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Contemporary processes and the selection of materials in historical urban greenery areas on example from Cracow and Warsaw

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Abstract. The paper will discuss urgent and topical problems that affect historical areas of urban open space. Its main goal will be the identification of phenomena which take place within it, and which mainly affect its natural tissue. The article will also contain such aspects like: an analysis of modern trends in revalorisation and the effects of its impact, an analysis of possible preventive measures that can be taken, as well as an evaluation of the influence of environmental factors on the condition of individual types of greenery. The problem of contemporary processes that take place in green areas located in the layouts of historical cities, towns and villages undertaken in the article constitutes a further development of research work that has been performed for many years at the Garden Design and Green Areas Division of the Institute of Landscape Architecture of the Faculty of Architecture of the Cracow University of Technology. The protection, revitalisation, regeneration and shaping of cultural and natural historical landscapes is a broad subject, in which the diagnosis of currently ongoing negative processes constitutes the basis of appropriately prepared guidelines and, afterwards, design work. The main objective of this article is analysing the changes that occur in material selections in areas of historical urban open spaces, against the background of the transformations of design tendencies, conservation ideas, environmental factors and civilizational needs. The article uses the research material of authors from the areas of Cracow and Warsaw.

1. Introduction

The main purpose of this work is an analysis of the transformations taking place in material selections in areas of historical urban greenery, against a background of changes in design tendencies, conservation ideas, environmental factors and civilisational needs. Selected parks from the area of Cracow and Warsaw were selected as representative examples of contemporary conservation efforts. These parks: The Royal Baths, the Garden of the Krasiński Family, Planty Park in Krakow, as well as the Marksman Park, are examples of layouts of immense significance to the cultural heritage of the country and which have recently been subjected to revalorisation work. An analysis of the results of this work, based on an original method of assessment, was meant to verify the justification of the work's performance, its appropriateness, especially in reference to the composition of the entirety of a given site, the existing tree stands, as well as new material selections. The results can be used as guidelines in undertaking work on other layouts of this type, providing the possibility of eliminating negative design decisions.

The cities of Warsaw and Cracow constitute the two most important Polish cities in numerous terms (they are, the largest and second-largest urban centres of the country, respectively). Krakow, as the



former, and Warsaw as the current capital of the country, hold a high historical and cultural rank, also having within their limits numerous structures and sites of high artistic value (e.g. both the area of the Old Town in Warsaw, as well that of Cracow are on the UNESCO World Heritage Sites List). Both cities are also the sites of layouts of greenery that are significant for Polish and European garden design, and which also constitute an important urban-planning-related and aesthetic factor. Krakow, with an area of 326,85 km² (and a population count of 766 739) possesses 43 parks with a combined area of 396,92 ha, of which 14 are sites listed in the historical monuments registry (with a combined area of 43 ha). Warsaw, in turn, with an area of 517,24 km² (and a population count of 1 758 143) has 79 parks with a total area of around 762 ha, of which 28 are listed sites.

2. Negative phenomena and cultural processes that occur in historical greenery in Poland

Taking up the discussion on the problem of the phenomenon of negative transformations in areas of historical greenery was a result of the problem of contemporary directions of revalorisation and the effects of their influence on historical greenery - both in aesthetic and compositional, as well as in utilitarian terms - that had been observed in Poland. This phenomenon is a part of research work that has been performed for many years at the Garden Design and Green Areas Division of the Institute of Landscape Architecture of the Faculty of Architecture of the Cracow University of Technology [1][2][3].

Revalorisation efforts - justified by principle - that have been gaining in intensity in recent years, directed mainly on the saving and recreating of historical layouts and complexes, carry with them significant threats to the durability of these sites. We can mention here improper actions towards this end, which include: 1. the revalorisation of large sites employing a "one-off" system - which constitutes significant pressure on the living tissue of the sites, especially on tree stands; 2. the fragmentation of areas or staging - selective efforts directed at solving a singular problem (surfaces, park furniture, the water system); 3. the overdevelopment of green areas - the introduction of an excessive amount of elements of greenery and infrastructure and users; 4. the excessive modernisation of historical areas, without referring to the history of the place and introducing inappropriate compositions, greenery selections and furnishing.

