



Review

A Vertical City Park Model for Promoting Physical Activity and Sports Practice in People of All Ages

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Abstract: (1) Background: Modern society is characterized by urbanization and an increase in noncommunicable diseases. Governments frequently adopt policies to intervene in this regard; however, they are not always successful. Parks are an easy and feasible health intervention, but they are not always present in cities due to a lack of space. Considering the above aspects, the present study aims to analyze the scientific literature on this topic to provide a city park model versatile in different urban contexts. (2) Methods: A review of the scientific literature on this topic is performed to discover building models designed to replace/flank urban parks. (3) Results: No such articles are found in the scientific literature. The proposed model is a vertical city park. It is a modular structure designed to be adaptable to the urban context. It includes parks, sports fields, and fitness centers in a green and healthy environment. (4) Conclusions: In the scientific literature, there are no mentions of city park models. Consequently, a design model is proposed. This model for a vertical city park can be an instrument for a population-based health program. This solution has the potential to be feasible and economical, thereby giving the community a more easy-to-adopt instrument.

Keywords: architecture; physical activity; sport; building; environment



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1. Introduction

Cities are characterized by an ever-increasing population density; more than half (about 55%) of the world's population live in urban areas and, in 2050, more than two thirds (about 68%) of the world's population will live in urban areas [1,2]. The process by which people become permanently concentrated in small areas, with economic, social, and environmental implications, is called urbanization [3]. Land use and transport policies contribute to an increase in noncommunicable diseases [4], resulting in 70% or more of the global mortality [5]. Low- and middle-income countries, due to noncommunicable diseases, present a 1.5 times higher risk of premature mortality than high-income countries [6]. The number of overweight and obese children is increasing [7], and older adults are growing in terms of number and age reached [8]. There is an increase in cardiovascular and metabolic risk factors from a young age [9], while older adults suffer from muscular problems [10] and cognitive functions decline [11,12]. This reduces the quality of the population's health. Health means physical, mental, and social well-being [13]; it is a complex and multifaceted concept that combines the physical, emotional, social, spiritual, and intellectual spheres [14]. Health promotion, compared with medical intervention or treatment, presents reduced health risks and limited healthcare system costs [15,16]. The World Health Organization (WHO) [13] affirms that governments should promote and protect the health of all people, without distinction of race, economic status, social condition, religion, or political belief. The policies of governments to reduce sedentary behaviors and improve physical activity are generally low to moderate, especially in low- and lower-middle-income countries [17].

Physical inactivity causes more than 3 million deaths per year, of which 2.6 million occur in low- and middle-income countries [18,19]. Urbanization is associated with lower

physical activity levels [20]. Globally, only 1/4 of adults achieve the current WHO guidelines for physical activity (at least 150–300 min of moderate-intensity aerobic physical activity per week) [21]. Cities should be structured to reduce noncommunicable diseases and promote active lifestyles through proper planning of land use and infrastructure building, transport management, housing, and economic actions [22]. They need to guarantee services for the community and be accessible to all segments of the population. The essential facilities have to be within walking distance and the people have to perceive safety [23]. Consequently, it is essential to build public spaces, parks, or infrastructures in urban areas dedicated to the health of individuals. The number of nearby recreation facilities and parks is positively correlated with physical activity levels [24,25]. Cities should have spaces for citizens that are green and that promote sports practice as well as well-being. Parks and green spaces are related to the achievement of the recommended amount of physical activity [26]. There is a positive correlation between parks and physiological [27] and health-related parameters in older adults [28]. Parks should be public, low-cost, well maintained, safe, and include people of similar age to increase physical activity levels, especially for adolescents [29,30]. Otherwise, people will move their activities to the streets or vacant lots, thus increasing the risk of injuries [30]. An important aspect for older adults is the location of the park; it is fundamental that the park is within walking distance [28].

