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# ARCHITECTURE OF ROOFTOP GARDENS, AS A NEW DIMENSION OF PUBLIC SPACE IN LONDON. CASE STUDIES IN QUALITATIVE RESEARCH

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#### Abstract

This paper 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 relatively new public utility space arouses visitors' interest, which is shown in the Authors' research. This paper presents a qualitative research and results of the research conducted in three rooftop gardens in London. The investigations were concerned with: way of use, site attractiveness, maintenance and popularity level of each site in relation to the others. For this purpose, surveys were carried out among people who had visited at least one of the three study sites. Two non-participant observational surveys were also carried out during the warm and cold months. Conclusions were formulated as a result of the research described in this paper. During the research a profile of users visiting such public spaces as roof gardens was established. The characteristic architectural features of the roof gardens were also determined, so that their space could be considered accessible to all, attractive and willingly visited.

Keywords: Architecture; Landscape design; Garden rooftops; Public space; Qualitative research.

#### **1. INTRODUCTION**

The subject of this paper is a rooftop garden as a type of public space situated on public utility buildings, such as office towers, hotels or shopping malls. 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. Rooftop gardens are spaces which usually arouse high interest among visitors. The popularity of such places is on the increase due to the fact that this is an attractive, innovative space providing visitors with a superb view [1]. 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 spaces [2, 3, 4, 5].

The subject literature dedicated to rooftop gardens or green roofs focuses, first of all, on ecological aspects [6] and ecosystem which are created by green roofs [7]. The analysis of the present state of investigations in this scope revealed publications dedicated to technological aspects [8], economic conditions [9] and specific conditions enabling the planting of greenery on rooftops [10]. Many studies focus on technological and engineering solutions [11], effective application of green roofs in the harvesting of renewable energy for the city and its inhabitants as well as technical solutions contributing to the lowering of temperature in cities [12]. Green roofs, as green spaces, also play a key role in the improvement of the urban environment by the enrichment with biodiversity and the purification of air [13].

Due to the fact that more and more rooftop gardens are coming into existence, it has become essential to get to know users' opinions on these objects, especially rooftop gardens in London.

This work aims to present research conducted in three popular rooftop gardens in London, between 2019–2020, by the authors of this publication. 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.

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This paper 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 Garden (Sky Garden, 20 Fenchurch St., City of London), The Garden at 120 (120 Fenchurch St., City of London) and Crossrail Place Roof Garden (Canary Wharf, London). 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. The tall objects have changed the image of London and their newly-arranged, widely-accessible rooftop gardens



Figure 1. Sky Garden, London – general view of the interior space. Photo: D. Winnicka-Jasłowska

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. 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 contemporary, highly urbanized central London, namely the City of London, where the share of the biologically active areas is rather low, there come into being innovative green spaces in the form of widely accessible rooftop gardens.

# 2. MATERIALS AND INVESTIGATION METHODS

The investigations focused on three selected objects which, in recent years, have become attractive points on London's map due to their location on rooftops.

**Sky Garden** – designed by Rafael Viñoly, located at 20 Fenchurch Street, City of London – crowns the office tower popularly called Walkie-Talkie Building, which thanks to attractive solutions of the rooftop has gained great popularity. Sky Garden is very popular due to the fact that the view from the last floor of the skyscraper provides visitors with a panorama of the whole city. 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. The garden offers fantastic views of London's panorama in all directions. It counts as the second best viewpoint, right after the Shard of London (Fig. 1).

**The Garden at 120** – designed by Latz + Partner architects, is a public space featuring a garden located on the rooftop of the office tower at 120 Fenchurch street, Langbourn, City of London. The space known as "The 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. The garden space is covered by an open trellis which supports the plants. 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 (Fig. 2).



Figure 2. Garden at 120, London – general view of the garden rooftop space. Photo: D. Winnicka-Jasłowska



Figure 3.

Crossrail Place Roof Garden, London - general view of the garden rooftop space. Photo: S.Tkaczuk

**Crossrail Place Roof Garden** – designed by Foster and Partners, located in Crossrail Pl, 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-metrelong 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. (Fig. 3) Post-Occupancy Evaluation (POE) was a method used in research [14], and included expert evaluation, non-participant observational research, and surveying. The research aimed to assess the attractiveness of the rooftop gardens, their degree of popularity among Londoners and tourists and the ease of accessibility for all users. The research also included user profiling, i.e. defining the most frequent visitors to rooftop gardens and their purposes.