The negative phenomena that take place in areas of historical greenery are not always spotted and properly interpreted. During the research, the following phenomena were identified:

- negative cultural phenomena that occur within sites of historical greenery (which are caused by legal conditions, e.g. associated with property divisions and forms of protection), including economic, administrative and social ones.
- negative natural phenomena that take place within sites of historical greenery - associated both with environmental factors, anthropic pressure, as well as the inappropriate management of greenery (the problem of the "falling out" of tree stands - the withering of individual species, the problems of species selection and problems of the erasure of composed layouts).
- negative phenomena which hinder the maintenance of existing and the introduction of new greenery in historical sites - associated with existential conditions and existing tree stands (the problem of limited space for trees, changes in habitat conditions as a result of changes in the vicinity, problems of the changes of urban (micro-, meso-) climate).

For the purposes of the study, a point-scale analysis was performed with the use of original indicators, concerning the most commonly occurring negative natural phenomena within the parks of Poland.

3. Analysis of phenomena on examples of Warsaw parks

The Royal Baths Park (*pol.* Łazienki Królewskie, figure 1), with an area of around 76 ha, constitutes one of the more expansive historical areas of the city. It has the character of a palatial and park layout and was established in the seventeenth-eighteenth century by king Stanisław August. The layout was

designed by outstanding architects and gardeners of the period (including Karol Ludwig Agricola, Jan Michał Tietz, Jan Chrystian Schuch [4]) as a green area of a classicist character, with a landmark in the form of the Palace on the Isle and a complex of three ponds placed along the main axis. Negative natural phenomena occurring in Łazienki Królewskie Park in Warsaw features the tables below (table 1).

Table 1. Negative natural phenomena occurring in Łazienki Królewskie Park in Warsaw

No.	Phenomenon	Impact strength	Reversibility
		1- Low, 2- Moderate, 3- Medium, 4- High, 5- Very high	1- Full 2- Possible 3- Conditional 4- Difficult 5- Impossible
The problem of the "falling out" of stands (the withering of individual species)			
1	Pest gradation (secondary factor)	3	2
2	The chronic nature of diseases or the activity of pests	2	1
3	Syndromes	3	2
4	Anthropic pressure	3	2
The problem of species selection			
5	The dominance of summary action in the replacement of specimens - lack of strategy	4	2
6	Lack of selection verification in the case of replacing individual specimens	3	2
7	Improper selection of species for specific places - avenue, row, street, road	3	2
8	Maintaining historical selection despite changes in: conditions, function, the environment	3	2
The problem of the erasure of composed layouts, arranged spaces			
9	Lack of control over succession processes	3	1
10	Change in species composition	4	3
11	Neglect in basic maintenance - periodic or long-term lack of maintenance	5	3
12	The effect of CO ₂ on the increase of the growth dynamic of biomass	3	3
13	The activity of social groups blocking clearing work in valuable tree stands	4	2