Physical activity is associated with the number of sports facilities, playgrounds, recreational centers, and parks in the area, and places with sports or game equipment [23]. Recent studies found positive outcomes on physical activity levels after urban interventions such as cycling and walking environment improvements or park renovations with new exercise equipment [31]. Playgrounds are necessary to improve physical activity in children [32]; parks are also ideal for adults and older adults [28,33] as well as young adults [25]. Fitness equipment installed in the parks allows for free and easy access to fitness training, thereby improving the physical status and health perception of the people [34]. A park or a recreation point within the urban context should be part of the healthcare system [35].

The implementation of several programs in Scandinavian countries has increased sports infrastructures; however, despite the installations of new sports facilities, the introduction of new sports has made the structures outdated, monofunctional, or only for sports with spectators [36]. This brings attention to the building architecture. Infrastructures should be designed for possible changes; they must be able to respond to the new challenges or requirements, thereby making them sustainable [37]. The present study aimed to integrate different disciplines and connect ideas to solve inter-related problems associated with public health and city planning [4]. It sought to analyze the current scientific literature to search for city park models and eventually propose a “park” model, built vertically, with facilities for all ages and interests, which governments could adopt to reach the citizens and promote health.

2. Materials and Methods

This review partially followed the preferred reporting for systematic reviews and meta-analyses for Scoping Reviews (PRISMA-ScR) checklist and explanation [38]. PRISMA-ScR was chosen to make our research objective replicable, thereby increasing the scientific quality of the manuscript. PRISMA-ScR proposes the eligibility criteria before article collection. After a preliminary screening, because of the low number of manuscripts, it was decided not to adopt the eligibility criteria for population, intervention, comparison, outcomes, and study design (PICOS criteria). Similarly, no limitations were adopted for the country of origin, the type of manuscript (i.e., original article, review, systematic review, abstract, book chapter, commentary, editorial, and prospective), or the type of study (i.e., randomized controlled trial, longitudinal study, and observational study). In this way, we wanted to include all manuscript typologies published on this topic. The studies were considered if they were written in English and published in peer-reviewed and international scientific journals.

The manuscripts were included if the topic was about a city park model or the design of a city park. As suggested by PRISMA, keywords were searched on electronic databases. The terms “city park model” and “city park building” were adopted as keywords during the search process. The decision to adopt only these keywords was to include similar articles and prevent confusion during analysis.

The scientific electronic databases PubMed, Scopus, Web of Science, and Google Scholar were searched. The above electronic databases include international and peer-reviewed journals. It was decided to exclude the web to avoid the grey literature and articles or projects not peer-reviewed by experts. The last date of the search was 29 August 2023 and all studies detected were considered for the analysis.

The two investigators screened the databases, and they performed the analysis independently. The findings were compared after the search and screening process.

The included studies are discussed narratively. Alternatively, if it is not possible to use any study, the generic scientific literature on urban parks is considered to build the model. A standardized model will be created, including the essential structure and services proposed in the articles.

3. Results

After the article collection process, no suitable studies were detected on the four databases searched. It indicates a possible lack of a city park model in the scientific literature. This highlights the necessity to create and propose a model proposal.

A recent research note proposed a vocabulary of design methods [39]. The study aimed to share a common language to better disseminate future works [39]. Furthermore, creating methods and protocols is important in the health context. It helps the researcher and the community and improves the quality of the intervention [40]. In the health promotion context, standard operating procedures are frequently proposed. They are a step-by-step guide that allows the repetition of an intervention, the comparison of data, and a reduction in the risk of errors and interpretation [40]. Because parks and facilities are essential for the health of the people, a standardized park model suitable for cities could help to increase the feasibility of the project and act as a health intervention.

A standardized design method in architecture, especially in the study of the design of a building, reduces the cost of construction. It would allow its repetition everywhere and at any time. A recent review found that design research lacks standard evidence in the area of design research [41], highlighting the necessity of models that could be implemented or improved through a scientific process. Considering the above aspects, the present study proposed a first example of a city park model.

