

DOROTA WINNICKA-JASŁOWSKA

ORCID: 0000-0003-4201-2985

Silesian University of Technology, Poland

ROOFTOP GARDENS, THEIR ARCHITECTURAL FEATURES AND ROLE THEY PLAY IN LONDON'S URBAN ENVIRONMENT. CASE STUDIES BASED ON OWN RESEARCH

OGRODY DACHOWE, ICH CECHY ARCHITEKTONICZNE ORAZ ROLA W ŚRODOWISKU ZURBANIZOWANYM LONDYNU. STUDIUM PRZYPADKÓW NA PODSTAWIE BADAŃ WŁASNYCH

Abstract

Rooftop garden is an attractive public space located on top of public utility buildings, such as office towers or shopping malls and other large-scale facilities. Green roofs considerably improve environmental conditions in urbanised landscape, increase the attractiveness of building objects and constitute an interesting alternative to traditional recreational spaces. This article provides characteristics of selected rooftop gardens based on the conducted research. It also determines the main architectural features of public space rooftop gardens. The investigations concerned: the way of use, site attractiveness, maintenance and popularity level of each case study. The results allowed to define general assumptions that should be taken into consideration at the designing stage of such objects.

Keywords: architecture, rooftop garden, green roof, public space, public utility buildings

Streszczenie

Ogród dachowy to atrakcyjna przestrzeń publiczna zlokalizowana na budynkach użyteczności publicznej, takich jak biurowce, galerie handlowe i inne obiekty wielkopowierzchniowe. Zielone dachy w istotny sposób poprawiają warunki środowiska przyrodniczego w mieście, podnoszą atrakcyjność obiektów, stanowią również ciekawą alternatywę dla tradycyjnych przestrzeni rekreacyjnych. W artykule scharakteryzowano wybrane ogrody dachowe na podstawie przeprowadzonych badań i określono ich główne cechy architektoniczne. Badania dotyczyły: sposobu użytkowania, atrakcyjności miejsca, utrzymania i poziomu popularności każdego z badanych przypadków. Wyniki pozwoliły na określenie ogólnych założeń, które powinny być brane pod uwagę przy projektowaniu tego typu obiektów.

Słowa kluczowe: architektura, ogród dachowy, zielony dach, przestrzeń publiczna, budynki użyteczności publicznej

1. INTRODUCTION

This article focuses on rooftop gardens as a widely accessible space located on the rooftops of public buildings. Rooftop garden is a type of space which takes up a considerable surface on the rooftops of buildings, such as office towers, hotels, shopping malls, and serves the purpose of public space available to everyone. This public space is becoming increasingly popular and generating interest among visitors, as shown by the authors' research¹. Contemporary rooftop gardens are mostly very attractive and innovative, and offer beautiful views of the city skyline. The paper discusses solutions to the rooftop spaces which have a substantial usable surface and constitute development of the roof zone of architectural objects having considerable cubature and rooftop surface. Green roofs and rooftop gardens tremendously improve natural environment conditions in the highly urbanized environment of cities, increase attractiveness of a particular architectural object, district, even city; and constitute an interesting alternative to traditional recreational spaces².

This work aims to present research conducted by the author of this publication in three popular rooftop gardens in London, between 2019–2020³. The above-mentioned investigations involved the assessment of the quality of rooftop garden space from the user's perspective, paying special attention to its functionality, attractiveness, popularity and a defined user profile. These studies are quite exceptional as no research has been conducted so far on this type of urban space from the angle of its use, purpose and architectural attractiveness. The subject literature dedicated to rooftop gardens or green roofs focuses, first of all, on ecological aspects⁴. The analysis of the present state of investigations in this scope revealed publications dedicated to technological aspects⁵, economic conditions⁶ and specific conditions enabling the planting of greenery on rooftops⁷.

Green roofs have been known since antiquity – for instance, the Hanging Gardens of Babylon. The 19th and 20th centuries witnessed solutions mainly in the form of small private gardens on roofs. Similar solutions became known in France, Italy and Spain. Particularly, in the highly urbanized and densely populated space of cities, such gardens formed a green oasis and a substitute for a private garden. In the 19th and 20th centuries, green roofs were planted in major American cities. Municipal green areas, whose plots of land were very expensive, were replaced with roof greenery⁸.