The aim of the research was to find out how this type of space is evaluated by its visitors in terms of functionalspatial and aesthetic solutions. What makes such places attractive? Who is a potential user of this type of facility? What do users like most and what is the reason for visiting roof gardens? Aspects of accessibility – how should access to such high places be solved in terms of functionality and space, and what facilities should be included in the space supporting the roof garden so that it can be used by all interested parties?

The survey was conducted online using a Google form. The questionnaire contained a total of 9 questions. Observational studies were carried out in January 2019 and 2020 and in September 2019, when outdoor air temperatures were extremely different.

#### **3. RESULTS**

#### 3.1. Survey research with Internet questionaire

A total number of 63 respondents took part in the survey. The respondents were selected at random. The study groups included: permanent inhabitants of London (22 individuals), temporary inhabitants 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 Fig. 4.



Selection of basic metric data by respondents

The site which was most often selected by answerers 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 (Fig. 5).



### Question 1 – what was the reason for your visit to the location chosen in the previous question?

Respondents' answers differed depending on the site they had visited. The majority of respondents indicated that the observation of the London panorama was the main reason for their visit to 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 of resting and relaxing. Less than a half of respondents marked this reason for the other two gardens (Sky Garden - 35%, The Garden at 120 - 45%). A considerably smaller number of respondents selected the above-mentioned places as the venue for meeting friends and family. Seventy per cent (70%) of respondents visited Crossrail Place Roof Garden due to its interesting architecture, whereas this reason was not marked by the majority of respondents in the case of the other two gardens (Fig. 6).



### Question 2 – what do you value most in this garden rooftop?

Visitors to Sky Garden valued most the opportunity to admire London's panorama (80%). The same quality was indicated in the case of The Garden at 120 (90%), whereas only 10% of respondents appreciated the view seen from Crossrail Place Roof Garden. However, according to respondents, the most valuable quality of Crossrail Place Roof Garden turned out to be the presence of diversified flora (90%). Equally high (80%) the respondents evaluated high aesthetic of the space and atmosphere in the garden. A considerably smaller number of people positively assessed the flora (40%) and the atmosphere (25%) in The Garden at 120. Sixty per cent (60%) of Sky Garden users appreciated its space because of the diversity of plant species, high aesthetic of its space and the prevailing atmosphere. A substantial minority of respondents (Sky Garden -20%, Crossrail Place Roof Garden - 35%, The Garden at 120 - 30%) used these spaces as the venue for business or private meetings (Fig. 7).



### Question 2 - valued features of garden rooftops

### Question 3 – on a scale of 1 to 10, how good is the city view?

Respondents valued most 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. The view over Canary Wharf (the district of former Docklands) from Crossrail Place Roof Garden was estimated as 6 (Fig. 8).

## Question 4 – please choose which of the aesthetic qualities impressed you 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 in 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%), whereas only half of respondents noticed the same quality in Sky Garden or Crossrail Place Roof Garden. The lowest aesthetic quality, according to all respondents, turned out to be architectural design solutions. They were noticed by only 30% of respon-



Question 3 – city view from rooftop gardens. Respondents' answers on skale of 1-10

dents evaluating The Garden at 120 and by half of respondents assessing the other two gardens. (Fig. 9)



Question 4 – aesthetic qualities of garden rooftops

## Question 5 – on a scale of 1 to 10 rate the ease of access to the rooftop garden

The ease of access to all the gardens was rated very highly by respondents. This is undoubtedly due to London's very good public transport system, which allows seamless travel from one end of the city to the other. In addition, the information provided on the websites about opening hours and admission rules allows for trouble-free access to the gardens. Admission to Sky Garden requires an early log-in. This ensures that every visitor is guaranteed entry on a particular day and time. No login is required for the other two gardens. Access to the Garden at 120 can sometimes be difficult due to the large number of interested people, especially during the summer season when London is full of tourists. A great advantage of the rooftop gardens discussed above is their accessibility for people with disabilities. They have priority access. At Sky Garden, wheelchair access is possible in the main areas. In the other gardens it is unproblematic throughout the space (Fig. 10).