Planning Methodology

Since Le Corbusie’s concept in 1922, nowadays, vertical cities are a solution for land scarcity; an example is the city of Singapore [42]. It is clear how a city park model, structured on several vertical levels, does not occupy considerable land, and it is ideal in an urbanized context, hence, the choice of overlapping the various environments to accommodate a large and differentiated audience. As suggested by the literature [43], a park designed to increase its attendance includes various sports fields, playgrounds, pedestrian paths, security, and easy playground access. Consequently, the present vertical park model has different spaces, including playgrounds, gardens, and outdoor and indoor physical activity fields.

The ground floor is closed from the outside to increase security, an important factor in park attendance [44]. This area is open onto the longitudinal axis with intense nature and tall trees to make the environment fresh and hospitable. This decision is because a green environment seems to increase physical activity levels [45], reduce air pollution, ensure biodiversity maintenance, and regulate the climate [46]. The ground floor is a common area, accessible to everyone, like a square or a neighborhood park. In this area, people can find activities for the community, neighborhood clubs, craft workshops (to transmit knowledge of the past), or meeting rooms available for nonprofit organizations. Different

services, as this model proposes, increase park attendance from young to older people [47]. It is designed to accommodate many people, with activities suitable for all ages, such as other projects carried out on parks [48].

The first level is characterized by a garden. It is equipped with games and structures that allow activities and unstructured play for children, as suggested by the literature [47]. Furthermore, the first floor provides better control over the area. In this way, parents can engage in other activities outside (such as work activities or going shopping) or inside (such as sports activities or physical activity practice) the structure.

The second level has a garden with free spaces to practice activities without specific equipment like martial arts, group dance, or simply gymnastics. Another garden located on the top floor opens up to the sky with a space for meditation, yoga, or similar activities. The three levels are designed based on the idea of noise level. The lowest level is the noisiest because there are many people. The highest level, reached especially, is quieter.

The middle floors primarily focus on sports and physical activity training. Hence, various disciplines can be practiced, from the softest activities to competitive sports. There are playing fields for various sports that can be managed by sports clubs, but public use must be guaranteed. The shape of this part of the building depends on the size and shape of the playing fields, from sports fields that occupy more space like soccer to smaller fields like volleyball, basketball, and tennis, until the top, where ping-pong, fencing, yoga, and Pilates can be practiced. The external façade leans towards the interior to open up towards the sky and receive diffused light. The concept behind the presence of different sports fields is to increase park attendance [49].

Although the structure is conceived vertically, accessibility is provided through lifts, stairs, and ramps for those who want to take a walk or jog. The sports fields and free spaces can be reached through two routes, one “fast” and one “slow”. The fast route uses staircases and lifts. The slow route instead connects the fields and free spaces on all levels, developing horizontally with ramps and rest areas (Figures 1 and 2). According to a study, if a road exists, people are enticed to participate in walking or running activities [45].

The park is conceived in replicable “units”, with sustainable systems and materials, and natural green spaces are mandatory. It can be replicated with great flexibility according to the spaces and needs of the municipality. The modularity of the elements makes it easy to assemble and reduces waste and costs, making this project economical and environmentally friendly. It can be implemented and replicated. The dimensions of the single “unit” can also be resized or expanded.

In the basement, in addition to the service rooms, only a few parking spaces are provided as the use of bicycles, micro-electric mobility, or public transport is encouraged. Eventually, these spaces can be exploited to implement other activities or services according to the needs.

Vertical green walls should be adopted in the internal facade. The vegetation consists of bushes and trees planted throughout the lot, from the ground floor to the upper levels. These plants create a fresh and healthy environment. This solution helps mitigate pollution, promote local microfauna and biodiversity, and regulate the climate [46]. The external facade is inclined to let in sunlight, collect rainwater, and install photovoltaic and solar panels. The inclination allows the placement of some trees on the ground floor, allowing the foliage to expand to the interior. This gives the feeling of being immersed in a natural setting even if in the city center. Additionally, the plants create a cooler and cleaner microclimate, especially in summer.

Heating is provided only in spaces with a reduced height where it is strictly necessary (i.e., changing rooms, ancillary rooms, and bathrooms). Changes are possible according to the needs of the climate location. The building is “transparent” to show the vitality of customers (Figure 3).