¹ Research conducted by: Dorota Winnicka-Jasłowska, Assoc. Prof., PhD, DSc, Eng., Arch., Silesian University of Technology and Sabrina Tkaczuk, MSc, Eng., Arch., Sheppard Robson, London.

² G. Yafeng et al., *Thermal performance and energy savings of white and sedum-tray garden roof: A case study in a Chongqing office building*, "Energy and Buildings" 2017, vol. 156, pp. 343–359.

³ D. Winnicka-Jasłowska, S. Tkaczuk, *Architecture of rooftop gardens, as a new dimension of public space in London. Case studies in qualitative research*, "Architecture Civil Engineering Environment" 2022, vol. 15, no. 2, pp. 45–56.

⁴ N.H. Wong et al., *The effects of rooftop garden on energy consumption of a commercial building in Singapore*, "Energy and Buildings" 2003, vol. 35, no. 4, pp. 353–364.

⁵ M. Shafique, K. Reeho, M. Rafiq, *Green roof benefits, opportunities and challenges – a review*, "Renewable and Sustainable Energy Reviews" 2018, vol. 90, pp. 757–773.

⁶ K. Euna et al., *Economic and environmental sustainability and public perceptions of rooftop farm versus extensive garden*, "Building and Environment" 2018, vol. 146, pp. 206–215.

⁷ M. Anwar, M.G. Rasul, M.M.K. Khan, *Performance analysis of rooftop greenery systems in Australian subtropical climate*, "Energy Reports" 2020, vol. 6, suppl. 1, pp. 50–56.

⁸ T. Liberalesso et al., *Green infrastructure and public policies: An international review of green roofs and green walls incentives*, "Land Use Policy" 2020, vol. 96, art. no. 104693.

Late 20th century and early 21st century witnessed larger and larger surfaces being taken by public buildings. Such architectural objects, especially shopping malls, office towers or hotels, developed their roof spaces as an alternative to recreational areas.

In the 21st century, architects concentrate their efforts on ecological aspects. Numerous publications on rooftop gardens raise the issues of ecology and ecosystem which are created by green roofs⁹. Many studies focus on technological and engineering solutions, the effective application of green roofs in harvesting of renewable energy for the city and its inhabitants, as well as technical solutions contributing to lowering the temperature in cities. Green roofs, as green spaces, also play a key role in the improvement of the urban environment by enriching biodiversity and purifying the air¹⁰.

2. SUBJECT, PURPOSE AND SCOPE OF THE RESEARCH

This article discusses the research on a relatively new phenomenon of situating public space on the rooftops of public buildings of large cubature. It is illustrated with examples of rooftop gardens located in London: Sky Garden¹¹, The Garden at 120¹² and Crossrail Place Roof Garden¹³. In these three cases, green roofs of the buildings have become London's public space. The main purpose of the investigations was the analysis of attractiveness, accessibility and functionality of such sites from the perspective of the user, for instance a city dweller or a tourist. We asked questions about the reasons for visiting rooftop gardens and functional conditions they should meet in order to enhance the number of visitors. We took a closer look at functional solutions, namely what kind of functions and qualities public roof gardens feature. The presented results of the survey show the factual aim of these objects and reveal whether they serve the purpose of recreational space, a site for social meetings, or rather a tourist attraction of the city of London – as it is in the case of two gardens situated on the skyscraper rooftops (Sky Garden, The Garden at 120) which provide the visitors with a magnificent view of the city panorama.

2.1. URBAN GREENERY AND RECREATIONAL AREAS – THEIR TYPES AND SIGNIFICANCE

Progressing growth of urban agglomerations, increasing urbanization and urban sprawl contribute to the deficit of vegetation in the cities. The side effect of sudden and sometimes uncontrolled changes is a decrease in green areas in the city centres and on their outskirts¹⁴. The dwellers of massive metropolises miss greenery in the cities. Almost everywhere in the world there is a shortage of vegetation in the public space serving the purpose of recreation and leisure.

⁹ J. Langemeyer et al., *Creating urban green infrastructure where it is needed – A Spatial ecosystem service-based decision analysis of green roofs in Barcelona*, "Science of the Total Environment" 2020, vol. 707, art. no. 135487.

