ISSN 2029–9990 JOURNAL OF SUSTAINABLE ARCHITECTURE AND CIVIL ENGINEERING
DARNIOJI ARCHITEKTŪRA IR STATYBA 2013. No. 3(4)

The Ecological, Aesthetic and Psychological Benefits from Using Climbing Plants in Urban Green Spaces in Cracow and Dresden

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crossref http://dx.doi.org/10.5755/j01.sace.3.4.4497

Nowadays, when the cities are even more crowded, the environmental planning and design is a big challenge. Due to outstanding features, like high oxygen production ability or small requirements, climbing plants can considerably improve city living conditions. What is more, they can partly solve the problem of shortage of public green spaces. This work is based on the research conducted in Cracow in cooperation with Dresden. It contains analysis of climbing plants location, comparison of their application methods and technical solutions, as well as public authorities attitude to this topic and inhabitants opinion about meaning of climbing plants in the urban circumstances. This paper considers climbing plants problem of ecological, aesthetic, psychological and economic aspects. The aim was to find the perfect solutions for using climbing plants in city structures and gain maximal benefits. The research shows the most popular climbing plants application methods and also the increasing popularity of unconventional uses. It compares methods used in Cracow and Dresden and shows the similarities and differences, giving the solutions for improving the quality of life in the cities generally. Moreover the longer tradition of using climbing plants in Dresden is a chance for Cracow and other cities to improve support technology and selection of sorts.

Keywords: *climbing plants, Cracow, Dresden, environmental planning, quality of live.*

1. Introduction

Nowadays more and more cities are fighting against environmental pollution, especially air and water contamination, and soil shortage. All these ecological problems have massive influence not only on the environment but also in the city appearance and inhabitant's life quality. This is the reason for looking for new methods for mitigating the consequent damages and, what is more important, preventing the new ones.

Among European cities Cracow is one of the best examples of location in the valley, where the quality of environment should be increased to ensure better level of living. Cracow is a perfect research field to experiment on its urban structures and find innovative solutions for improving living conditions in urban spaces.

Dresden was chosen to compare with Cracow, not only because of longer tradition of using climbing plants in the city, but also because of distinctly better living conditions.

All the surveyed Dresden inhabitants agreed, that the quality of living in Dresden is high (80 per cent of inhabitants state that quality of environment is good). In comparison to this, only 11 per cent of people are satisfied with environment quality in Cracow. All positive aspects of this issue and proven solutions should be an inspiration for Cracow and other cities.

Lack of fresh air, clean water and space to relax, heat islands are undoubtedly noticeable in urban circumstances. The research discovered that climbing plants, because of their good features like huge bioactive surface, ability of high oxygen production and dust elimination, ensuring biodiversity and small space requirements are the perfect tool to cope with these problems. Moreover, they are the best solution for unaesthetic places like waste containers or big homogenous surfaces e.g. concrete walls or facades. The interesting application is also using climbing plants as a background in composition with other species.

It is the reason, why the research was conducted. The aim was to find out versatile methods of using climbing plants in the city structures.

The research discovered solutions for using climbing plants in the city structures with achieving the maximal benefits.

2. Methods

The inspiration for carried research was inventory of 40 climbing plants positions made by Cyprian Kamil Norwid Community Centre in Cracow in 2009. It was lead to show that climbing plants are the important part of the Cracow green structures.

Our research shows much more methods. They should be inspiration for more frequent use of climbing plants to improve the quality of the cities structures. The important fact is to show methods tested in Dresden, where visible longer tradition of using climbing plants shows distinctly their good influence on condition of the city.

This work deals also with social aspect, showing the inhabitants and public authorities attitude to the topic. It is because such an psychological impact is really important in organizing green development process and the aim was to show, that is needed to convince people that usage of climbing plants is important. The success depends on inhabitant's attitude towards present green spaces and new plants.

The research, which this work is based on, was conducted in Cracow in cooperation with Dresden. It has begun in November 2012 and keeps on going.

Three main steps were identified in the researching process. The first contained analysis of climbing plants location and conducting surveys. Authors obtained 150 questionnaires from the residents of Cracow and Dresden which show their attitude to the meaning of climbing plants in urban areas. The examples of cataloguing and surveying methods are presented in Fig. 1 and Fig. 2.