Figure 1. Vertical city park overview.

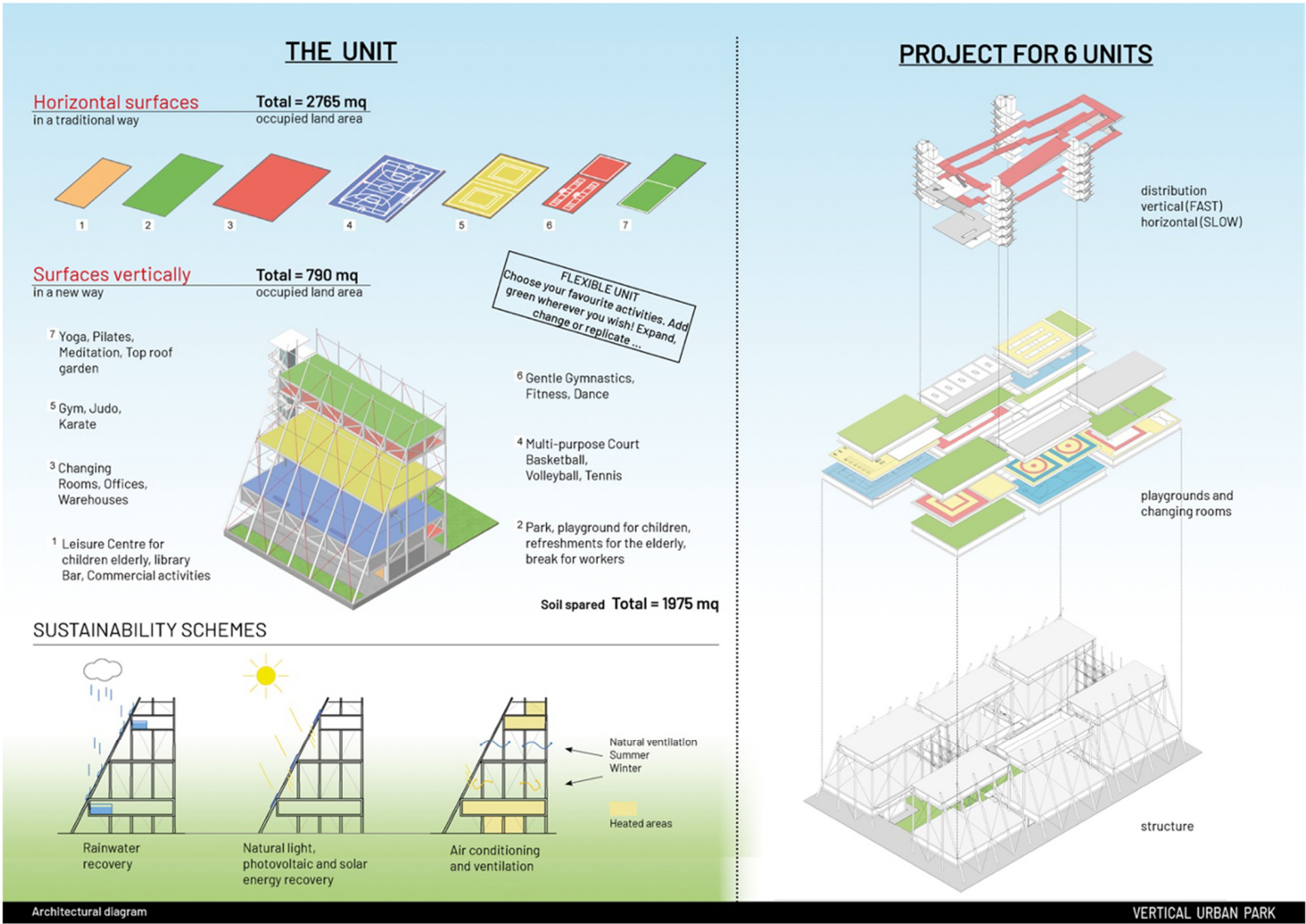


Figure 2. Detailed description.