¹⁰ S. Sattler, I. Zluwa, D. Osterreicher, *The "PV Rooftop Garden": Providing Recreational Green Roofs and Renewable Energy as a Multifunctional System within One Surface Area*, "Applied Sciences" 2020, vol. 10, no. 5, art. no. 1791.

¹¹ Sky Garden – 20 Fenchurch St., City of London.

¹² The Garden at 120 – 120 Fenchurch St., City of London

¹³ Crossrail Place Roof Garden – Canary Wharf, London

¹⁴ J. Langemeyer et al., *op. cit.*

Urban green spaces are vital parts of any city due to their capacity to provide a large number of urban services to a wide range of stakeholders. However, since urban green spaces can consume large areas of the city, where land is both scarce and expensive, planners and managers are usually faced with conflicting challenges. They must endeavour to provide the tremendous amount of urban services, which are expected by the stakeholder, while simultaneously, attempting the careful design of urban green spaces in a limited area¹⁵.

Urban green spaces constitute an integral part of the city plan, serve as places for leisure and relaxation encouraging city inhabitants to spend their free time in the open air. City creates a specific spatial system, in which living conditions of humans result both from their way of life and the formation of urban space. Urban green spaces are an inherent element of the city; they create public space, meeting points and places for building social relations. Urban green areas are classified as a vital element of the system of public spaces within the city. Parks and green spaces are equally important as squares and streets. They play a strategic role of providing the city with widely accessible areas for recreation and other activities pursued by the city dwellers¹⁶. Moreover, green areas are becoming fragments of the urban composition – they influence the structure, atmosphere and character of squares, yards and streets. Urban greenery located in the municipal tissue contains, first of all, biologically active areas, such as parks, city gardens, promenades or lawns. They have a great impact on both physical and mental human condition as they are a place of active leisure and psychological regeneration of inhabitants. The upkeep of the sufficient surface of green areas and providing equal access to all of them is a common challenge for urban planning in densely populated developing cities¹⁷.

2.2. DEVELOPMENT OF URBAN GREEN AREAS TOWARDS ROOFTOP GARDENS IN LONDON

London is a city which has been developing quickly and dynamically over centuries and has grown to become one of the largest urban agglomerations in the world. This city has preserved its identity, rich history, and culture, combining them with simultaneous rapid development into a contemporary smart city¹⁸. Apart from its historical roots and values, London is one of the most modern, cutting-edge cities of the 21st century. The constantly growing urban tissue combines ‘old’ – historic and cultural values with ‘new’ – most modern architecture including cutting-edge technology. The cityscape is changing – the present-day London has massive skyscrapers which compete with the silhouettes of historic and well-known buildings. The tall objects have changed the image of London and their newly arranged, widely accessible rooftop gardens constitute an innovative solution to the shortage of green areas. The search for new attractive green and recreational areas has been lifted to a higher level.

¹⁵ A. Belmeziti, F. Cherqui, B. Kaufmann, *Improving the multi-functionality of urban green spaces: Relations between components of green spaces and urban services*, “Sustainable Cities and Society” 2018, vol. 43, p. 1.

¹⁶ I. Simović et al., *Underlying mechanisms of urban green areas’ influence on residents’ health – A case study from Belgrade, Serbia*, “Forest” 2023, vol. 14, no. 4(40), art. no. 765.

¹⁷ D. Kolokotsa et al., *On the impact of nature-based solutions on citizens’ health & wellbeing*, “Energy and Buildings” 2020, vol. 229, art. no. 110527.

¹⁸ Smart London [in:] London City Hall, <https://www.london.gov.uk/programmes-strategies/business-and-economy/supporting-londons-sectors/smart-london> (access: 10.05.2023).

The demography and the scale of tourism in London have resulted in scouting around for new appealing urban spaces to visit and spend time in.

In today's highly urbanized London, innovative green spaces have emerged in the form of accessible rooftop gardens that sit high above street level, crowning the roofs of skyscrapers.

3. MATERIALS AND INVESTIGATION METHODS

The investigations focused on two selected objects situated in the City of London, on Fenchurch Street, namely: Sky Garden and The Garden at 120. The third object, Crossrail Place Roof Garden, is located on the roof of a shopping mall in Canary Wharf, London.