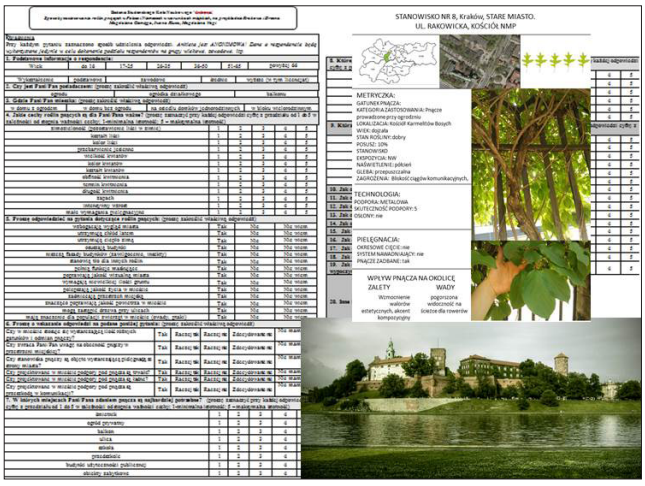

Fig. 1. *Example of the cataloguing and surveying method in Polish language version*

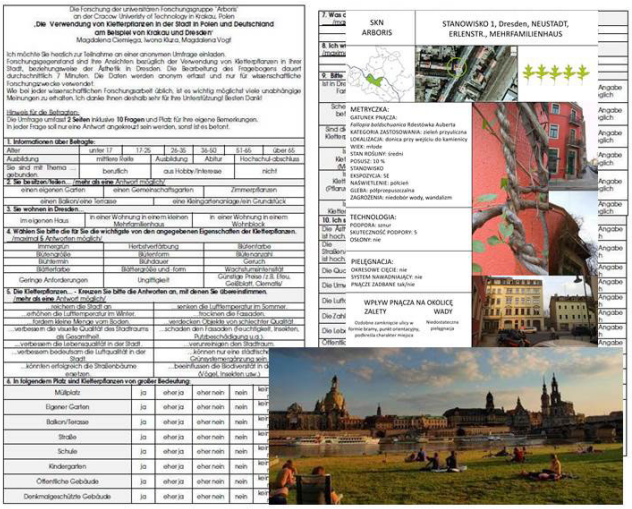

Fig. 2. *Example of the cataloguing and surveying method in German language version*

The second step was evaluation and comparison of climbing plants application methods and technical solutions in Cracow and Dresden, as well as building statistics on survey's basis. Finding good practice was possible because of wide research material, especially photos and maps. Almost 100 locations of climbing plants were catalogued in Cracow and Dresden. They are shown on two maps of localizations in Fig. 3 and Fig. 4.

