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Ecosystem Services in Urban Parks: Their Impact on Health and Human Well-being

Servicios Ecosistémicos en Parques Urbanos: su Impacto en la Salud y el Bienestar Humano

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ABSTRACT

Urban parks play a fundamental role in providing ecosystem services (ES), which are essential to the sustainability of cities and human well-being. In many cities, the planning and management of green spaces has not been a priority, resulting in insufficient or poorly distributed green infrastructure. Through a review of scientific literature, this study analyzes the importance of urban parks as green infrastructure that contributes to climate regulation, air purification, biodiversity conservation, and recreation, elements that are essential for urban quality of life. The findings highlight that only 24 % of the analyzed studies explicitly address the impact of urban parks on human well-being. In comparison, 80 % of the scientific output is concentrated in the U.S., China, and Europe. Additionally, it was found that increasing vegetation cover by just 1 % could prevent up to 4.8 premature deaths per 100,000 inhabitants. The study also explores the socioeconomic benefits of these spaces, including their impact on public health, social interaction, and the economic value of nearby areas. In light of these challenges, it emphasizes the need to integrate ecosystem services into urban planning through sustainable management strategies that balance recreational use with environmental protection. Finally, it underscores the importance of adopting innovative approaches, such as green infrastructure, to strengthen cities' resilience to climate change and ensure the provision of ecosystem services for future generations.

KEY WORDS: Ecosystem services, urban parks, environmental health, human well-being, green areas.

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RESUMEN

Los parques urbanos desempeñan un papel fundamental en la provisión de servicios ecosistémicos (ES), esenciales para la sostenibilidad de las ciudades y el bienestar humano. En muchas ciudades, la planificación y gestión de espacios verdes no ha sido prioritaria, resultando en infraestructura verde insuficiente o mal distribuida. A través de una revisión de la literatura científica, este estudio analiza la importancia de los parques urbanos como infraestructuras verdes que contribuyen a la regulación del clima, la purificación del aire, la conservación de la biodiversidad y la recreación, elementos que son esenciales para la calidad de vida urbana. Los resultados destacan que solo el 24 % de los estudios analizados abordan explícitamente el impacto de los parques urbanos en el bienestar humano, mientras que el 80 % de la producción científica se concentra en E.U.A, China y Europa. Además, se encontró que incrementar en un 1 % la cobertura vegetal podría evitar hasta 4.8 muertes prematuras por cada 100,000 habitantes. Asimismo, se abordan los beneficios socioeconómicos de estos espacios, incluyendo su impacto en la salud pública, la interacción entre las personas y el valor económico de las zonas cercanas. Ante estos retos, se destaca la necesidad de integrar los servicios ecosistémicos en la planificación urbana mediante estrategias de manejo sostenible que equilibren el uso recreativo con la protección ambiental. Finalmente, subraya la importancia de adoptar enfoques innovadores, como infraestructuras verdes, para fortalecer la resiliencia de las ciudades ante el cambio climático y garantizar la provisión de servicios ecosistémicos a generaciones futuras.

PALABRAS CLAVE: Servicios ecosistémicos, parques urbanos, salud ambiental, bienestar humano, áreas verdes.

Introduction

In the context of rapid urbanization, urban parks play a virtal role in supporting large cities by providing ecosystem services (ES), including climate regulation, noise reduction, and improved thermal comfort, all of which contribute to mental health and overall well-being (González Osorio *et al*., 2022; Hernández *et al*., 2024). In densely populated areas, these green spaces also serves as climate refuges, providing shade and mitigating heat stress during extreme weather events (Singkran *et al*., 2023; Cortés *et al*., 2023; Medina *et al*., 2021; Auer *et al*., 2022).

Biodiversity, as a key part of ES, improves air and water quality and supports recreational opportunities and psychological restoration (Millennium Ecosystem Assessment, 2005). Furthermore, access to biodiverse green areas promotes physical activity, which helps prevent

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chronic conditions such as obesity, diabetes, and heart disease (Frumkin *et al*., 2017; Arango *et al*., 2020; Cárdenas *et al*., 2021). Evidence also links exposure to natural environments with reductions in stress, anxiety, and depression. Beyond these health benefits, investment in green infrastructure generates economic benefits by increasing property values and creating jobs in planning and maintenance (Ángel-Maya, 2013; Matos *et al*., 2024).

While urban parks improve environmental quality, their location and management can influence exposure to atmospheric pollutants. Importantly, the conservation and restoration of these ecosystems in cities have received less attention than those in rural areas (Sirakaya *et al*., 2017; Cedillo, 2024). The massive expansion of urban areas has generated problems such as air, water, and soil pollution, as well as biodiversity loss. Therefore, it is a priority to implement actions and strategies to maintain these ES (Ortega *et al*., 2023; Lobato *et al*., 2024; Rosales & Olmos, 2020).

This article aims to review recent literature on the role of urban parks in the provision of ecosystem services (ES), with a focus on their contribution to urban sustainability and human well-being. Urban parks act as “cooling islands” (PCI), mitigating the urban heat island effect by reducing summer temperatures by up to 6.8°C (Aram *et al*., 2019). This phenomenon is critical in high-density cities, where the lack of vegetation intensifies health risks, especially during heat waves (WHO, 2016a).

The importance of ES has also been recognized at the international level in agreements such as the Convention on Biological Diversity (CBD) and the Ramsar Convention, both of which highlight the need to integrate conservation strategies in urban environments (Sirakaya *et al*., 2017). However, these commitments are often voluntary and lack effective implementation mechanisms, underscoring the need to strengthen local and national policies that enable the harnessing of biodiversity benefits in cities.

A study conducted at the University of Valle campus during the COVID-19 pandemic demonstrated how restricted access to ES, such as those provided by green areas and trees, negatively affected human well-being, especially in aspects like health, social relationships, and freedom of action (Méndez Arroyo *et al*., 2022; Restrepo *et al*., 2023). Similarly, Pitt and Gunn (2024) emphasize that ecological degradation can increase public health risks, including the spread of zoonotic diseases. Taken together, these findings underscore the fundamental role of natural and urban ecosystems in promoting human health and community resilience. Therefore, an approach that integrates human, animal, and environmental health allows for a better understanding of the relationship between environmental quality and human well-being. Implementing urban policies based on this approach contributes to creating healthy environments, reducing negative impacts, and strengthening community resilience.