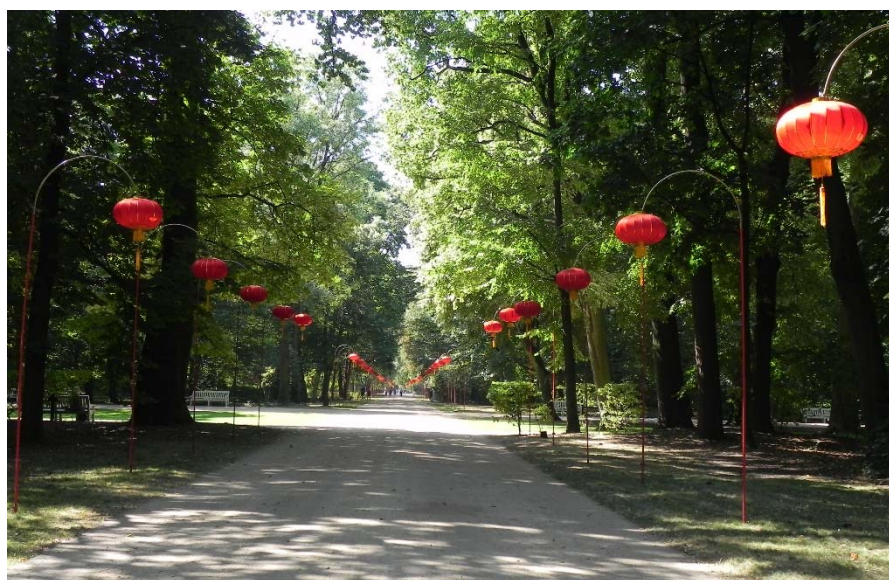


Figure 1. Chinese Avenue in Łazienki Królewskie Park

The Garden of the Krasiński Family has a surface area of 7,2 ha (figure 2). Its genesis goes back to the Baroque and the residence of the Krasiński Family designed by Tylman van Gameren. Its contemporary form is an effect of successive transformations - being turned into a city park in 1756 (design by

Domenico Merlini), and afterwards, in the years 1891-1895, a redesign in the landscape style by Franciszek Szanior, damage caused by wartime operations during World War II and the post-war partial reconstruction and expansion [5]. In the years 2012-2014 the site was subjected to revalorisation work, which referenced both the Baroque and the landscape form, while introducing a number of contemporary functions. Negative natural phenomena occurring in this park features the tables below (table 2).

Table 2. Negative natural phenomena occurring in Krasińskich Garden in Warsaw

No.	Phenomenon	Impact strength	Reversibility
		1- Low, 2- Moderate, 3- Medium, 4- High, 5- Very high	1- Full 2- Possible 3- Conditional 4- Difficult 5- Impossible
The problem of the "falling out" of stands (the withering of individual species)			
1	Pest gradation (secondary factor)	3	2
2	The chronic nature of diseases or the activity of pests	3	1
3	Syndromes	3	2
4	Anthropic pressure	4	2
The problem of species selection			
5	The dominance of summary action in the replacement of specimens - lack of strategy	4	2
6	Lack of selection verification in the case of replacing individual specimens	4	2
7	Improper selection of species for specific places - avenue, row, street, road	4	2
8	Maintaining historical selection despite changes in: conditions, function, the environment	4	3
The problem of the erasure of composed layouts, arranged spaces			
9	Lack of control over succession processes	4	2
10	Change in species composition	4	2
11	Neglect in basic maintenance - periodic or long-term lack of maintenance	4	2
12	The effect of CO ₂ on the increase of the growth dynamic of biomass	3	3
13	The activity of social groups blocking clearing work in valuable tree stands	5	2



Figure 2. The Garden of the Krasiński Family, greenery in front of the palace

4. Analysis of phenomena on examples of Cracow parks

Cracow's Planty Park is a belt of greenery that stretches around the Old Town, with an area of 21,42 ha (figure 3). It was arranged in the year 1817-1822, immediately after the decision of the municipal

authorities to demolish a part of the medieval walls that had surrounded the oldest part of the city [6]. Planty Park has a walking and recreational character, with a rich dendrological collection and an additional content layer, which is composed of monuments from various periods of the layout's existence. The composition itself has gone through various stylistic transformations (from classicist to naturalist ones, with elements of Art Nouveau), periods of greatness, but also of neglect. Currently it is one of the most recognisable green spaces of the city, with an individual character and atmosphere. Negative natural phenomena occurring in this park features the tables below (table 3).