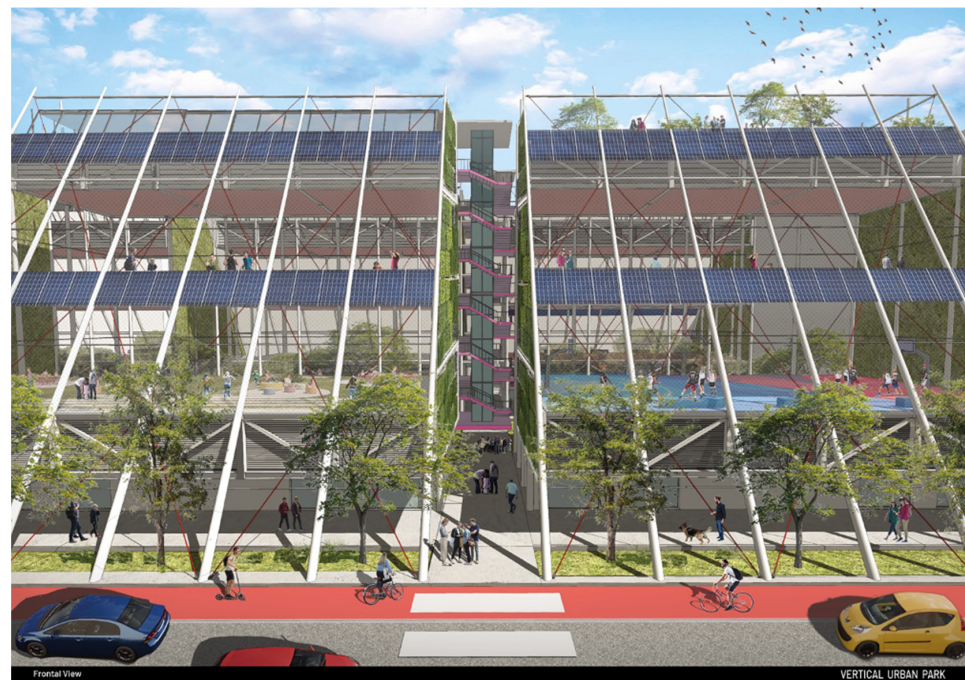


Figure 3. External view of the model.

4. Discussion

This review highlights the lack of a park model in the scientific literature. The manuscript also provides a model that can be adopted everywhere and by everyone to intervene in the health context. The advantage of this model is the possibility of having vertical parks with facilities in every city and context. This article is a collaboration aimed at improving the livability of future cities; policymakers now have a tool to enhance the health of the people and should act with a proper intervention [50]. A park guarantees contact with nature, an important aspect to decrease the incidence of physical and mental illnesses [51]. Furthermore, green spaces in urban areas are linked with sustainable cities. Nature helps reduce air pollution, promote biodiversity, maintain and capture carbon, and regulate the climate [46]. This type of park model could also be useful in cities with extreme climate conditions, for example, in northern or southern states like Canada, Scandinavia, some regions of Russia, Saudi Arabia, Qatar, or the United Arab Emirates.

A vertical park allows a transversal intervention, including people of different ages and with different problems. The scientific literature suggests that a good and well-planned intervention should include different populations and be directed to the person [52]. The structure of this park model is ideated for this aim: the first floor is designed to limit sedentary lifestyle, which is especially important for children and adolescents [53]; adults can use the sports field; and older adults can participate in adapted training programs [54] on the upper levels. Also, the connection between the floors is ideated to keep people fit and to include people with special needs. This last population requires attention; indeed, they usually practice less physical activity than people of the same age [55–57]. This solution reduces the physical (i.e., access to the structures) and social (i.e., the negative attitudes of the society) barriers [58]. This park model, through ramps and lifts, aims to eliminate most of the architectural barriers. One last aspect is the possibility to build this structure everywhere, even close to their own home. It could encourage physical activity especially in adolescents [59]. This solution is ideal also for those areas where people with low socioeconomic status and minority backgrounds live. In this way, it is possible to promote physical activity programs in this population that generally has a low physical activity level [60].