Question 5 – ease of access to the garden rooftops. Respondents' answers on skale of 1–10

### Question 6 – is there anything you would like to add to this garden rooftop space to make it better?

Sixty five per cent (65%) of the Sky Garden users said that this space did not lack anything, whereas 20% responded that they were of no opinion. Fifteen per cent (15%) of the respondents relayed that there was a shortage of spots to sit down and, also, that they would like to have the opportunity to observe the city line from a balcony or open terrace from each side of the garden. Eighty-three per cent (83%) of the users of Crossrail Place Roof Garden stated that this space did not lack anything, whereas 8% responded that they were of no opinion. The remaining 8% of the respondents said that they missed desks and tables where they could use their laptops and work amongst lush tropical vegetation. Forty-seven per cent (47%)of the users of The Garden at 120 claimed that this space did not lack anything, while 23% answered that they were of no opinion. The remaining 30% stated that they missed, among other things, some eating places (Fig. 11).



Figure 11.

Question 6 – Is there anything you would like to add to this garden rooftop space to make it better? Respondents' answers

### Question 7 – in your opinion, public spaces of this type are aimed at tourists or locals?

Four per cent (4%) of respondents thought that public rooftop gardens were aimed only at London's inhabitants 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. In addition, respondents stated that rooftop gardens were not so popular with tourists as with the city inhabitants. 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. A substantial majority of the questioned people (92%) stated that public space in the form of rooftop gardens was aimed both at London dwellers and tourists thanks to the opportunity to see the views, the neighbouring buildings, the whole cityscape - free of charge. Moreover, respondents thought that it was an ideal site for relaxation and getting some peace and quiet. At the same time, respondents thought that public rooftop gardens were a tourist attraction. According to one of the respondents, rooftop gardens contributed to an increase in the market value of neighbouring real estates and helped to develop business located in their vicinity (Fig. 12).



### Question 8 – in your opinion, are rooftop gardens a tourist attraction?

All respondents unanimously said that rooftop gardens as public space were a tourist attraction. To properly present the obtained answers, the authors grouped and assigned them to five categories created by the authors on the basis of the repeatability of arguments given by respondents. The most common argument provided by respondents was that rooftop garden as a public space was a tourist attraction due to its flexibility (50%) – being a site which enabled contact with nature in the heart of a bustling city; which attracted, surprised but also provided peace and quiet as well as an opportunity of relaxation while visiting the city; and created 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 beautiful holiday photos. Thirty per cent (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 accessibility to everybody and a free-of-charge entry.

Examples of the most interesting answers to Question 8: - "A big number of tourists causes an increase in visitors traffic intensity, an increase in the noise volume and reduces the possibility of peaceful leisure"; - "Atypical park in atypical place"; - "A wonderful view over the city, a silent point on the map of the crowded city"; - "It's beautifully designed with a mixed perspective of the surrounding buildings and the cityscape"; - "It isn't too common in other cities of Europe, that's why such a beautiful place, together with a café and a restaurant, attracts a considerable number of tourists from all over the world." - "A fantastic view and a pleasant location where you can simultaneously be in a big concrete jungle and yet far away from it (flora, etc.)"; - 'The rooftop vegetation is a super option in cities dominated by buildings; it is a rare place'; - "You can see beautiful tropical plants, admire the city panorama, a free-of-charge view over the city'; - "A great advantage of this place is accessibility and flexibility"; - "A good idea to spend time together in a beautiful location; surrounded by greenery which definitely makes visitors relax"; - "Vegetation diversity to admire. A viewpoint and place for taking unique photographs".

#### Question 9 – choose up to three accurate answers from the options below to finish 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 respondents (52%) thought that public rooftop gardens influenced the attractiveness of the city among tourists, increased the attractiveness of the place and district and positively influenced human wellbeing. Only 10% of respondents believed that such spaces increased the quality of the natural environment in the city. Additionally, 3% of respondents individually finished this sentence. One of respondents defined the rooftop garden as "an attractive place in terms of entertainment and human public activity". Another surveyed person reckoned that the rooftop garden was "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 characteristic and popular".

#### **3.2.** Expert evaluation using a checklist and non-participatory observational studies

Expert evaluation and non-participatory observational studies were conducted in the above-mentioned rooftop gardens, namely in January (2019, 2020) and September (2019). The selected time represents the coldest month in the whole year, when at the moment of carrying out observations the temperature oscillated between 8-10°C, and the warmest month, when on the day of performing observations the temperature oscillated between 26-27°C. The research criteria that were analysed were attractiveness, accessibility, popularity and state of maintenance. Within the framework of adopted four criteria, the studied sites were assessed twice on a scale of 1 to 5, where 1 meant: unsatisfactory accessibility, low attractiveness, bad maintenance, low popularity; whereas 5 signified: satisfactory accessibility, very high attractiveness, very good maintenance, very high popularity. Observations in The Garden at 120 were carried out in 2020 due to the fact that in 2019 the garden was not opened yet.