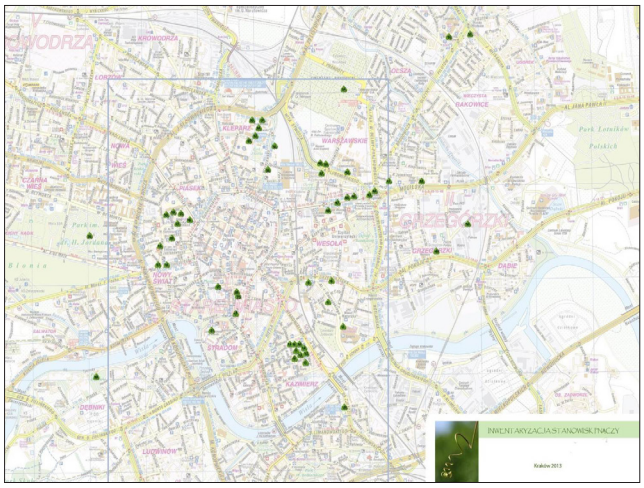

Fig. 3. *Researched area in Cracow*

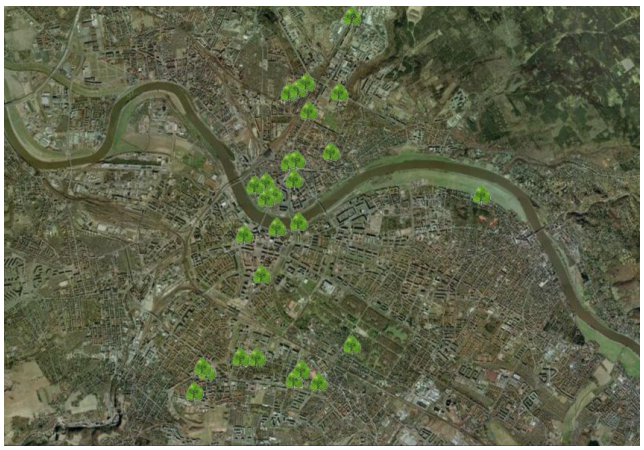

Fig. 4. *Researched area in Dresden*

The third step was generalizing conclusions and specifying solutions. The researched area covered city centre because there are located public spaces which are used by inhabitants and tourists. In such an accumulation of open public spaces, climbing plants have many functions. There are 10 different categories of their locations: public areas and buildings (like squares, churches, museums, schools, hospitals), greenery along the streets, restaurants and cafes, historic buildings and monuments, office buildings, parks, fences, masking unaesthetic objects, blocks of flats and hotels.

In each category researchers were looking for ecological, aesthetical and psychological benefits that climbing plants can bring for all people. They can also check the influence on the quality of live, especially by process of creating much more possibilities for spending free time and arranging public in crowded city centres

3. Results in Dresden

Dresden is an example of the perfect application of different green structures in the city. Although the frequency of using climbing plants in Dresden is smaller than other plants, they are important part of green structure and share all the functions. Fig. 5 shows the most popular uses of climbing plants in Dresden. The function, you will see, is completing green structure. They are mostly a vertical motive on facades, accompanying plants, especially in a creeping form, and they are improving aesthetics of the unattractive places in the city.

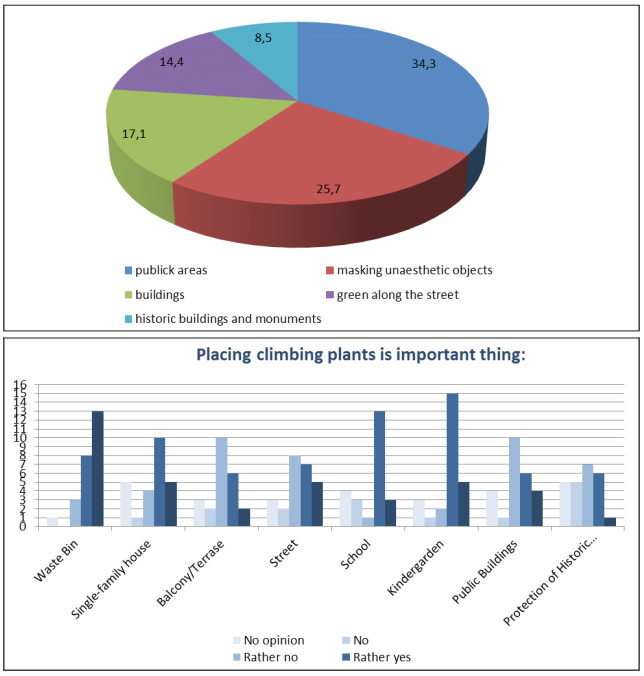

Fig. 5. *Most popular uses of climbing plants in Dresden*

In Dresden green planning is about creating aesthetic places for living and recreation. Climbing plants help a lot in achieving this aim. Their ability to create exceptional atmosphere in a public space is notably remarkable in city interiors in Dresden centre – Altstadt and Neustadt, and distinctly in two unique residential districts – Blasewitz and Hellerau. These areas were especially focused on, as a model places.

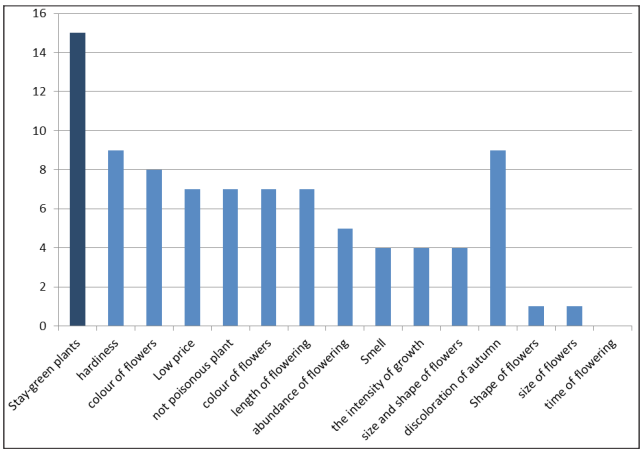

Fig. 6. *Important features of climbing plants for Dresden inhabitants*

Because of plenty of green in the Altstadt in the public spaces (streets, markets, inner courtyards) and around the public buildings (university, departments) inhabitants evaluate very well the quality of life in Dresden. It is also a perfect advertisement for a city and could affect potential future occupants and tourists quantity. The use of climbing plants may create splendid venues. The example of such an application can be shown in Fig. 7 famous Kunsthofpassage in Neustadt or inner yard from Altstadt on Fig. 8.