Loneliness is a serious problem in modern society [61,62]. It is a risk factor for all-cause mortality [63], and society is becoming more interested in this aspect of life [64].

The park, in this case, the vertical park model, could become a place where people can share knowledge and learn from each other [65]. A park is a place where different ages are together, like in the traditional small city park [66]. Furthermore, sports facilities serve as anchor points for socialization through collective interaction of activities that may occur on sporting grounds [67]. The park is also a place where it is common to meet homeless individuals or intoxicated persons. While homeless individuals are not a problem for park users, the presence of intoxicated persons decreases the number of park users [68]. This vertical park solution, with closed spaces, could allow nonprofit organizations to accept vulnerable people. Furthermore, according to the literature, to fight illegal activities and make the park safer, it is important to organize supervised activities [68,69]. This model allows attendance at any time with structured and unstructured activities, fronting also the problem connected to illegal activities. A structure like this, with limited entrance, can be easily monitored with video surveillance. This facilitates its control and makes it safer.

The decision to adopt a natural model is due to the growing interest of the scientific community in green urban spaces as sustainable and livable locations to spend leisure time [70]. A park provides a setting in the urban context where people can be physically active, connect with nature, have social interaction, and take a break from their daily routine [71]. An urban green space has an important role in creating a culture of health and social well-being [72] in young [73] and older adults [74]. Furthermore, the pathways connecting the floors, with trees, gardens, and water features, aim to create a favorable aspect for physical activity practice [75]. The proposed solution, as the literature suggests [76], aims to protect people from disturbing noises to promote recovery and social experiences. The natural environment is associated with health outcomes by reducing stress levels and loneliness and increasing physical activity [77,78]. Furthermore, green surfaces in the city provide ecosystem services like managing water, regulating building temperatures, improving energy consumption, reducing sound transmission and urban heat, and facilitating carbon capture [79–81]. Other aspects to consider are an increased quality of life and well-being, promotion of biodiversity, increased urban wildlife habit, and aesthetic enhancement [79–81]. The green walls and the stained glass let blue light enter the building, which increases health outcomes like well-being, mood, and physical performance [82].

The vertical park model aims to connect people with nature and it also provides an environment for the health (physical, psychological, and social) of the population. It aims to be a safe place of inclusion and cultural development. The construction of this kind of park could be a means to combat a sedentary lifestyle [83], also, in low-income environments [84]. The possibility of creating a park in the city center or disadvantaged areas of the urban context, as well as in small spaces, will ensure green areas and sports facilities. This park typology could acquire a property value, saving energy and providing economic benefits [85]. Finally, its construction and maintenance are employment opportunities [85].

The vertical park is a recreational and well-being space, but it could be also a tourist attraction [85]. It brings some benefits to the environment, improving air quality, reducing noise, improving biodiversity and nature conservation, and ensuring pollution control [85]. The project could also have policy relevance; improving the health of the population implies a reduction in the costs for the healthcare system [86]. A natural place in the urban environment brings positive feelings and beneficial services that fulfill immaterial and nonconsumptive human needs [87]. This aspect is fundamental to have positive implications in the workplace and society. Indeed, a park is associated with lower absenteeism by employees [85] (Figure 4).