Sky Garden – crowns the office tower popularly called Walkie-Talkie Building, which thanks to attractive solutions of the rooftop has gained great popularity. The view from the top floor of the skyscraper provides visitors with a panorama of the whole city. It counts as the second-best viewpoint, right after the Shard of London. The space of Sky Garden has the form of a three-storey-high conservatory housing a bar, circulation space for walking around and a view terrace. Thanks to the creation of a proper microclimate, there are exotic plants growing in this space. They can be closely observed from the surrounding walking path (Ill. 1, 2).



Ill. 1. Sky Garden, London – general view of the interior space (left). Picture: D. Winnicka-Jasłowska.
Ill. 2. Sky Garden, London – view of exotic plants in garden interior space (right). Picture: D. Winnicka-Jasłowska.



Ill. 3. Garden at 120, London – general view of the garden rooftop space (left). Picture D. Winnicka-Jasłowska.
Ill. 4. Garden at 120, London – general view of the garden rooftop space (right). Picture D. Winnicka-Jasłowska.

Garden at 120 – is located on top of the office tower called Fen Court. The garden was opened in 2019 and is impressive as far as its size and views are concerned. This space features alleys and benches surrounded by plant and flower beds. Another factor contributing to its attractiveness is that this place offers a view of the City and the opportunity to admire its most modern architecture. (Ill. 3, 4)

Crossrail Place Roof Garden – located in Canary Wharf, London is a partly covered roof of a street food market. This site resembles a park with alleys, benches and plants characteristic of the ‘east’ and ‘west’. It is a kind of conservatory housing exotic greenery, divided into two hemispheres of the globe: the east one with the greenery typical of Australia and Asia, as well as the west one dominated by the greenery of both Americas. This rooftop garden is a 300-metre-long space, which makes it possible to go for a walk following its internal alleys. These alleys create an educational path with boards providing information on the vegetation growing in the garden (Ill. 5, 6).



Ill. 5. Crossrail Place Roof Garden, London – view of the garden rooftop space with path and exotic plants (left). Picture: D. Winnicka-Jasłowska.

Ill. 6. Crossrail Place Roof Garden, London – view of the garden rooftop space with path and exotic plants (right). Picture: D. Winnicka-Jasłowska.

3.1. DESCRIPTION OF THE SURVEY AND RESULTS

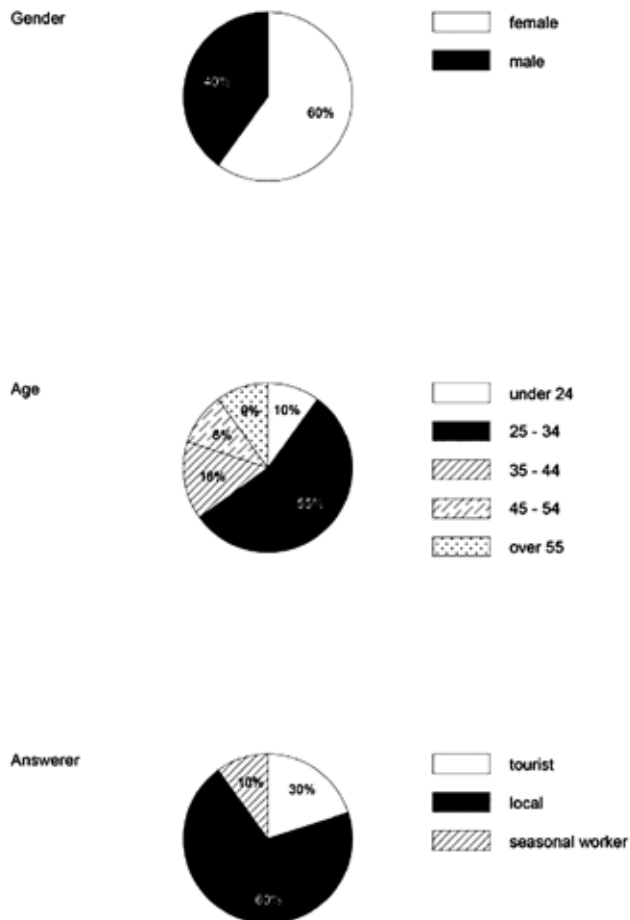
The applied investigation method involved the Post-Occupancy Evaluation (POE¹⁹) at level 1 – indicative – in the scope of a walkthrough evaluation, observation investigations and a survey using a questionnaire elaborated specially for this purpose. The investigations aimed to evaluate the attractiveness, popularity and functions of the rooftop gardens subjected to the research. The studies involved also determining the user profile, i.e. defining the most frequent visitors to rooftop gardens and what their goals are. The questionnaire contained a total number of 11 questions, including basic and detailed questions (questions 2–8) which referred to particular locations of analysed gardens. This section included the following queries: what are the main reasons for using the above-mentioned rooftop garden spaces and which of their qualities are most appreciated by respondents. The third part contained general questions (questions 9–11), the purpose of which was to recognise the role played