Fig. 7. *An example of creating high quality public spaces in the city centre with the use of climbing plants, Kunsthofpassage, Neustadt*

Fig. 8. *An example of creating high quality public spaces in the city centre with the use of climbing plants – Postplatz, Altstadt*

Climbing plants accompany historical monuments in Dresden, which results in emphasizing their old character. A good example could be composition on Martin Luther church in Fig. 9.

Fig. 9. *Marthin Luther church, Neustadt*

Gardeners take special care of plants what is notable in the Figure 10. This is why, instead of disturbing climbing plants, they are helping to underline value and appreciate beauty of old architectural structures.

Fig. 10. *Inner yard of Hüllseebau, Technische Universität Dresden, Plauen*

The two mentioned residential areas, Blasewitz and Hellerau, are the favorite locations to live in. It is significant, how inhabitants can be influenced to decide where to live by creating spaces with the use of green, especially climbing plants. The Fig. 11 and Fig. 12 show how the climbing plants build the unity with architectural structures and create an ensemble character of researched places. People can take such benefits from surroundings like perfect conditions to psychical and physical relax, healthier environment, contact with nature.

Fig. 11. *Mosaic showing the atmosphere created by using climbing plants in Blasewitz*

Fig. 12. *Mosaic showing the atmosphere created by using climbing plants in Hellerau*

Dresden gives more inspirations for public spaces. The most innovative ones are in Neustadt, where materials and forms of constructions are ingenious. In the Fig. 13 it is presented the wooden construction with a composition of more than five different species. Moreover it is a place for arranging meetings.

Fig. 13. *Interesting construction in Neustadt*

There is one more important method of using climbing plants that deserves attention. There is plenty of creeping uses of climbing plants in Dresden, but they are also located on natural objects like trees. Together with putting them on small architecture in the city, they are creating a really interesting city landscape of the streets. The examples are shown in Fig. 14.

Fig. 14. *Interesting city landscape of the streets in Dresden*

4. Results in Cracow

Cracow has to face many problems connected with large air, water and environment pollution. Statistics show that the quality of air violates many standards of safety, especially during the winter season. The two major sources of the most harmful pollutants are domestic solid fuel furnaces and motor vehicles, but local industry also contribute. The quality of green public spaces is also disappointing. The frequency of using climbing plants is also very low.

Figure 15 shows the most popular uses of climbing plants in Cracow. The first three ranks are: public areas and buildings with 35.7 per cent, green along the streets with 16.1 per cent and restaurants and cafes (12.5 per cent).

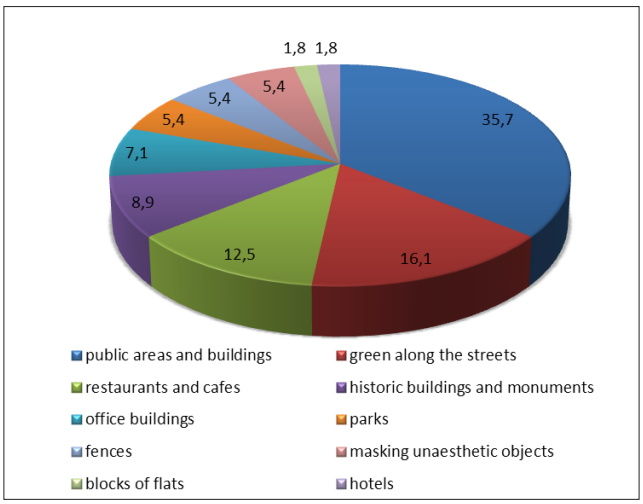

Fig. 15. *Most popular uses of climbing plants in Cracow*

It is worth noting that considerable many owners of the restaurants realize that climbing plants could be very beautiful in interiors and they can create a good atmosphere which causes the increasing numbers of clients. There are many examples of good practices especially in Kazimierz, an old Jewish district. This place after revitalisation becomes one of the most popular areas in Cracow. Climbing plants are used in many restaurants and cafes on Szeroka, Józefa and Jakuba Steet which is shown in Figure 16.