The chief investigation criteria were as follows: accessibility in January and September, attractiveness of the site for visitors in January and September, maintenance of greenery in January and September, popularity of the place in January and September.

investigation criteria appret to observations and then assessment in ganuary and september in selected rootop gardens								
Rooftop Garden	Accessibility	Accessibility	Attractiveness	Attractiveness	Maintenance	Maintenance	Popularity	Popularity
	January	September	January	September	January	September	January	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

Investigation criteria applied to observations and their assessment in January and September in selected rooftop garder

**Sky Garden** – obtained the highest evaluation in the scope of three criteria irrespective of the season of the year and temperature because the garden is roofed. However, its accessibility is limited due to the fact that visitors must log onto the system which manages the availability time, before they actually visit the site. In the summer time, when tourist traffic increases, accessibility drops due to the garden's high popularity with the visitors. Outside the sightseeing time, visitors may come, for instance, to dine there after 6 p.m., however, they must abide by the dress code.

Table 1

**The Garden at 120** – was opened at the beginning of 2019, that is why it was evaluated in September 2019 and January 2020. The garden is not roofed, as a result, its attractiveness is lower in the winter time than in the summer time. During the winter, the garden vegetation goes through dormancy 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.

Crossrail Place Roof Garden - is roofed, however, some zones are partly opened. That is the reason why its attractiveness is lower in the winter, when the temperature drops, than in the summer, when it is warm. It enjoys a lower popularity among tourists than the gardens in the City of London, due to its location in the district of Canary Wharf, on the outskirts of London. However, the garden is much more popular with the local inhabitants and people working in Canary Wharf. A particularly big number of people visit it during lunchtime. The rooftop garden attracts people with its flora and the microclimate of a greenhouse. This object is not as popular with tourists as Sky Garden. The Garden at 120 is more popular than Crossrail Place Roof Garden, but, so far, less popular than Sky Garden. Moreover, The Garden at 120 is able to hold 200 people, whereas Sky Garden may hold as many as 500 at the same time.

While making a decision which destination to see, one should first think about the purpose of the visit – whether it is to relax or admire views/cityscape, or maybe to enjoy greenery and architectural solutions. 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 the destinations which ships from Canary Wharf once sailed to. 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 big number of people doesn't create an ideal place for relaxation. The Garden at 120 is a new rooftop garden and because of that it is not so well known as Sky Garden. However, its popularity is growing and its appearance improving thanks to the controlled growth of vegetation.

The survey, expert evaluation and non-participatory observational studies carried out in three selected locations 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 the control of the visitors traffic, as it is done in Sky Garden by means of a special system. Successful logging onto the system guarantees the access to the garden at a given date and time. The system both facilitates and monitors access as this place enjoys the greatest popularity of the three locations and is considered to be one of the biggest attractions in London. The remaining two gardens are valued for their easy accessibility without the necessity of prior electronic booking. 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.

### 4. CONCLUSIONS

The research carried out allowed for the formulation of conclusions which should be the subject of further research into public space located on the roofs of buildings, due to the fact that architectural objects of this type are a novelty and have become synonymous with modern public space. With regard to the scope of the research, these conclusions may be formulated as follows:

Attractiveness – A factor contributing to the attractiveness of rooftop gardens is architectural space which has high aesthetic features and at the same time, offers a view of an attractive space of the city (the 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 onto the system to book a particular time slot and free access for each visitor at any time are vital qualities which 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.

Architecture and maintenance - Rooftop gardens should be fully or partly covered with a roof due to changeable weather conditions and seasons of the year. The roof or partial-roof provides cover for the visitors but also creates a microclimate for the plants - it protects against wind, keeps a certain level of humidity and ensures a proper temperature. The large surface roof structure over such objects constitutes a high architectural value, which is appreciated by visitors. Office buildings should be provided with an independent access to the rooftop garden for people who are not office employees but only visitors. High level of maintenance – building, landscaping, furnishing and plants. Popularity - depend on: information about (website), seasons and weather, city view, nice plants, and cafe or gastronomy function.

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