¹⁹ W.F.E. Preiser, E. White, H. Rabinowitz, *Post-Occupancy Evaluation*, Routledge, Abingdon, Oxon 2015.

by rooftop gardens according to respondents and who are people visiting such spaces. The questionnaire included questions with multiple answers to choose from as well as open-ended questions (questions 9–10).

Question 1. Please select basic metric data.

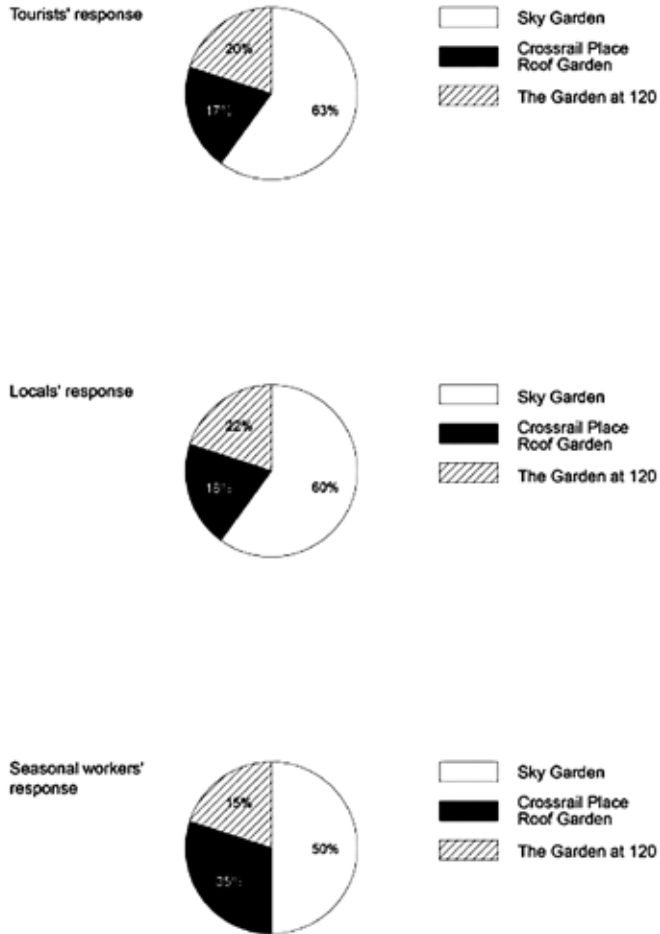
A total number of 63 respondents took part in the survey. The respondents were selected at random. The study groups included: permanent residents of London (22 individuals), temporary residents who came to the city mainly for work purposes (6 individuals) and tourists who visited the city recently (35 individuals). The study involved the participation of 38 women and 25 men. The majority of subjects was in the 25 to 54 age bracket. A precise picture of basic metric data is presented in Ill. 7.



Ill. 7. Internet survey – basic metric data (elab. by S. Tkaczuk in: D. Winnicka-Jasłowska, S. Tkaczuk, *Architecture of rooftop..., op. cit.*)

Question 2. Which location does the following question apply to?

The site which was most often selected by respondents in all respondent groups was Sky Garden – nearly 60% of respondents chose this particular location. The ratio of votes for Crossrail Place Roof Garden and The Garden at 120 was proportional (Ill. 8).