In the field of environmental health, knowledge, methodologies, and tools are acquired that make it possible to identify, address, and control problems, as well as to make decisions and implement measures to maintain conditions that favor the health of people, communities, and ecosystems. A clear example of this is the healthy biodiversity of an urban park, which directly

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depends on strong environmental health. The World Health Organization (WHO, 2025) states that clean air, a stable climate, and adequate levels of water are fundamental requirements to ensure good health. It also recognizes health as a fundamental human right and defines it as "a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity" (WHO, 1946). In this context, the role of urban parks in the provision of ecosystem services is analyzed, with the aim of offering recommendations for sustainable urban planning and the conservation of ecosystems in urban environments.

Method

Search and selection criteria for articles

To prepare this article, a systematic review of the scientific literature published through 2025 was conducted. The search focused on studies examining the relationships among ecosystem services, urban parks, and human well-being. With the support of the University of Guadalajara (UdeG) virtual library, the following databases were used: PubMed, Web of Science (WoS), Scopus, and, additionally, Google Scholar, as well as collaborative platforms such as ResearchGate. Furthermore, the reference manager Mendeley was used to organize and manage the bibliographic sources, facilitating the analysis and synthesis of the information. This search methodology ensured a rigorous and systematic approach, allowing for the integration of multidisciplinary and up-to-date perspectives.

Search strategy: The search conducted in Web of Science using the keywords “ecosystem AND services AND urban park” yielded a total of 2,374 publications indexed in the Core Collection. Among the countries and regions with the highest scientific output on this topic, the following stand out (Figure 1): the United States, with 703 publications; China, with 571; Germany, with 205; England, with 204; and Australia, with 184. These data reflect global interest in research on ecosystem services and their relationships with urban parks, highlighting the significant contributions of these nations to advancing knowledge in this field.

On the other hand, the search conducted in Web of Science using the keywords “urban park AND human well-being” yielded a total of 579 publications selected from the Core Collection. Among the countries/regions with the highest scientific production on this subject, the top five are (Figure 2): the United States, with 192 publications; China, with 152; England, with 64; Australia, with 41; and Germany, with 39.

Applied filters: The studies were selected under clearly defined inclusion and exclusion criteria. To ensure the quality and relevance of the studies, research published from 2000 onward was selected, specifically those analyzing how urban parks benefit people and the environment. Preference was given to articles published in recognized academic journals, with solid scientific bases and clear results. Studies not focused on urban environments, those without a direct link to health or well-being, and non-scientific documents (such as government reports) were excluded. Additionally, it was verified that each selected source provided measurable indicators or

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key arguments for the analysis, avoiding redundancies and ensuring geographical and thematic diversity in the review.

Selection process: To ensure that only the most relevant works were included in the review, articles were first filtered by title and abstract, eliminating duplicates and those that did not meet the established criteria. More detailed reading was applied to the preselected studies, prioritizing those that provided concrete data on the benefits of urban parks (e.g., improvements in physical and mental health or environmental conditions). Key references that were recurrently cited in the literature were also included, ensuring that the review integrated both recent findings and fundamental contributions to this topic.

The results of the Web of Science search clearly reflect two predominant approaches in the literature: one focused on the ecosystem services provided by urban parks (2,374 publications) and another centered on their impact on human well-being (579 publications). This quantitative difference could be interpreted as greater academic interest in the ecological and functional aspects of parks compared to their direct benefits on human health and quality of life. Nevertheless, both topics show steady and complementary growth.

The systematic review highlights the growing scientific attention on the intersection between ecosystem services, urban parks, and human well-being. The use of multiple academic databases, such as Web of Science, Scopus, and PubMed, along with collaborative and management tools such as ResearchGate and Mendeley, strengthened the rigor and multidisciplinary scope of the analysis. This strategy enabled the integration not only of recent research but also of key references that have influenced the field's development.

In geographical terms (Table 1), the United States and China stand out as leaders in both lines of research. The extensive scientific output of these countries can be attributed to their robust academic infrastructure, public policies on sustainable urbanism, and the scale of their metropolitan areas, which demand nature-based solutions. Germany, England, and Australia also rank among the top five countries in both searches, suggesting a global trend in integrating urban planning with environmental and social objectives.

The difference in the number of publications between the two searches also reveals opportunities. For instance, while studies on ecosystem services in urban parks are more abundant, there remains considerable scope to strengthen the empirical evidence on their specific impacts on human well-being. This is especially relevant in densely populated urban contexts, where citizens' physical and mental health can benefit significantly from contact with nature.

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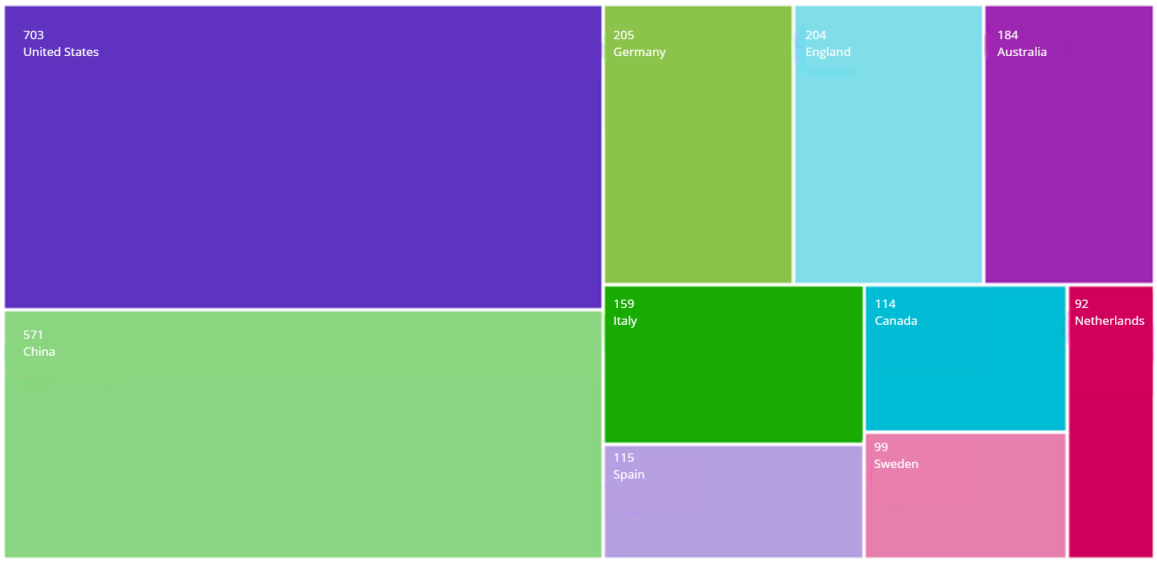

Figure 1. Number of publications per country found in Web of Science using the keywords "ecosystem AND services AND urban park".