Table 3. Negative natural phenomena occurring in the Planty Park in Cracow

No.	Phenomenon	Impact strength	Reversibility
		1- Low 2- Moderate, 3- Medium, 4- High, 5- Very high	0- Full 1- Possible 2- Conditional 3- Difficult 4- Impossible
The problem of the "falling out" of stands (the withering of individual species)			
1	Pest gradation (secondary factor)	3	2
2	The chronic nature of diseases or the activity of pests	3	2
3	Syndromes	4	2
4	Anthropic pressure	4	3
The problem of species selection			
5	The dominance of summary action in the replacement of specimens - lack of strategy	4	3
6	Lack of selection verification in the case of replacing individual specimens	4	2
7	Improper selection of species for specific places - avenue, row, street, road	4	2
8	Maintaining historical selection despite changes in: conditions, function, the environment	4	2
The problem of the erasure of composed layouts, arranged spaces			
9	Lack of control over succession processes	3	2
10	Change in species composition	4	2
11	Neglect in basic maintenance - periodic or long-term lack of maintenance	3	2
12	The effect of CO ₂ on the increase of the growth dynamic of biomass	4	3
13	The activity of social groups blocking clearing work in valuable tree stands	5	2



Figure 3. The Planty Park, in the background the Old Town in Cracow

The Marksmen Park (*pol.* Park Strzelecki) was established in the 1830's as a garden belonging to the Marksmen Brotherhood, an organisation teaching marksmanship to burghers. The park, originally

larger, currently occupies an area of 1,41 ha and constitutes a small enclave of greenery in a region that is highly urbanised, both historically and contemporarily. The garden has a shape similar to a rectangle and a geometric compositional layout with sizable trees and a large number of commemorative statues (figure 4). It originally had a geometric layout with a central avenue and a fenced-off shooting range, but was given a more freeform layout of paths referring to the calligraphic style towards the end of the nineteenth century. It has been significantly transformed recently, with the selection of species for new plantings, the employed materials and the growing amount of statues and artefacts being a source of concern (table 4).

Table 4. Negative natural phenomena occurring in the Marksmen Park in Cracow

No.	Phenomenon	Impact strength	Reversibility
		1- Low 2- Moderate, 3- Medium, 4- High, 5- Very high	1- Full 2- Possible 3- Conditional 4- Difficult 5- Impossible
The problem of the "falling out" of stands (the withering of individual species)			
1	Pest gradation (secondary factor)	4	2
2	The chronic nature of diseases or the activity of pests	3	2
3	Syndromes	4	2
4	Anthropic pressure	5	3
The problem of species selection			
5	The dominance of summary action in the replacement of specimens - lack of strategy	4	3
6	Lack of selection verification in the case of replacing individual specimens	4	2
7	Improper selection of species for specific places - avenue, row, street, road	4	2
8	Maintaining historical selection despite changes in: conditions, function, the environment	4	2
The problem of the erasure of composed layouts, arranged spaces			
9	Lack of control over succession processes	3	2
10	Change in species composition	5	3
11	Neglect in basic maintenance - periodic or long-term lack of maintenance	4	2
12	The effect of CO ₂ on the increase of the growth dynamic of biomass	4	3
13	The activity of social groups blocking clearing work in valuable tree stands	5	2



Figure 4. The Marksmen Park, on the first plan, a statue of St. John Paul II

5. Results and discussions

The research showed that the main infringements concerning revalorisation work were mostly related to the management of tall greenery, as well as its influence (especially in tightly packed groups) on the remaining elements of a composition (both plant-based elements as well as those of a functional character). As a result, this had led to the lowering of both the aesthetic and historical value of these areas. Furthermore, the analysed works had a very brief character, there was a lack of a long-term plan of cultivating these layouts.

Active efforts in terms of the management of tree stands were thus observed to have considerable significance to the protection and development of valuable layouts of historical greenery. The process of the rearrangement of tree stands in each park did not always take into account a methodically appropriate manner of replacing individual specimens. In many cases summary, unplanned efforts were dominant, based on replacing existing trees without performing an analysis of the appropriateness of a given species and the site. Unverified selections of tree species affected the erasure of compositions.