Ill. 8. Internet survey – selection of an object by respondents (elab. by S. Tkaczuk in: D. Winnicka-Jasłowska, S. Tkaczuk, *Architecture of rooftop...*, *op. cit.*)

Question 3. What was the reason for your visit to the location chosen in the previous question?

The majority of respondents indicated the view of the London panorama as the main reason for visiting Sky Garden (70%) and The Garden at 120 (55%). Almost all respondents (90%) revealed that the most valued quality of Crossrail Place Roof Garden was the possibility to rest and relax. 70% of respondents visited Crossrail Place Roof Garden for its interesting architecture.

Question 4. What do you value most about this location?

Visitors to Sky Garden valued most the opportunity to admire the London's panorama (80%). The same quality was indicated in the case of The Garden at 120 (90%). However, according to respondents, the most valuable quality of Crossrail Place Roof Garden turned out to be the presence of diverse flora (90%). Equally high (80%) did the respondents evaluate the high aesthetics of the space and atmosphere in the garden.

Question 5. On a scale of 1 to 10, how good is the city view?

Respondents rated the highest the view from Sky Garden and that from The Garden at 120. The subjects evaluated the above-mentioned views as high as 9, which resulted from the possibility of seeing a 360-degree panorama of the city centre.

Question 6. Please choose which of the aesthetic qualities impressed you the most?

What impressed respondents most in the Crossrail Place Roof Garden was the vegetation and its variety (100%). The same factor caused the lowest result among respondents evaluating The Garden at 120 (15%). As far as Sky Garden is concerned, its flora impressed 60% of respondents. The Garden at 120 was appreciated most as a staying-in and walking space (85%).

Question 7. On a scale of 1 to 10, rate the ease of access to the rooftop garden.

The ease of access to all gardens was assessed very highly by respondents. This fact is undoubtedly influenced by the very good public transport in London, which allows hassle-free travel from one end of the city to the other. In addition, the information provided on the websites about opening hours and entry rules makes it possible to access the gardens without any problems. A great asset of the above-discussed rooftop gardens is their accessibility and availability for people with disabilities.

Question 8. Is there anything you would like to add to this rooftop garden to make it better?

65% of Sky Garden users said that this space did not lack anything, whereas 20% responded that they had no opinion. 83% of users of Crossrail Place Roof Garden stated that this space did not lack anything, whereas 8.5% responded that they had no opinion. The remaining 8.5% of respondents said that they missed tables where they could use their laptops and work amongst lush tropical vegetation. 47% of users of The Garden at 120 claimed that this space did not lack anything, while 23% answered that they had no opinion. The remaining 30% stated that they missed some eating places.

Question 9. In your opinion, are this type of public spaces aimed at tourists, locals or both?

4% of respondents thought that public rooftop gardens were aimed only at London's residents due to the fact that the gardens were located in the vicinity of their places of residence and that created the possibility of making frequent visits to such gardens. Other respondents (4%) claimed that the studied sites were more aimed at tourists. This opinion was justified by the fact that there was a free entry for visitors and the possibility of admiring the city panorama, which was more attractive to people living outside London. The substantial majority of questioned people (92%) stated that public space in the form of rooftop gardens was aimed both at London dwellers and tourists.

Question 10. In your opinion, are rooftop gardens a tourist attraction?

All respondents unanimously said that rooftop gardens as a public space were a tourist attraction. The most common argument provided by respondents was that rooftop garden as a public space was a tourist attraction due to its multifunctionality (50%) – being a site which enables contact with nature in the heart of a bustling city; that attracts, surprises but also provides peace and quiet as well as an opportunity to relax while visiting the city; and creates spaces to be freely used. In addition, the arguments provided by 47% of respondents showed that the investigated spaces created unique viewpoints of the city. They are visually attractive places and showpieces of the city which attract tourists, moreover, enable taking photos. 30% of the obtained responses revealed that public rooftop gardens were a tourist attraction due to their innovative space – space understood as architectural innovation, interesting and unique in terms of unorthodox roof garden solutions. A considerable minority of

arguments (17%) showed that rooftop gardens were a tourist attraction only because of the site's accessibility to everyone and a free-of-charge entry.