Source: Web of Science, 2025.

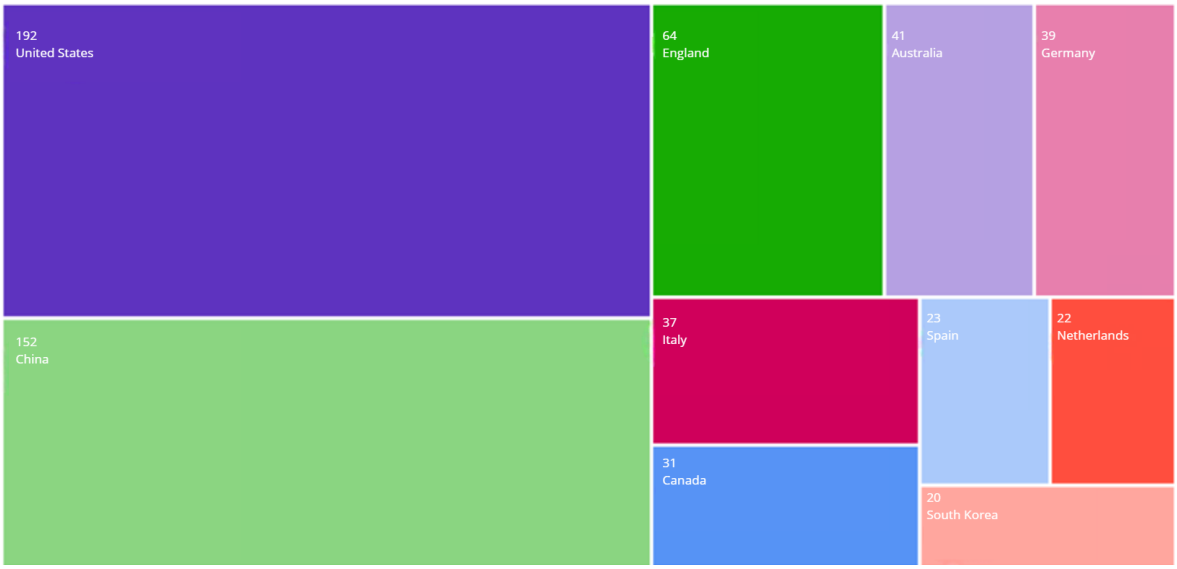

Figure 2. Number of publications per country found in Web of Science using the keywords *'urban park'* and *'human well-being'*.

Source: Web of Science, 2025.

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Table 1. "Publications by country/region in Web of Science: 'ecosystem services AND urban park' vs. 'urban park AND human well-being'."

Country/Region	Publications ("ecosystem AND services AND urban park")	Publications ("urban park AND human well-being")
USA	703	192
China	571	152
Germany	205	39
England	204	64
Australia	184	41

Own elaboration.

Definition and Classification

Ecosystem services (ES) are defined as the benefits that people obtain from ecosystems, and they are classified into four categories: provisioning (food, water), regulating (climate, air quality), cultural (recreation, psychological well-being), and supporting (biogeochemical cycles). Urban parks are key providers of these services, especially in highly urbanized environments (Martínez *et al*., 2021; Wang *et al*., 2021; Montes-Pulido & Forero, 2021).

A healthy ecosystem maintains its organization, autonomy, and resilience to stress over time. In urban environments, this implies managing parks sustainably to conserve their biodiversity and ensure their functioning, even in the face of threats such as pollution or climate change. Integrating ecosystem health into environmental accounting systems, such as the UN SEEA, can justify investments in their conservation and restoration, recognizing their value not only in economic terms but also as pillars of human well-being and environmental sustainability (United Nations, 2021). Therefore, it is essential to promote policies and monitoring programs that ensure the creation and maintenance of healthy urban parks, maximizing their benefits for society and the environment (Hernández-Blanco *et al*., 2022; Zhang *et al*., 2024).

Ecosystem services, also known as environmental services, are the benefits that ecological processes and natural systems provide to living beings and the planet. According to the Food and Agriculture Organization of the United Nations (FAO), these services are the driving force of the environment and are essential for life. In this sense, the responsible management of resources such as water, air, soil, climate, and biodiversity is fundamental to ensuring their availability for present and future generations (SEMARNAT, 2003; Balvanera & Cotler, 2007; Fox *et al*., 2022).

An example of negative interactions is agricultural expansion and biodiversity loss. The modification of forests and jungles for agricultural purposes increases food production but reduces

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biodiversity and affects regulating services such as erosion control and carbon sequestration. This phenomenon illustrates the need to balance economic development with ecosystem conservation in order to avoid compromising their capacity to provide essential services.

Over time, many ecosystems have been transformed into intensive production systems, such as the conversion of forests and grasslands into agricultural areas for food production. However, these changes have altered the capacity of ecosystems to provide other fundamental benefits, often without our awareness (Balvanera *et al*., 2009; Pozada *et al*., 2023; Melgajero *et al*., 2021).

For example, wetland ecosystems, such as those associated with the León River in the Urabá Antioqueño region of Colombia, play a fundamental role by providing a wide range of ecosystem services. These include water provision, climate regulation, flood control, and the supply of food resources, all of which are essential for the survival and development of local communities. However, the degradation of these ecosystems, driven by factors such as population growth and economic development, threatens their capacity to provide these benefits and puts biodiversity at risk (Arana Medina, 2015).

