

The role and importance of green areas in the context of spatial development of cities in the People Republic of China

Rola i znaczenie terenów zielonych w kontekście rozwoju przestrzennego miast w Chińskiej Republice Ludowej

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Streszczenie: Tereny zielone zapewniają wiele korzyści miastu i jego mieszkańcom. Aktualnie w Chinach problemem jest zagospodarowanie terenów zielonych na terenie aglomeracji. Chińskie miasta, ze względu na szybki rozwój, powiększają swoją powierzchnię wchłaniając tereny zielone nie tylko na terenie miasta, ale także na przedmieściach. Oprócz zmian przestrzennych tereny zielone zmieniły swój charakter. Tradycyjne chińskie ogrody są zastępowane przez parki z koszonymi trawnikami i kwietnikami, co upodabnia je do miast europejskich.

Kurczenie się miejskich terenów zielonych jest zauważalne. Dlatego władze podejmują starania, aby chińskie miasta uzyskały status „zielonych”. Ich celem jest nie tylko zwiększenie terenów zielonych w obrębie miasta, ale także ograniczenie zużycia energii, racjonalne gospodarowanie wodą i ściekami oraz minimalizacja produkcji odpadów.

Słowa kluczowe: różnorodność biologiczna, tereny zielone, krajobrazy, ogród

Key words: *biodiversity, green areas, landscapes garden*

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THE BENEFITS OF THE EXISTENCE OF GREEN AREAS IN THE CITY

Although the city is largely dependent on internal ecosystems that are situated beyond their borders (e.g. depends on agro-ecosystems providing food), the urban dwellers also derive benefits (directly and indirectly) from internal ecosystems*. Ecosystem services locally generated by green areas are critical for the quality of life in the city (Bolund, Hunhammar 1999).

The green areas in the city have a positive impact on air quality, taking part in absorbing carbon dioxide and producing oxygen (Jo 2002). They contribute to the reduction of noise, regulate microclimate (Bolund, Hunhammar 1999), influence the reduction of the urban heat island phenomenon¹. They also protect the soil from erosion and influence the increase in retention of rainwater (Jim 2001).

For people living in densely populated cities, green areas provide recreational, social and cultural benefits; this is where people carry out physical activities and can rest mentally (Tarrant, Cordell 2002). Urban green areas contribute to improvement of human health and to faster recovery from illness (Maas et al. 2006, Qureshi et al. 2010). In terms of economic benefits, urban green areas could help increase real estate values (Anderson, Cordell 1988, Łowicki 2010).

Despite the many benefits provided to residents, urban green areas, as pointed by Tian et al. (2014), are threatened type of land use. They cover a small area, they are separated from each other by a densely built-up areas, highly fragmented and moreover, they are impoverished in terms of biodiversity. The pressure to invest and develop the land, is seen as the main cause of loss of biodiversity (Gordon et al. 2009). Protecting valuable natural areas, especially those which are the least transformed by man, can help to sustain them and warrants proper functioning of ecosystems, which in turn enables the delivery of a wider range of benefits to humans².

Only an ecosystem in a good ecological condition (healthy) has the ability of providing benefits (Costanza et al. 1998, Lu, Li 2003); and the ecosystem can be

¹ As a result of the phenomenon of urban heat island, in summer, the need for air conditioning is more in the centers of large cities than on their outskirts. Beijing Municipal Commission of Development and Reform states that in Beijing, in summer, air-conditioning consumes up to 40% of the total electricity demand during peak network load. The cooling effect of green areas would help to reduce energy consumption and consequently CO₂ emissions associated with the operation of air conditioners (Lin et al. 2011).

² There is a conflict between the protection of biodiversity and the expectations of city dwellers with regard to the green areas. Gobster et al. (2007) suggests that aesthetic preferences do not always meet the high ecological value of the area. For example, neat, evenly trimmed lawns are seen as beautiful and desirable in the landscape of the city, although their importance for biodiversity is less than the biologically rich wetlands, which are seen as less attractive.

considered healthy, only when it is resistant to human pressure; is un-degraded and able to maintain equilibrium in the long term (Rapport et al. 1998, Brussard et al. 1998). Providing a large area of healthy, properly functioning system of green areas is one of the primary ways of shaping the spatial structure of cities.

FROM CLASSIC CHINESE GARDENS TO GREEN ROOFS

The Chinese garden always remained in a close relationship with nature and was intended to imitate the most beautiful natural landscapes. Through contact with nature, the individual could find an escape from everyday problems and experience inner harmony (Święcki, Latkowska 2014). Classic Chinese gardens, for nearly 2000 years, are the predominant type of green areas in Chinese cities (Photo 1).