Question 11. Choose up to three correct answers from the options below to complete this sentence: Rooftop gardens...

A vast majority of respondents (76%) revealed that rooftop gardens were an ideal place for rest, recreation and meetings with others. Half of the respondents (52%) thought that public rooftop gardens influence the attractiveness of the city among tourists, increase the attractiveness of the place and district and positively influence human wellbeing. One respondent defined the rooftop garden as 'an attractive place in terms of entertainment and human public activity'. Another surveyed person reckoned that the rooftop garden is 'a good alternative for people who want to spend some time in the open air, but not necessarily at the level of a busy street'. What is more, according to another respondent, rooftop gardens 'increased the attractiveness of the office tower on top of which they were located and made that object distinctive and popular'.

3.2. OBSERVATION-BASED RESEARCH AND RESULTS

Observation-based research was conducted twice in the above-mentioned rooftop gardens, namely in January and September. The selected time represents the coldest month of the whole year, when at the moment of observation the temperature oscillated between 8–10°C, and the warmest month, when on the day of observation the temperature oscillated between 26–27°C. Within the adopted four criteria, the studied sites were assessed twice – in January and September, on a scale from 1 to 5, where 1 meant: unsatisfactory accessibility, low attractiveness, poor maintenance, low popularity; whereas 5 signified: satisfactory accessibility, very high attractiveness, very good maintenance, very high popularity (Tab. 1).

Table 1. Investigation criteria applied to observations and their assessment in January and September in selected rooftop gardens (elab. by D. Winnicka-Jasłowska).

Rooftop Garden	Accessibility January	Accessibility September	Attractiveness January	Attractiveness September	Maintenance January	Maintenance September	Popularity January	Popularity September
Sky Garden	4	2	5	5	5	5	5	5
The Garden at 120	5	4	2	5	5	5	2	4
Crossrail Place Roof Garden	5	5	4	5	5	5	3	4

Sky Garden – obtained the highest evaluation in three criteria irrespective of the season and temperature because the garden is roofed. However, its accessibility is limited due to the fact that visitors must log into the system that manages availability times before actually visiting the site. In the summer, when tourist traffic increases, accessibility drops due to the garden's high popularity with the visitors.

The Garden at 120 – the garden is not roofed, and as a result, its attractiveness in winter is lower than in summer. During the winter, the garden vegetation goes dormant and the

ambient temperature is too low to fully use and appreciate the garden. Its popularity has been on the increase since it was opened in 2019.

Crossrail Place Roof Garden – is roofed, however, some zones are partially open. Therefore, its attractiveness is lower in winter, when the temperature drops, than in summer, when it is warm. The garden is much more popular with the local residents and people working in Canary Wharf. A particularly large number of people visit it during lunchtime. The rooftop garden attracts people with its flora and the microclimate of a greenhouse.

In the Crossrail Place Roof Garden, there is a beautiful array of flora, which emphasises the character and harbour history of the site. The plants growing there were imported from destinations where ships from Canary Wharf once sailed. In addition, visitors can admire an interesting architecture of the garden's roof. Sky Garden is visited by numerous people due to its popularity and the opportunity to see the whole panorama of London, however, the presence of such a large number of people does not create an ideal place for relaxation. The Garden at 120 is a new rooftop garden and because of that it is not as well known as Sky Garden. However, its popularity is growing and its appearance improving thanks to the controlled growth of vegetation.

4. SUMMARY OF THE RESEARCH AND CONCLUSIONS

The survey and observation-based investigations carried out in three selected locations in London revealed that the most valued qualities of such spaces included: the possibility of recreation and the opportunity to admire the city panorama as well as carefully-selected and well-maintained greenery. The above-mentioned places are considered attractive due to their design solutions, location on rooftops and the views they offer. Another important aspect is accessibility and control of visitors traffic, as it is done in Sky Garden by means of a special system. The entry to all three locations is free of charge, which is a big advantage. This contributes to the fact that they are not only a tourist attraction but also a meeting spot for residents and employees of the office districts of the City of London and Canary Wharf.