According to the Millennium Ecosystem Assessment (2005), ecosystem services are the benefits that ecosystems provide to society and are divided into four main categories:

1. **Provisioning services:** tangible goods such as food, water, and raw materials.

2. **Regulating services:** natural processes that regulate climate, water quality, and pollination.

3. **Cultural services:** intangible benefits such as leisure, tourism, and emotional well-being.

4. **Supporting services:** essential ecological functions, such as soil formation and nutrient cycling.

The idea of ecosystem services was developed to emphasize the strong connection between ecosystems and human well-being (Balvanera & Cotler, 2007). Therefore, conserving and properly managing urban ecosystems is crucial, as their degradation can directly affect public health, the economy, and people's quality of life. This highlights the need to protect and sustainably oversee urban green spaces, because losing or damaging them can lead to serious negative effects on communities and the environment.

Urban Parks as Providers of Ecosystem Services

Urban parks bring together attributes that make them fundamental spaces for life in cities. Their vegetation, species diversity, and landscapes contribute to creating pleasant environments that support recreation, rest, and social interaction. At the same time, they fulfill essential

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environmental functions such as mitigating the urban heat island effect, purifying the air, controlling floods, and regulating the microclimate, which is particularly important in densely populated urban contexts. Studies have shown that increasing vegetation cover, even in small percentages, can generate significant health benefits and reduce risks during heat waves (Martin *et al*., 2025; Mexia *et al*., 2018; WHO, 2016a; Du *et al*., 2017). These spaces are also vital for urban sustainability, as they act as carbon sinks, help regulate the hydrological cycle, and conserve biodiversity, thereby strengthening resilience against climate change and other environmental challenges (Canadell *et al*., 2014; Boćkowski *et al*., 2024). Thus, beyond their recreational function, urban parks constitute green infrastructure that integrate ecological and social benefits, and whose proper management is key to maintaining their value in the long term.

However, it is important to highlight the need to differentiate between tangible ecosystem benefits, which can be assessed through biophysical and ecological indicators, and the cultural or social perceptions that users attribute to green spaces. This distinction allows for more precise planning of cultural ecosystem services (CES), as perception may be influenced by symbolic, emotional, and sociocultural aspects rather than by the adequate provision of the service. Misguided assessments may lead to ineffective or inadequate interventions. For instance, perceptions of safety or landscape beauty may determine visitation frequency without necessarily being related to real environmental benefits (Huai *et al*., 2022; Chen *et al*., 2024).

A study conducted in Cajamarca identified ecosystem services, including the provision of water, food, and raw materials, as well as climate regulation, carbon sequestration, and soil formation. These services are fundamental to human well-being, as they influence the availability of essential resources, environmental health, and the quality of life of local communities. Mountain ecosystems play a key role in water regulation, preventing erosion and ensuring water supply for human consumption and economic activities. However, it was found that the capacity of these ecosystems is decreasing due to overexploitation, pollution, and land-use change. The reduction of these ecosystem services directly affects the quality of life, leading to water scarcity, biodiversity loss, and reduced capacity for climate regulation (Boñón, 2014).

The interconnection between the social and environmental benefits of urban parks is evident. Pitt and Gunn (2024) highlight how these spaces not only provide recreational areas but also act as key habitats for biodiversity. They contribute to disease regulation and ecological balance, playing a fundamental role in urban sustainability. Moreover, the need for interdisciplinary collaboration among experts in health, ecology, and urban planning is emphasized in order to design policies that maximize these benefits. Under the premise of “thinking globally and acting locally,” strategies such as restoring green spaces and creating resilient environments in the face of climate change and biodiversity loss are promoted.

Urban and agricultural expansion has led to significant biodiversity loss and soil degradation, which negatively affect the capacity of ecosystems to provide essential services (Zhang *et al*., 2025; Kitaibekova, 2023). In this sense, urban parks emerge as a key solution to restore ecological functions and mitigate environmental impacts by providing habitats for biodiversity and improving soil quality.

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These spaces not only enhance self-perception of subjective well-being but also foster positive attitudes, healthy emotions, and behaviors that contribute to disease regulation and prevention. Likewise, they help develop resilience in individuals, enabling them to better cope with everyday stress, personal challenges, and changes in their surroundings (Garibay-Chávez, 2019; Kong & Sarmiento, 2022; Huai *et al*., 2022).

Cultural Ecosystem Services and Urban Design: Keys for Sustainable Park Planning

The provision and perception of cultural ecosystem services (CES) in urban parks depend on factors such as space design, vegetation diversity and distribution, accessibility, maintenance quality, and the social context in which they are embedded. Research in different cities has shown that these elements directly influence how people value aesthetics, recreation, health, and emotional connection to a place (Bi *et al*., 2024; Tu *et al*., 2023; Huai *et al*., 2022; Zhang *et al*., 2024; Wang *et al*., 2021; Wang *et al*., 2022). For example, more diverse landscapes can enrich the aesthetic experience while also shaping recreational use, while accessible, well-maintained designs promote social cohesion and a sense of community belonging.

In recent years, the study of cultural services has incorporated mixed methodologies and geospatial technologies that combine objective information (such as satellite imagery or vegetation inventories) with subjective data obtained from surveys or social media (Wilson & Willette, 2022; Chen *et al*., 2024; Florencio *et al*., 2022; Wei *et al*., 2024). This integration provides a more comprehensive understanding of the role of parks in local identity, emotional well-being, and urban resilience (Dushkova *et al*., 2025; Granobles Velandia *et al*., 2024; Sarı & Bayraktar, 2023). Thus, cultural ecosystem services emerge as a bridge between nature and society, and their management requires a participatory, interdisciplinary approach to ensure benefits are maintained and strengthened over time. In particular, the relevance of CES for sustainable urban planning, the strengthening of well-being and local identity, as well as their role in the socio-ecological resilience of cities, is underscored.

Although diverse in their approaches and contexts, the reviewed studies converge on the need to adopt integrative and participatory perspectives to understand the complexity of cultural services better. This is especially relevant in Latin American cities, where urban parks fulfill ecological, social, and symbolic functions that transcend their physical design. Therefore, the analysis of cultural CES not only enables a deeper appreciation of the human experience of nature but also guides public policies that are more inclusive and sensitive to the socio-environmental context.

