not be understood as a specific area with a specific role; rather, it is a system of areas. These can differ by character and role. Still, they should form a unit, a complex, where natural relations and substance cycles will exist in dependence on the building.

The easiest and most common example, which however cannot work as a full-fledged garden itself, is a wall with climbing plants. This is the cheapest method and the easiest to implement with a great effect. It is fast and does not demand large expenses. The area - especially its height - which can be used is limited by the plant growth. The maximum height of the tallest species is 24 m (Pejchal, 2006). To reach further, it is necessary to modify the architecture so that plants can be planted in higher floors. The attempts to disrupt the wall's monotonous character by climbing plants and provide the sensation of a classical garden appeared at the end of the 20th century. In this period, house facades were newly designed as green gardens. Vertical gardens, connected with the name of Patric Blanc, first appeared in France. An example would be Musée du quai Branly. The area that a vertical garden can use is unlimited. It is only dependent on the technology used. However, with a growing area the implementation requirements increase. The connection of a building and a garden is very close in vertical gardens, similarly to walls with climbing plants. However, due to the vertical orientation, its impact on human beings is aesthetic. Vertical gardens are dependent on a continual water cycle. Also a short-term failure can cause irreversible damage.

The crucial form usable when designing buildings in the sense of "a building as a garden" is typical roof gardens. Their implementation is conditioned by the building stability and it is almost unlimited with the proper dimensions. These gardens can bring both material benefits and recreation. A building as a garden can use all the mentioned forms of vegetation application. Together with the inseparable non-living garden parts, they create a complex whole.

Nowadays, there are a number of projects around the world that satisfy the vision of "a building as a garden". The successful examples include Bad Blumau by Friedensreich Hundertwasser from 1993-1997, organically shaped buildings are based on the local landscape and they form its parts. The shopping street Namba Park, in Osaka, by Architect Jon Jerde from 2003. Nasher Sculpture Center in Dallas from the architect Renzo Piano, opened in 2003, which draws the surrounding garden into its interior.

The first practical experiments by the author of this paper to create a complex corresponding to the mentioned principals include the design of a part of Plzeň. The design was created in cooperation with Professor Damec. All the required functions of the area, such as parking, shopping, entertainment, administration, spiritual uplifting, etc., are housed by a 4-floored large underground building. It is based on a simple modulus of columns. The garden covers most of its roof area and enters the underground floors by skylights. The garden thus becomes an imminent part of the interior. Rainwater from the area is collected in several tanks located below the ground substrate and is used for watering. The city structure thus gains two different areas of the same size and at the same place - a building performing all the required roles and a garden. The place is used twice. The design contrasts with the prevailing architects' and urban planners' views who build up the allotted areas with overground structures.

Image 1 - visualization of multi-functional building in Plzeň, (Filipi, Damec, 2014).

Image 2 - visualization of multi-functional building in Plzeň, (Filipi, Damec, 2014).

Image 3 - visualization of multi-functional building in Plzeň, (Filipi, Damec, 2014).

Image 4 - visualization of multi-functional building in Plzeň, (Filipi, Damec, 2014).

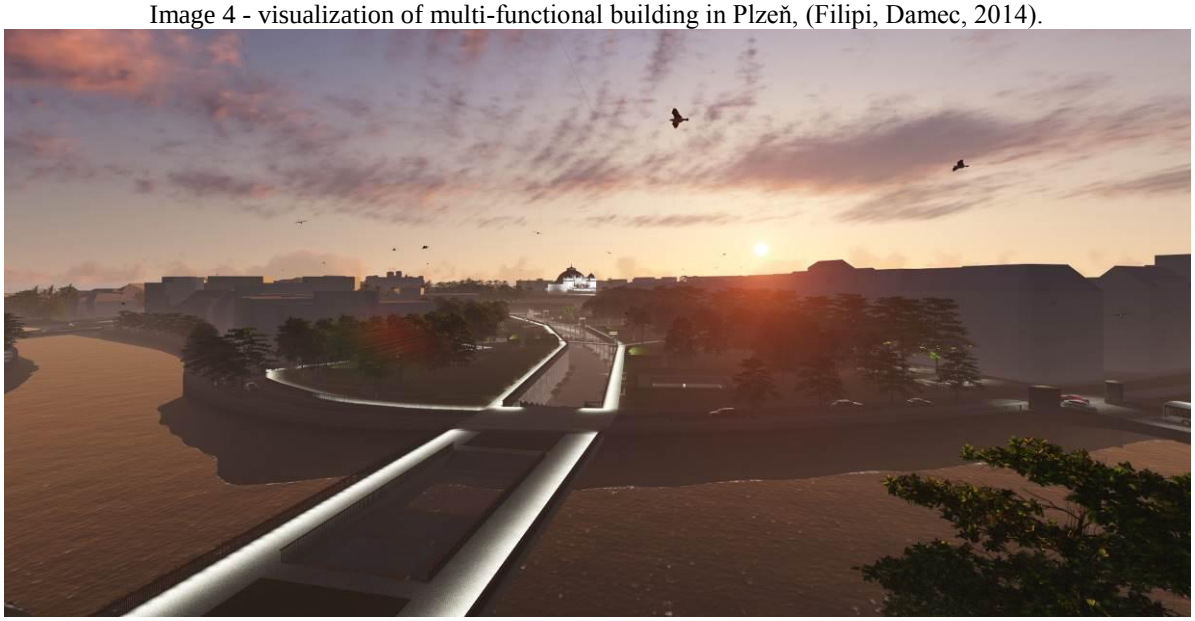

Image 5 - visualization of multi-functional building in Plzeň, (Filipi, Damec, 2014).

Image 6 - visualization of multi-functional building in Plzeň, (Filipi, Damec, 2014).

Conclusion

Currently, it is possible to realize architectonic visions of green buildings and towns that correspond to the requirements of the sustainable development. However, a substantial factor is interdisciplinary cooperation, especially between architects, garden designers and landscape architects. Their joint efforts may design buildings with parameters that can

provide grounds for a garden. Suitably selected plant species are as important house elements as its stability.

A well-working connection of a building, garden, and town inhabitants represents an imaginary path of human beings back to the Garden of Eden. Thanks to this idea, towns can become greener, more compact, and more open to the landscape and nature.

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