The conducted survey and observations resulted in additional conclusions, which can be formulated as follows:

- A factor contributing to the attractiveness of rooftop gardens is the architectural space which has high aesthetic features and, at the same time, offers a view of the attractive space of the city (a view which could not be seen to such an extent from the pavement level).
- Preferred additional functions connected with greenery and vegetation zones on rooftops: cosy spots to sit down, cafés, restaurants and easily accessible toilets – such functions contribute to the fact that visitors to rooftop gardens want to stay longer in such places.
- Accessibility – both easy logging into the system to book a particular time slot and free access for any visitor at any time are vital qualities that increase the popularity of such spaces. In addition, easy accessibility to all people, including those with disabilities, makes it possible for everybody to visit such places.
- Rooftop gardens should be fully or partially covered with a roof due to changing weather conditions and seasons. The roof provides cover for the visitors but also creates a microclimate for plants – it protects against wind, keeps a certain level of humidity

and ensures the right temperature. The large roof structure over such objects constitutes a high architectural value, which is appreciated by visitors.

References

- [1] Anwar M., Rasul M.G., Khan M.M.K., *Performance analysis of rooftop greenery systems in Australian subtropical climate*, “Energy Reports” 2020, vol. 6, suppl. 1, pp. 50–56.
- [2] Belmeziti A., Cherqui F., Kaufmann B., *Improving the multi-functionality of urban green spaces: Relations between components of green spaces and urban services*, “Sustainable Cities and Society” 2018, vol. 43, pp. 1–10.
- [3] Euna K. et al., *Economic and environmental sustainability and public perceptions of rooftop farm versus extensive garden*, “Building and Environment” 2018, vol. 146, pp. 206–215.
- [4] Kolokotsa D. et al., *On the impact of nature-based solutions on citizens’ health & well being*, “Energy and Buildings” 2020, vol. 229, art. no. 110527.
- [5] Langemeyer J. et al., *Creating urban green infrastructure where it is needed – A spatial ecosystem service-based decision analysis of green roofs in Barcelona*, “Science of the Total Environment” 2020, vol. 707, art. no. 135487.
- [6] Liberalesso T. et al., *Green infrastructure and public policies: An international review of green roofs and green walls incentives*, “Land Use Policy” 2020, vol. 96, art. no. 104693.
- [7] Preiser W.F.E., White E., Rabinowitz H., *Post-Occupancy Evaluation*, Routledge, Abingdon, Oxon 2015.
- [8] Sattler S., Zluwa I., Osterreicher D., *The “PV Rooftop Garden”: Providing Recreational Green Roofs and Renewable Energy as a Multifunctional System within One Surface Area*, “Applied Science” 2020, vol. 10, no. 5, art. no. 1791.
- [9] Shafique M., Reeho K., Rafiq M., *Green roof benefits, opportunities and challenges – a review*, “Renewable and Sustainable Energy Reviews” 2018, vol. 90, pp. 757–773.
- [10] Simović I. et al., *Underlying mechanisms of urban green areas’ influence on residents’ health – A case study from Belgrade, Serbia*, “Forest” 2023, vol. 14, no. 4(40), art. no. 765.
- [11] Smart London [in:] London City Hall, <https://www.london.gov.uk/programmes-strategies/business-and-economy/supporting-londons-sectors/smart-london> (access: 10.05.2023).
- [12] Winnicka-Jasłowska D., Tkaczuk S., *Architecture of rooftop gardens, as a new dimension of public space in London. Case studies in qualitative research*, “Architecture Civil Engineering Environment” 2022, vol. 15, no. 2, pp. 45–56.
- [13] Wong N.H. et al., *The effects of rooftop garden on energy consumption of a commercial building in Singapore*, “Energy and Buildings” 2003, vol. 35, no. 4, p. 353–364.
- [14] Yafeng G. et al., *Thermal performance and energy savings of white and sedum-tray garden roof: A case study in a Chongqing office building*, “Energy and Buildings” 2017, vol. 156, pp. 343–359.

Author’s Note

Assoc. Prof. Dorota Winnicka-Jasłowska PhD, DSc, Arch.

Faculty of Architecture, Department of Design and Qualitative Research in Architecture, Silesian University of Technology. In her scientific works she focuses on qualitative analysis in architecture, issues of designing campus and university building spaces, design assumptions for “green” buildings.

dorota.winnicka-jaslowska@polsl.pl