Socioeconomic Benefits of Ecosystem Services in Urban Parks

Urban parks provide important socioeconomic benefits to communities by serving as spaces for recreation and well-being. These green areas enable outdoor activities that directly affect the population's physical and mental health (FAO, 2020). In addition, they foster social cohesion by providing accessible spaces for interaction, leisure, and nature appreciation.

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Urban parks offer multiple socioeconomic benefits, among which the following stand out:

- **Public health impact**: reduction of stress, respiratory diseases, and promotion of physical activity.

- **Economic value**: increase in the value of nearby properties, attraction of tourism, and generation of jobs in maintenance and planning activities (Ángel-Maya, 2013).

- **Social equity**: access to green spaces in marginalized areas, helping to reduce social inequalities.

The presence of parks and green spaces within cities helps restore key ecological functions and provides benefits to the population, such as climate regulation, air purification, and spaces for psychological well-being and recreation. Investment in green infrastructure can increase the value of nearby properties, underscoring the economic benefits of green spaces in cities and making urban environments more attractive to investors and new residents. Moreover, the development of urban parks can contribute to job creation in activities related to their maintenance and planning (Ángel-Maya, 2013; Florencio *et al*., 2022; Wei *et al*., 2024).

It is essential to clarify the difference between urban green areas and green infrastructure. While green areas may refer to any vegetated space, such as gardens, medians, or parks, green infrastructure represents a more integral concept. It consists of interconnected networks of natural or semi-natural spaces, strategically planned to maintain ecological processes, conserve biodiversity, and provide multiple ecosystem services. This approach emphasizes the ecological functionality of the urban system and its integration into territorial planning, beyond mere aesthetic or recreational value (García & Losada, 2023).

The impact of urban green spaces on health largely depends on their location. Placing them in areas with low vegetation or high population density enhances their benefits, especially when they host biodiversity that regulates climate, improves air quality, and reduces noise (Martin *et al*., 2025; Marselle *et al*., 2021; Tran *et al*., 2022). It is not only the amount of green areas that matters, but also their quality, since more diverse ecosystems generate stronger positive effects in urban environments.

The relationship between urban forests and human well-being shows that contact with nature encourages physical activity, reduces stress, and improves quality of life, even in contexts with limited access (Remme *et al*., 2021; Tandaric *et al*., 2022). Interdisciplinary studies confirm that exposure to natural environments improves attention, mood, and mental health, with benefits that depend on the type, duration, and frequency of the experience (Bratman *et al*., 2012). Examples such as Healthy Parks, Healthy People, or forest bathing highlight their value as tools for health promotion and disease prevention (Garibay-Chávez, 2019).

In this sense, green infrastructure, composed of networks of natural and semi-natural spaces, maintains ecological processes, conserves biodiversity, and provides services such as

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carbon sequestration, water regulation, and erosion control. In urban areas, parks and forests fulfill this role, improving quality of life and strengthening environmental sustainability (García & Losada, 2023). Their design must be strategic to maximize benefits without conflicting with other uses, ensuring they fulfill ecological functions, mitigate climate change, and contribute to public health.

Challenges and Threats to Urban Parks

Despite their multiple benefits, urban parks face various challenges and threats that compromise their ability to provide essential ecosystem services. Among these challenges are:

- **Urban pressure and fragmentation of green spaces**: Accelerated urbanization fragments natural habitats, reducing ecological connectivity and negatively affecting biodiversity. Inadequate design (e.g., excessive paving) reduces their cooling capacity. Parks with less than 30 % vegetation cover show a 50 % lower Cooling Effect Index (CEI) (Aram *et al*., 2019, p. 9).

- **Pollution**: Air, water, and soil pollution reduce the quality of regulating ecosystem services, such as air purification and water filtration.

- **Lack of proper planning and management**: Intensive use of green spaces for recreational activities can cause soil compaction, affecting water infiltration capacity and reducing vegetation regeneration (Ortega *et al*., 2023).

The latter represents one of the most significant tensions in the management of urban parks. The increase in visitor influx can lead to impacts such as soil erosion and compaction, loss of vegetation cover, disturbance of fauna, and waste accumulation. Likewise, the accidental introduction of exotic species through recreational activities deteriorates the park's environmental quality and limits its capacity to provide regulating ecosystem services (Vargas, 2022). These effects can be particularly critical in areas that host fragments of native ecosystems or endangered species, raising the need for differentiated management according to the ecological sensitivity of each zone.

In Matlazincas Urban Park (Toluca, Mexico), an environmental and social analysis revealed issues such as vegetation degradation, wildlife disturbance, vehicle intrusion, the presence of pets, and inadequate solid waste management. Through an environmental impact matrix and 137 visitor surveys, it was identified that, although the population values the park and uses it for sports and recreational activities, participation in environmental programs remains low. The study recommends strengthening the dissemination of its biodiversity, cultural, and artistic values, and promoting collaboration among different social actors for its conservation (Cruz & Pérez, 2019).

In Cobija, Pando (Bolivia), a study with 720 surveys and policy analysis revealed a gap between the social valuation of green areas and their administrative management. Although 74 % of respondents acknowledged their importance, 84 % were unaware of the existence of laws protecting them. The lack of technical staff, effective policies, and an updated registry of these

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spaces limits their conservation, underscoring the urgency of clear regulations and education programs that promote community participation to achieve sustainable management (Vásquez *et al*., 2025).

This duality represents a challenge for decision-makers, who must design policies and regulations that balance human use without compromising the ecological integrity of the urban ecosystem. Internal zoning, use schedules, and awareness campaigns can help mitigate these effects (Dushkova *et al*., 2025; Ortega *et al*., 2023).

Human well-being is intrinsically linked to the health of ecosystems. For example, the wetlands of the León River not only provide essential resources such as water and food but also regulate the local climate and protect communities from floods and other natural disasters. However, the degradation of these ecosystems, caused by activities such as deforestation, extensive agriculture, and pollution, has significantly reduced their capacity to provide these services, affecting the quality of life of the people who depend on them (Arana Medina, 2015; Wilson & Willette, 2022).