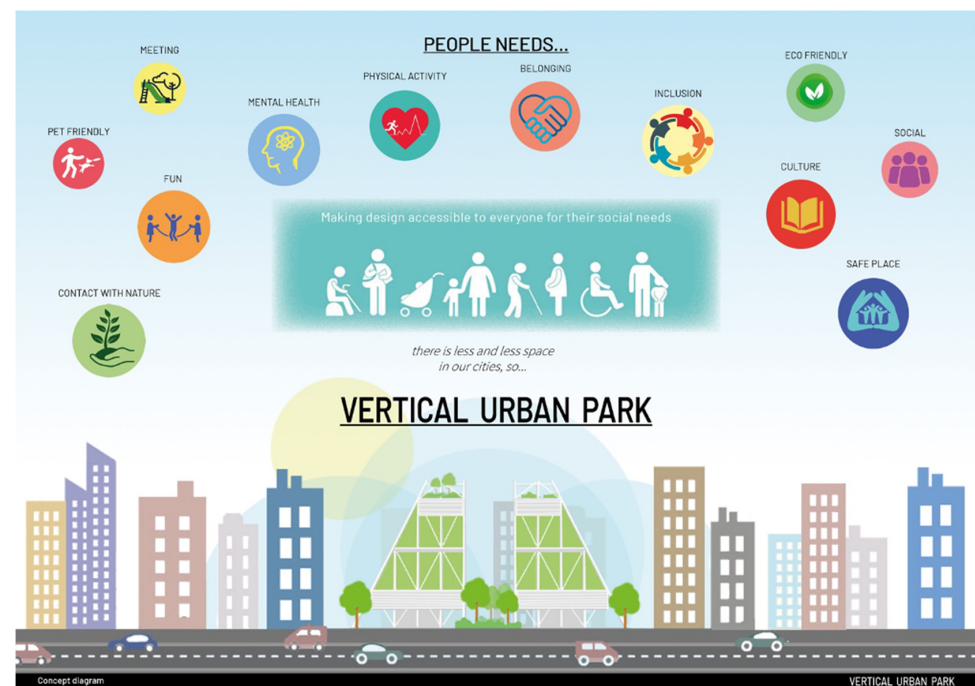


Figure 4. Overview of the impact of the vertical park in the urban context.

One limitation of this review is the lack of architectural scientific articles to better support the model. The vertical park model is only a proposal. Future studies could implement and improve it scientifically and architecturally. Further studies could include articles searched on the web and not only on scientific electronic databases. We opted to include only articles published on scientific electronic databases in which international, peer-reviewed articles are published to increase the quality of this work. Future studies could scientifically analyze the project's costs, benefits, limits, and applications. Construction systems and prefabrication should be studied to evaluate the ideal solution in different contexts. This includes considering climatic conditions and material choice. Future studies could assess the feasibility of using wooden parts from an even more sustainable perspective. Scientific research could also evaluate it economically but, above all, consider the short- and long-term well-being benefits for people. One last aspect to consider in the future, with proper and specific studies, is the real benefit of a closed urban park in terms of sustainability and ecosystem services. These aspects play a fundamental role in promoting urban health development [88]. It is well known from the literature that urban nature is fundamental for city sustainability; indeed, it has an important role in the social and psychological needs of citizens [87]. It is also known that land sparing is fundamental for future urban designs to guarantee ecosystem services [89]. It is also necessary to adopt intelligent arrangements and technology to further increase natural capital [89] and this park model aims to provide a solution. It is important to understand whether a closed park (the present model) is as useful as an open park (the classic park with no walls and roofs), especially in terms of benefits for the ecosystem. Unfortunately, there are no "closed parks" structures on the main scientific electronic databases like PubMed and Scholar. This means that proper data collection for ecosystem benefits is necessary.

5. Conclusions

In conclusion, the current literature review has not found design models for urban parks in scientific databases. This is an important lack because a standardized model could help propose a fast, easy-to-adopt construction. Having a design model available that can be adapted to the urban context might solve the shortage of green spaces in modern cities. Considering the findings of this study, this review aimed to propose a model for a vertical

city park. This model is designed following the published scientific literature about city parks. The proposed model could be adopted for health intervention in all populations. It is applicable in all cities and contexts and in a limited location. The vertical park proposes a safe and controlled location for people of all ages. They can participate in different sportive, cultural, and social activities. The availability of green spaces guarantees a natural zone in urbanized contexts; in this way, people could have a place to relax and enjoy a break from everyday life. It is a project shared with the community to provide an instrument to the government to fight noncommunicable diseases and to improve overall population health and well-being.

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