Fig. 16. *Climbing plants in restaurants and cafes interiors in Kazimierz district (Reopium Club, Ariel and Vinci Restaurant)*

Fig. 17 shows us that Cracow inhabitants would like to see climbing plants especially on waste containers, historical buildings and monuments. Surprising fact is that they do not think that this kind of green is needed in public areas and buildings. One of the explanations could be that they do not have knowledge about benefits of using climbing plants in urban circumstances.

Fig. 18 shows us that people in Cracow strongly believe that climbing plants enrich visual quality of the city (above 80 per cent). Many inhabitants also maintain that these plants improve standard of living (63 per cent) and air quality (54 per cent).

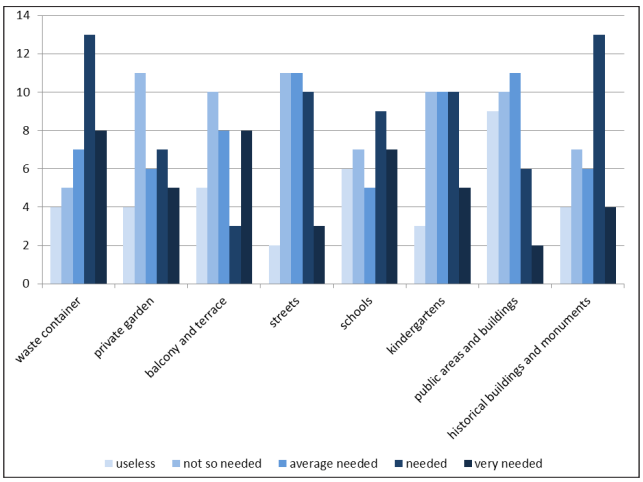

Fig. 17. *How climbing plants are important for people in Cracow*

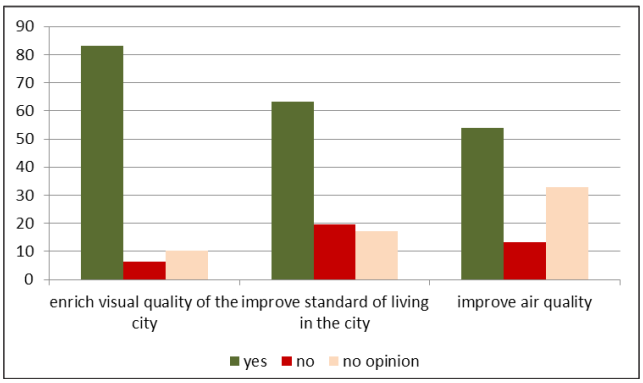

Fig. 18. *Opinion of Cracow inhabitants about climbing plants*

Climbing plants accompany historical monuments in Cracow, which results in emphasizing their old character. A good example could be composition on Wawel Castle shown in Figure 19. It should be noted that Jacek Borowski said that Wawel Castle in Poland is probably the best and most diverse in terms of applications and the number of species example of climbing plants implementation. It also contributes to historic buildings. The architecture is monumental and gives the chance to introduce plants growing strongly. This case shows that using climbing plants on historic buildings is a reasonable idea and the biggest advantage is creating unique and magic atmosphere. Another thing is that plants on Wawel Castle are under special care of gardeners. They are irrigated and cropped when needed.

Fig. 19. *Climbing plants covering Wawel Castle*

Cracow gives some more inspirations for public spaces. The most innovative ones are Wyspiański Pavilion (Pawilon Wyspiańskiego, Figure 20.) and Małopolska Garden of Arts (Małopolski Ogród Sztuki – MOS, Figure 21.). Wyspiański Pavilion is a modern conference and exhibition centre. There are three stained-glass windows in the façade which are based on previously unrealized designs by Stanisław Wyspiański (famous Polish playwright, painter and poet). The façade consists of rows of moving brick elements mounted on metal rods, which allow the lighting of the interior to be changed. There is also a special metal construction for climbing plants. They climb using steel ropes. This is an example of designing climbing plants as an integral part of the building which refer to the architecture ideas of Teodor Talowski, famous Polish architect.