According to González Osorio *et al*. (2022), urban green spaces act as sinks for atmospheric pollutants, significantly mitigating respiratory and cardiovascular diseases resulting from prolonged exposure. In addition, these environments foster mental well-being by offering spaces for recreation and contact with nature, which reduces stress and promotes a healthy lifestyle. The economic valuation of these services shows that the population recognizes their importance and is willing to contribute financially to their conservation, reinforcing the need to include these spaces in urban planning and public health strategies.

Singkran (2023) notes that urban parks provide key services such as carbon sequestration, reduction of surface runoff, and removal of air pollutants, such as particulate matter (PM2.5) and nitrogen dioxide (NO_2), thereby mitigating climate change and improving air quality in cities. Furthermore, tree species diversity and proper tree assessments are essential to maintaining these ecosystem services in the long term. These ecological benefits are fundamental to urban sustainability.

Orozco-Medina *et al*., (2019) analyzed particulate matter concentrations in a park in Guadalajara and demonstrated how air pollution in these spaces can pose a health risk to visitors, especially in spring, when particle concentrations are higher. This type of research highlights the importance of urban parks not only as recreational and sports spaces but also as providers of key ecosystem services, such as air quality regulation and pollution mitigation.

Urban parks play a fundamental role in human health and well-being by providing key ecosystem services, such as climate regulation, improved air quality, and noise reduction. However, the paper by Rojas Padilla and Pérez-Rincón (2013) highlights several limitations of the ecosystem services approach, pointing out that it tends to focus too much on the benefits that nature provides to humans. This leads to the conservation of ecosystems being justified primarily by their utility to people, leaving aside the intrinsic value of other species and their right to exist

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independently of their function for society. Moreover, the concept of natural capital and the models used to measure ecosystem services may provide a simplified view of nature.

The growing trend of economically valuing ecosystem services has made their importance more visible to decision-makers. However, this approach entails risks: it may foster a utilitarian view of nature that overlooks its intrinsic, spiritual, or ethical value. Likewise, monetary valuation methods tend to underrepresent cultural, symbolic, or non-marketable services, leading to exclusions or environmental injustices. This debate is crucial to prevent green spaces from becoming objects of speculation or urban gentrification, which would undermine their accessibility and equity (Rojas Padilla & Pérez-Rincón, 2013; Matos *et al*., 2024).

These approaches treat ecosystems as resources that can be managed and controlled in the same way as human-made goods, which does not reflect their actual complexity. It is also noted that the monetary valuation of ES does not fully capture their ecological, sociocultural, and spiritual benefits, which can lead to their commodification and restrict equitable access to these commons.

These factors reduce the capacity of urban parks to provide essential ecosystem services, putting at risk their sustainability and their role in human well-being. Therefore, it is essential to implement management and conservation strategies that balance recreational use with the protection of biodiversity and the ecological resilience of these spaces.

In this regard, authors such as Rincón *et al*. (2021) highlight the need to adopt comprehensive approaches that combine economic valuation methods with qualitative and participatory approaches capable of capturing the complexity of society–nature relationships. The inclusion of community perspectives, local knowledge, and criteria of environmental justice allows for the recognition of non-monetary dimensions (such as sense of belonging, cultural identity, and intergenerational value) that are often excluded from conventional analyses. Adopting this holistic vision can prevent urban planning from prioritizing only highly profitable projects and instead promote policies that guarantee the conservation of and equitable access to green spaces for the entire population.

On the other hand, the unequal distribution of urban parks within cities reflects and often amplifies preexisting socio-spatial inequities. Various studies have shown that, in many Latin American contexts, areas with lower green space coverage coincide with low-income neighborhoods, high population density, and poorer environmental quality (Rigolon, 2016). For example, in Santiago de Chile, it has been found that socioeconomically vulnerable sectors have less green space per inhabitant and that these spaces are located farther from residences, which limits their frequent use (Reyes & Figueroa, 2010). This shortage reduces access to key benefits such as opportunities for recreation, physical activity, social interaction, and contact with nature, all of which are associated with improvements in physical and mental health. In addition, the distance or poor connectivity to these parks increases time and transportation costs, creating additional barriers to their use.

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Beyond quantity, the quality of the parks available in different urban areas also shows marked inequalities. While green spaces in higher-income areas usually feature better infrastructure, maintenance, and security, marginalized areas often lack adequate equipment, cleanliness, and surveillance, which discourage their use and reduce their potential as tools for social cohesion and community well-being (Wolch *et al*., 2014). These disparities generate cycles of exclusion, as the benefits of urban nature tend to concentrate in privileged areas, leaving vulnerable communities exposed to greater environmental risks and with fewer opportunities for social development.

Integration of Ecosystem Services into Urban Planning

Urban population growth over the last century has led to an increasing demand for green spaces in cities. It is estimated that more than 60 % of the world's population will live in urban areas by 2050, which underscores the importance of urban parks as key elements in planning more livable cities. In addition to providing recreational areas, these spaces play an essential role in the quality of life of urban inhabitants by offering healthier and more sustainable environments (Mexia *et al*., 2018; Menezes da Silva *et al*., 2023).

The design and planning of urban environments play a fundamental role in promoting health and human well-being. The integration of green spaces, such as urban parks, not only improves the environmental quality of cities but also positively influences the population's physical and mental health. In this regard, several studies have emphasized the importance of considering the relationship between the built environment and health in urban planning. Fernández Marín (2021) highlights how the distribution of green areas, air quality, and accessibility to health-oriented infrastructure can significantly impact people's well-being, underscoring the need for interdisciplinary approaches to ensure more livable cities.

The guide on the integration of ecosystem services into urban planning (ISE) helps planners recognize the connection between nature and urban development, identify key ecosystem services, and evaluate their impacts, risks, and opportunities. It provides guidance on how to:

1. Define the scope of work.
2. Analyze and prioritize ecosystem services.
3. Identify the status, trends, and trade-offs.
4. Analyze the institutional and cultural framework.
5. Prepare for better decision-making.
6. Implement change.