Photo 1. Forbidden City Garden, Beijing (photo by L. Poniży)

Fot. 1. Forbidden City Garden, Pekin (fot. L. Poniży)

They were created based on philosophical canons of harmony and beauty (Taoism, Confucianism, Buddhism) Individual elements of the garden composition: rocks, water, garden buildings and plants were all arranged according to these principles. Gardens inspired by Taoism were created in a way that makes them most similar to the natural landscape, as miniatures of its most beautiful parts (Zieliński 2008). According to Confucianism, a garden is a place that provides

refuge from the surrounding hubbub, and the beauty of its scenery is intended to induce feelings and thoughts which facilitate comprehension of the world (Wójcik 2004). Thanks to Buddhist monks' interest in botany and literature, knowledge about plant symbolism was revived and disseminated, and became the basic criterion for its application in Chinese gardens (Wójcik 2004).

In Chinese gardens rocks (male element of nature) and water (female element) represent profound symbolic meanings and are the most important components. Through the centuries plants were applied in Chinese gardens very sparsely. As passing and impermanent elements, they were treated as less important, secondary garden components (Zieliński 2008). The growing importance of plants in garden art only appeared at the beginning of the 10th c., but their share was still much smaller than in European gardens.

Along with foreign missionaries in the first half of the nineteenth century, elements of public green areas, characteristic of European cities, such as extensive lawns with scattered trees, trimmed bushes and flowerbeds, appeared in China (Photo 2).



Photo 2. The Temple of Heaven Park, Beijing (photo by L. Poniży)

Fot. 2. The Temple of Heaven Park, Pekin (fot. L. Poniży)

In the 50s of the twentieth century, as a result of the Soviet Union influence, multi-purpose recreation and culture parks were created. Since the introduction of China Economic Reform in 1978, in the urban regions, one can notice characteristics of Western European cities: parklands with evenly trimmed lawns and

regular flowerbeds. A public park is the most typical form of green areas in Chinese cities, however, its character often differs from the classic look of a Chinese garden (deprived of ponds, streams, rocks, stones, and classical Chinese architecture) (Ignatieva et al. 2015).

The main task of parks and public gardens is to provide aesthetic experience; they also create the background for socializing. Impeccably maintained lawns and flowerbeds, trimmed trees and shrubs, however, require continued human support as well as substantial financial resources (continuous work of human hands, irrigation and fertilization) (Zhao et al. 2010).

The concept of '3D' green areas has been gaining popularity in China. It is not possible to create new green areas in the city centers, which is due to the existing intense investments on one hand and the historical and cultural heritage on the other. In the face of increasing demands to improve the quality of life, in order to increase green areas, new gardens are created on the rooftops and balconies, and the walls of buildings are being covered with greenery (Xu et al. 2011).

GREEN AREAS IN THE CONTEXT OF SPATIAL DEVELOPMENT OF CITIES

In most Asian cities there is a sharp conflict between urbanization and limited space for development, which generates crowded cities with inadequate amount of open space for people and many species of wild animals (Jim 2000). As a result of human pressure the quality of natural habitats also deteriorates. We observe disappearances of natural areas, wetlands, forests, meadows, pastures; which are replaced by artificial means such as public parks, gardens, monocultural plantings along roads (Tan 2011).

These problems very much concern cities in China. In the last 30 years, most of them have made a tremendous leap in spatial development, and some, such as Shenzhen, over the past few decades, have grown from practically non-existing to multimillion metropolis.

Beijing area increased from 183.8 km² in 1973 to 1,368 km² in 2013. Only in 2000–2010 did the green areas decrease by 199 km². Due to the lack of undeveloped areas suitable for the development of buildings in the central part of Beijing, new districts have arisen in suburbs and villages. This building investment is being carried out on land earmarked for agricultural purposes. Natural and semi-natural ecosystems are replaced by areas with impervious surfaces. The closer to the city center, the greater the participation of impervious surfaces in the general area (Xiao 2007). Moreover, we can observe an increase in the isolation and fragmentation of the landscape patches (Zhang et al. 2015), which is a reverse process to creating

a linked system of areas of high natural values, which is the desired system from the point of view of landscape ecology. A green belt separating the central part of the city from suburban areas, which was proposed in the Urban Master Plan of 1958, has been fragmented. The growth of the city, absorbing open spaces causes a continuous increase in the distance between the residents of older neighborhoods and natural areas, making it difficult to meet demands for recreation and leisure (Xu 2011).

The results of the analyses presented by Zhao et al. (2013) show a completely different trend in changes in the surface of green spaces in cities. The authors looked at the share of green spaces within the urban areas of 286 cities in the years 1989–2009. In 2009 this share ranged from 2.8% to 69.8%. 91% of the cities analyzed showed an upward trend of the share of green urban areas in the 20 year period of analysis. The average share rose from 17% in 1989 to 37.3% in 2009. The authors reported that the increase in the share is positively correlated with the process of urban sprawl, whereas there is no correlation with geographic and climatic factors. The green areas appear more frequently along with new residential areas on the outskirts of cities than in existing urban development, as an example of a form of space recycling.

Even if we can observe the upward trends in share of green areas in Chinese cities it is, nevertheless, the owner/administrator of a local government area of the city who manages its resources. Thus, custody of spatial development, including the development of a system of green areas, is exercised by a self-governing entity which is subordinate to the city council. Jim and Chen (2006) draw attention to the lack of public participation in shaping the green areas, which causes a mismatch between the expectations of citizens and offers by officials.