The successive loss of plants within a composition, the growth of tree stands and increasing crowding are problems that cannot be solved through a one-time operation, even if it will affect an entire site. In the Royal Baths Park in Warsaw almost 2000 trees were removed over the course of the last 30 years due to justified reasons concerning excessive crowding, yet it did not affect the physiognomy of the park. The carrying out of this process over a short period of time would result in significant changes in habitat conditions and the compositional layout. The disappearance of precious specimens, regardless of its cause, leaves a permanent gap in the composition of tree stands and parks. For instance, Krakow's Planty Park lost its Kentucky coffeetree in the 1990's and it has not been recreated to this day. It was the only specimen, thus being all the more important to the layout of the site.

The second important problem was the inappropriate coordination of works and responsibilities among different groups and layers of greenery, which led to difficulties in recreating the lower layers of plants. In the area of Krakow's Planty Park this was also associated with an improperly understood principle of preserving the safety of users, which resulted in a low amount of bushes in this area. In examples from Warsaw we can observe attempts at reintroducing material solutions referring to a specific period or composition, while in examples from Krakow there were either no such attempts or they were unsuccessful.

The overcrowding of tree stands, especially in examples from Warsaw, led to a worsening of the conditions of residing in the area of arranged greenery (the Krasiński Family Garden). Attempts at decreasing the overcrowding led to beneficial results, but require long-term efforts.

The work that was carried out surely resulted in increased interest in these parks by users, as well as in suspended tourist traffic in these areas. An excessively large amount of elements of street furniture, surfaces, monuments and benches can, however, have a destructive effect, both on the greenery, as well as the character of a historical park (Marksmen Park).

The third phenomenon that was observed and that affects the condition of each type of greenery to the greatest degree was broadly understood anthropic pressure.

It manifested itself particularly in the changes of soil conditions, through excavations, improper selection of surfaces, the winter maintenance of surfaces. This was also associated with improper design decisions (Planty Park, Marksmen Park).

Environmental factors, to which plants in urban conditions are particularly susceptible to, directly affect plants, and the changes that take place within said conditions cause the initiation of succession mechanisms. Often when decisions concerning the removal of tree stands are made, new altered insolation, humidity or temperature conditions either make it possible for other layers of the tissue of greenery to develop or they hinder such growth (Planty Park, the Krasiński Family Garden).

6. Conclusions

The negative transformations observed in the analysed examples are proof of the insufficient active protection of sites, particularly tree stands. The strata from the post-war period and that of the political transformation, often resulting from neglect in terms of care and an improper management of a site are

problematic in Polish historical parks (and not only those from Krakow and Warsaw that have been discussed in the article). They require in-depth analyses and the development of guidelines for revalorisation designs.

What is important, the full revalorisation of the sites under discussion will only be possible once the precepts of the management of such sites are put in order, as well as after the development of coherent, comprehensive designs.

The research provided not only a possibility to assess the negative natural phenomena that occur within the sites of historical greenery covered by the analysis (Tables 1, 2, 3, 4), but also for developing additional guidelines for other revalorisation work. They primarily apply to the most important problem that has been pointed out, which is the rearrangement of tree stands, and which should be based on:

- negative cultural phenomena that occur within sites of historical greenery (which are caused by legal conditions, e.g. associated with property divisions and forms of protection), including economic, administrative and social ones,
- justified decisions concerning the removal of trees due to excessive crowding in order to improve habitat conditions,
- the possibility of restoring, recreating and introducing necessary bushes and perennial plants which constitute the lower layer and which have withered due to the growth of trees,
- appropriate species selections, adapted to the site and the habitat,
- analysis of the problems of the maintenance of greenery for the purposes of cost rationalisation,
- a precise analysis of the influence of habitat factors on a given site, in order to determine proper species selections and its forms that are adapted to its location.

The process of the revalorisation of historical parks and gardens must maintain balance between the needs of users and the preservation or even the uncovering of the historical value of these sites. This is why it is necessary to employ material solutions that make it possible to effectively utilise a site while maintaining compositional fidelity and the tradition of the place. It is also essential for work to be performed successively, continuously, especially concerning the removal of plants, the cultivation of tree stands and with new plantings of various forms of greenery.

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