The size and distribution of green spaces in the city affect their capacity to provide ecosystem services (García & Losada, 2023). This suggests that urban forests should be strategically

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designed to maximize their ecological potential without generating conflicts with other services. An example of urban forest planning was the INVERCLIMA project in Galicia, which mapped areas to delineate green infrastructure, highlighting the importance of mixed and deciduous forests in providing multiple ecosystem services. The study concluded that combining forested areas with agricultural and grassland zones helps improve ecosystem resilience without compromising fire safety.

The integration of ecosystem services into territorial development not only supports biodiversity conservation but also promotes human well-being. Planning based on ES enables decisions that improve communities' quality of life by ensuring healthy, sustainable environments. In this sense, the use of participatory tools in territorial management contributes to designing strategies that benefit both the environment and people, ensuring a balance between socioeconomic development and environmental quality (Gómez-Campos *et al*., 2023; Dushkova *et al*., 2025).

It has been shown that greater species richness in green spaces is linked to mental health benefits, such as reduced stress and increased emotional well-being. Biodiversity not only beautifies the landscape but also plays a fundamental role in people's quality of life. Therefore, the conservation of urban biodiversity should be seen as an investment in public health, fostering environments that support the physical and mental well-being of the population (Marselle *et al*., 2021).

Green infrastructure, understood as a planned network of natural and semi-natural areas designed to provide ES, has the potential to improve human health and well-being. Although the benefits of green spaces are widely recognized, the specific effects of green infrastructure are less studied. Small elements, such as green roofs and walls, can mitigate urban flooding, regulate indoor temperatures, reduce heat islands, improve air quality, and decrease noise pollution. However, further evidence is needed to connect these effects with concrete health outcomes directly. Elements such as parks and urban trees, although not always considered part of green infrastructure, have demonstrated multiple health benefits, including stress reduction, improved mental health, and encouragement of physical activity.

Key points regarding the importance of urban parks and forests in the provision of ES that can enhance human well-being include:

- Carbon capture and storage.
- Regulation of the hydrological cycle.
- Erosion control.
- Biomass production.
- Improvement of air quality.

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- Supply of resources such as fruits and plant fibers.

The study by Chu, Li, and Chang (2021) evaluated 19 urban parks using the Neighborhood Green Space Tool (NGST), with limited representation from Latin America (only 8 articles, compared to more than 500 from the U.S. and China). This tool enabled analysis of different aspects of park quality across six key categories: accessibility, recreation, convenience, natural features, incivilities, and usability. Accessibility is a crucial factor, as safe and well-designed pathways facilitate entry and movement within the park. The availability of recreational facilities influences the level of physical activity and socialization among users, while amenities such as benches, trash bins, and adequate lighting enhance comfort and safety. Moreover, the quality of natural elements, such as well-maintained trees and vegetation, contributes to a sense of well-being and connection with nature. On the other hand, the management of incivilities, such as litter, vandalism, or excessive noise, is essential to ensure a positive experience. Finally, park usability, determined by user interaction and enjoyment, reflects the success of the design and maintenance of these spaces (Chu *et al*., 2021).

In Table 2, key aspects of this review were compiled to provide a concise description of the findings. This serves as an essential element for highlighting points of interest related to the object of study of this review and offers the reader a preamble to the article's conclusions and closing.

Table 2. Main Key Findings of the Review

Finding	Description	References
Geographic distribution of scientific production and its relation to ES	The United States and China concentrate most publications on urban parks and ES, possibly due to larger research budgets, consolidated academic networks, and the wide availability of urban parks, which facilitate sampling and data analysis.	Web of Science, 2025.
Multifunctional importance of urban parks and their contribution to Ecosystem Services (ES)	Urban parks provide multiple ES, including regulating services (climate control, pollutant capture, water regulation), provisioning services (genetic resources, pollinator habitats), cultural services (recreation, environmental education, cultural identity), and supporting services (nutrient cycles, biodiversity maintenance). It has been documented that a 1 % increase in urban vegetation cover can prevent up to 4.8 premature deaths per 100,000 inhabitants, demonstrating the direct connection between ES and public health.	Martínez *et al*., 2021; Wang *et al*., 2021; Montes & Forero, 2021; Ortega *et al*., 2023; Lobato *et al*., 2024; Rosales & Olmos, 2020; Millennium Ecosystem Assessment, 2005; Sirakaya *et al*., 2017; Cedillo, 2024.

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Continuation

Table 2. Main Key Findings of the Review

Finding	Description	References
Contribution to physical and mental health through regulating and cultural ES	Cultural and regulating ES provided by urban parks (such as reducing the urban heat island effect and providing safe leisure spaces) promote psychological and physical well-being. These benefits include improved emotional regulation, reduced anxiety and depression, and a lower incidence of cardiovascular diseases. Acting as "cooling islands" that reduce temperatures by up to 6.8°C, they also decrease heat stress, encouraging physical activity and social interaction.	Aram *et al*., 2019; OMS, 2016; Singkran *et al*., 2023; Cortes *et al*., 2023; Medina *et al*., 2021; Auer *et al*., 2022.
Socioeconomic benefits linked to cultural and provisioning ES	Well-managed urban parks increase nearby property values, generate jobs in cultural, recreational, and maintenance activities, and foster urban tourism. These benefits derive mainly from cultural ES (landscape attractiveness, recreation) and provisioning ES (usable biological resources), which can act as drivers of urban regeneration and social cohesion.	Ángel-Maya, 2013; Matos *et al*., 2024; Zhang *et al*., 2024; Hernández-Blanco *et al*., 2022.
Unequal distribution and insufficient management of urban parks	The unequal distribution of urban parks means that access to cultural, regulating, and supporting ES is conditioned by socioeconomic factors, producing urban inequities. This is critical in low-income communities, which often rely more on local ES due to the lack of private alternatives. Tensions between conservation and recreational use can degrade key ES such as microclimate regulation and biodiversity preservation.	González Osorio *et al*., 2022; Hernández *et al*., 2024; Balvanera & Cotler, 2007; Fox *et al*., 2022; Rigolón, 2016; Rincón *et al*., 2021; Reyes & Figueroa, 2010; Wolch *et al*., 2014; Rojas & Pérez, 2013; Matos *et al*., 2024.
Need for stronger public policies with a local focus	Although international frameworks exist, they lack effective implementation mechanisms in urban settings. Strengthening local public policies would ensure the continuous provision of ES, especially regulating and supporting those that require long-term planned interventions.	Pitt & Gunn, 2024; Sarı & Bayraktar, 2023; Martin *et al*., 2025; FAO, 2020; Chu *et al*., 2021.