Moreover the growing scarcity of land resources, high pressure on land demand, and keen pursuit of short-term economic benefits (Cho, Choi 2014) may motivate local governments to lease out potential and existing green spaces in order to maximize municipal land revenue (Chen, Hu 2015).

THE FUTURE OF THE CITY IS GREEN

An increase in access to information and the opening of the Middle Kingdom to the world was one of the factors that has changed the Chinese society over the last thirty years. It has also affected changes in the approach of Chinese people to the environment and the issue of its protection.

China's desire is to make their cities acquire the status of 'green', which is reflected not only in efforts to increase the number of green areas, but also to reduce energy consumption, make transportation more environmentally friendly, rational management of water and wastewater and minimize waste production.

The Sino-Singapore Tianjin Ecocity is a flagship product, which is the result of a collaboration between the Chinese and the Singapore governments. As the site of the project, they selected unused, substandard areas situated on the Gulf of Bohai (Bo Hai) nearby the city of Tianjin. The currently implemented project involves the construction of a modern city which is to accommodate 350 thousand residents by the year 2020 and it is to be well balanced considering its environmental, social and economic functions (Pow, Neo 2015).

Considering green areas, the project uses Singaporean standards for the organization of new urban areas, requiring the establishment of housing estate parks with the minimal area of 0.2 ha. per every 2500–5000 people living in multi-family buildings. These parks should be connected with each other as well as with other public areas by green corridors (Jim, Chen 2003). The city will be surrounded by an extensive parkland, connected with the city center by green belts. The green areas will be complemented with natural and artificial lakes connected by a network of channels.

Singapore standards were also used in the development plans for green areas in the city of Nanjing; they were organized into a hierarchical, three-stage system. At the metropolitan level, main components of the system are wedges of greenery, which are largely natural woodlands, connecting the urban areas with the suburbs. At the level of the city – green corridors – a network which is both interconnected and connecting wedges of greenery, being created mainly for the purpose of leisure, but also as a habitat and migration area for species which are more resistant to city stress. At the district level – green perpend – invading deep into the urban fabric, providing contact with nature, for daily relaxation.

The condition for the proper functioning of the system is to interconnect all the elements into a coherent integrated network (Jim, Chen 2003).

The majority of Chinese cities are currently implementing national programs related to the improvement of environmental quality ('Eco-city', 'Low-Carbon City', 'Garden City', 'Eco-Garden City'). The national program, 'Garden City', implemented in 1992, to the greatest extent refers to urban green areas. It presumes that such a status is given to a city that meets government criteria for forest cover, the share of green areas in the city area and the availability of public parks (Wolch et al. 2014). Since implementation until 2011, 184 cities have been awarded such a status. They can apply for the title of 'Eco-Garden City' by meeting additional criteria related to environmental protection, ecological development, reduction of urban heat island effect. This title, in addition to the above example of Nanjing, was granted at the end of 2010 to Qingdao, Yangzhou, Hangzhou, Weihai, Suzhou, Shaoxing, Guilin, Changshu, Kunshan, Zhangjiagang and Jincheng (Zhou et al. 2014).

CONCLUSIONS

Despite the many efforts being made: implementation of projects, national programs, introduction of stricter standards of planning, the demand for green areas is still greater than supply. While the national average urban area of green space per inhabitant in the United States is 50.18m², it is only 6.52 m² in China. Even in the case of Hangzhou, a city with the status of 'Eco-Garden City', with a 40% share of green areas in the city area, the rate is 15 m² (Wolch et al. 2014). For a Sino-Singapore Tianjin Eco-city project the presumed rate is 12 m² per capita.

With new residential areas, green spaces appear and they require legal planning. However, they are mainly parks, which, from the very beginning to the end, were created by man and demand his continuous support. As a result of spatial development, natural and semi-natural areas (forests, wetlands, natural meadows, pastures) keep on shrinking or even disappear. A survey conducted among residents of Guangzhou (Jim, Chen 2006) indicate that green areas are considered as scenic, aesthetic background for recreation, leisure, social meetings, whereas their environmental importance for the city was overlooked. On the other hand, these same respondents, named the improvement of the microclimate (oxygen production, carbon sequestration, lowering of ambient temperature) and environmental quality (absorption of air pollution, noise reduction) as the most important benefits of the existence of green areas. The mostly valued areas were the ones with a high degree of naturalness (forest parks) and parks organized in a mixed style 'oriental-west', leaving behind those with traditional Chinese character and those designed in the style of parks in Western cities.

The importance and benefits of the existence of green areas perceived by the inhabitants, give reasons for their involvement in the design process. So far in China, it has not been common. Solutions imposed from above and crammed into planning standards, despite their compliance with the regulations, do not always meet the needs and expectations of users of urban open spaces, hence the need for cooperation between public authorities (responsible for spatial planning) and residents as well as non-governmental organizations and making sure all the parties concerned are involved in the design process.

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