Fig. 20. *Wyspiański Pavilion, Cracow*

Małopolska Garden of Arts is a regional cultural center, administratively and organizationally linked to the Juliusz Słowacki Theatre in Cracow. MOS activity is based on the idea of synthesis of various art domains in a single space. There are located newly planted climbing plants on the wall which surrounds the building. This idea shows that designers and architects provide a special place for this kind of plants in their projects. The largest advantage of using climbing plants in this case is creation of green wall which perfectly fits to the conception and rareness of this place. This initiative should be recommended and implemented in other public areas not only in Cracow, but also in other places.

Fig. 21. *Małopolska Garden of Arts, Cracow*

5. Discussion

This part will consist of comparison of both cases – Cracow and Dresden, showing also the directions of benefits of using climbing plants in the cities. Both Cracow and Dresden have many similarities in the field of the ecological, aesthetic and psychological aspects of using them in urban green spaces. On the other hand, there are also some important differences which should be noted.

Firstly, the most popular places for climbing plants are public areas and buildings, greenery along the streets and new locations. One of the best practices in Cracow is locating plants in restaurants interiors and designing multispecies compositions. Climbers create urban interior in Dresden and also cover historical buildings. Secondly, the biggest problem in Cracow is the lack of care (irrigating, cropping etc.) and inappropriate selection of newly planted climbers. In Dresden this issue is better – climbing plants are under strict control of professional gardeners, however, there are notable negligence in the care (mainly lack of appropriate cropping). Thirdly, climbing plants play an important role in urban spaces in both cities. They mask unaesthetic facades, waste containers and other ugly places. Our research showed that they are increasingly used as an integral part of the buildings. Architects are more often convinced of the ecological, aesthetic and psychological benefits from climbing plants.

Moving to the social aspects of climbing plants, it should be emphasized that knowledge about advantages of using climbing plants is wider among Dresden inhabitants. They support the idea of planting them in urban spaces. On the contrary, many people in Cracow believe that climbing plants have a negative impact on buildings' facades (like insects and too much humidity). Inhabitants of both cities agree that climbers improve quality of living standards in the city and that they are positive element in urban compositions. It is essential to plan as many green, vertical surfaces as it is possible.

6. Conclusions

Cities as a whole profit from numerous applications of climbing plants in their structure and new green city image. Aesthetical point of view is as important as an ecological one.

The conducted research gives a new look on climbing plants as an inseparable tool in designing green. It shows their importance in the city, especially they are completing views and panoramas. This kind of usage have to be continued, especially such an innovation methods like in Neustadt in Dresden.

They are also perfect instrument to create public spaces. It's important to develop the tradition of arranging the surroundings of restaurants. They should be used in other locations as bus stops or other places where people spend a lot of time too.

There are some solutions, which can improve the quality of living in the city like vertical surfaces. They are an answer for the lack of soil and poor air quality which is a big problem. Owning new bioactive places is also really important because of the ability to reduce heating effect and abilities to absorbe water. Due to their positive ecological impact on environment, climbing plants influence psychological and physical condition of people. The choosing interesting arts like in Cracow and mixing climbing plants with another types like in Dresden are the best way to get all these advantages and the best visual effect also.

This work proves that using climbing plants affects distinctly the quality of living in the city. It's not only the researchers finding but also the inhabitants' opinion. It's really important to make them participate in designing green spaces and understanding the importance of this process.

Ecological, aesthetic and psychological benefits from using climbing plants in urban green spaces are priceless and in the same time the costs of their application are really low. It is worth to use climbing plants in green city structures. Designers should constantly improve technical aspects of using these plants, but not forgetting about the already proved methods. The important findings are not only technical methods of supporting climbing plants but also their possible locations. Especially that climbing plants can be really locate in almost all places in the city.

This research shows how many good working solutions are already founded. The case of Dresden shows that climbing parts as an inseparable part of green design in the city are giving long-term advantages for its. Both Cracow and Dresden let us and governments be inspired and use even more climbing plants in the city structures. The best way to do this is to start at the beginning, like in Małopolska Garden of Arts in Cracow, where climbing plants almost accompany the construction of the building.

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Received 2013 05 21
Accepted after revision 2013 08 05

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