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Table 2. Main Key Findings of the Review

Finding	Description	References
Urban biodiversity as a key factor of resilience	The biodiversity present in urban parks and forests contributes to climate regulation, improved air quality, reduced noise pollution, and the mitigation of environmental risks associated with urbanization. More diverse ecosystems generate greater benefits for public health and sustainability, making their conservation a priority in urban planning.	Marselle *et al*., 2021; Tran *et al*., 2022; Martin *et al*., 2025; Du *et al*., 2017.
Psychological benefits from contact with nature	Frequent contact with natural environments improves attention, regulates emotions, and reduces stress. Activities such as walking in a park or practicing “forest bathing” have restorative effects, reinforcing the importance of integrating accessible green areas into the urban fabric to promote mental health.	Bratman *et al*., 2012; Garibay, 2019; OMS, 2016.
Green infrastructure as a multifunctional strategy	Green infrastructure is not just a collection of green areas, but a planned network of natural and semi-natural spaces that work together to maintain ecological balance in the city. These spaces help capture carbon, regulate water, protect soil, and conserve biodiversity. When strategically integrated into parks and ecological corridors, they not only provide environmental benefits but also make cities more resilient and pleasant places to live.	García & Losada, 2023; FAO, 2020; Canadell *et al*., 2014

Based on the analysis, review, and compilation of the information presented in this table, the value of urban parks for human well-being and environmental sustainability is clearly expressed. The United States and China concentrate the largest share of scientific production on this topic (Web of Science, 2025), highlighting the advantage they gain from their resources and academic networks for conservation. The review shows how these spaces provide key ecosystem services, such as climate regulation, habitat provision, cultural benefits, and biodiversity support, with direct impacts on public health. Revealing data confirm that an increase in vegetation cover can prevent premature deaths. Urban parks improve mental and physical health, reduce anxiety and cardiovascular disease, and enhance their socioeconomic value through increased nearby

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property values, job creation, and tourism. However, the unequal distribution and access to green areas deepen inequities and may become a factor of marginalization, directly affecting vulnerable communities (Aram *et al*., 2019; WHO, 2016b; Singkran *et al*., 2023; Cortes *et al*., 2023; Medina *et al*., 2021; Auer *et al*., 2022; Martínez *et al*., 2021; Wang *et al*., 2021; Montes & Forero, 2021; Ortega *et al*., 2023; Lobato *et al*., 2024; Rosales & Olmos, 2020; Millennium Ecosystem Assessment, 2005; Sirakaya *et al*., 2017; Cedillo, 2024).

To address these challenges, robust local public policies are required that prioritize green infrastructure and biodiversity conservation, both essential for resilient cities. The strategic planning of these spaces not only mitigates environmental risks but also promotes social cohesion and quality of life, while highlighting their role in sustainable urban development. The authors consulted refer to international frameworks; however, the lack of effective implementation mechanisms in urban contexts is evident. Therefore, there is a need to strengthen local public policies to ensure the continuous provision of ES, such as regulating and supporting services, so that through planned interventions, political and ethical commitments can move from concern and discourse to reality and implementation (Pitt & Gunn, 2024; Sarı & Bayraktar, 2023; Martin *et al*., 2025; FAO, 2020; Chu *et al*., 2021).

Conclusions

Urban parks are essential green infrastructures for human well-being and environmental sustainability, as demonstrated by the evidence compiled in this review. However, only 24 % of the studies analyzed their impact on human well-being, revealing a ‘gap’ in interdisciplinary approaches. Most of the literature is concentrated in the U.S. (30 %) and China (24 %), with limited representation from Latin America. Key findings reveal that parks with less than 30 % vegetation cover (Mexia *et al*., 2018) lose 50 % of their climate regulation capacity, while increasing urban vegetation by just 1 % could prevent 4.8 premature deaths per 100,000 inhabitants (Martin *et al*., 2025). To close these gaps, it is urgent to prioritize research in tropical contexts and to design policies that guarantee equitable access to these spaces. This confirms their key role in providing ecosystem services, including climate regulation (with local temperature reductions of up to 2°C), air purification, and the promotion of mental and physical health.

Nevertheless, critical challenges persist. Only 15 % of the studies integrate human health metrics with ecosystem services, evidencing a disconnect between disciplines. Additionally, there is a geographical bias, with 80 % of publications focused on the U.S., China, and Europe, which limits applicability in tropical regions and Latin American cities with high inequality. This thematic gap underscores the need to strengthen multidisciplinary approaches that jointly address the environmental and human benefits of urban parks.

These spaces not only improve air quality, regulate the climate, and promote biodiversity, but also provide significant socioeconomic benefits, stress reduction, increased physical activity, and social cohesion. However, they face threats such as urban pressure, pollution, and inadequate planning, which jeopardize their capacity to continue providing these services.

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The integration of ecosystem services into urban planning is key to ensuring more livable, resilient, and sustainable cities. Tools such as the ISE guide and interdisciplinary approaches enable the identification, prioritization, and effective management of these services, ensuring that urban decisions align with environmental conservation and human well-being. Moreover, citizen participation and the economic valuation of ecosystem services underscore the importance of investing in green spaces and conserving urban biodiversity.

This article highlights the need to rethink the management of urban parks from an ecosystem perspective, recognizing their value beyond aesthetics or recreation. Incorporating ecosystem services into urban planning can significantly contribute to achieving goals such as the Sustainable Development Goals, particularly those related to sustainable cities, health, and climate change.

In a context of growing urbanization and climate change, urban parks emerge as natural solutions that not only mitigate environmental impacts but also improve people's quality of life. Their strategic design, proper maintenance, and sustainable management are fundamental to maximizing their ecological, social, and economic benefits. Ultimately, the protection and expansion of these spaces must be priorities on the global urban agenda, recognizing their value as pillars of healthier, more equitable, and more resilient cities.

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