Original article http://dx.doi.org/10.18623/rvd.v21.2408

CONTRIBUTIONS OF BIOPHILIA TO SUSTAINABLE DEVELOPMENT

CONTRIBUIÇÕES DA BIOFILIA PARA A O DESENVOLVIMENTO SUSTENTÁVEL

Article received on: 08/15/2022
Article accepted on: 03/25/2024

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The authors declare no conflict of interest.

Abstract
Addressing the application of biophilia in urban areas, this article aims to analyze the effectiveness of its implementation in promoting sustainable development in its three main dimensions: environmental, economic, and social. The study proposes three specific objectives. Firstly, to highlight the intrinsic connection between humans and nature, examining how this relationship has evolved over time and how the biophilic concept reaffirms it as a fundamental core. Next, to analyze how the 2030 Agenda, a global commitment to sustainable development, relates to biophilic principles, and to assess whether Brazilian legislation is contributing to integrating these principles into urban life in the country. Finally, to investigate and understand how the different dimensions of sustainable development connect to biophilic principles and their impacts on well-being in

Resumo
Abordando a aplicação da biofilia em áreas urbanas, este artigo tem como objetivo analisar a eficácia de sua implementação para promover o desenvolvimento sustentável em suas três principais dimensões: ambiental, econômica e social. O estudo propõe três objetivos específicos. Inicialmente, buscar-se-á evidenciar a conexão intrínseca entre os seres humanos e a natureza, examinando como essa relação se desenvolveu ao longo do tempo e como o conceito biofílico a reafirma como núcleo fundamental. Em seguida, analisar-se-á como a Agenda 2030, um compromisso global para o desenvolvimento sustentável, se relaciona com os princípios biofílicos, e verificar se a legislação brasileira está contribuindo para integrar esses princípios na vida urbana do país. Por fim, este artigo buscará investigar e compreender como as diferentes dimensões do desenvolvimento sustentável se conectam aos princípios biofílicos e seus impactos no

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urban areas, especially in achieving goal 11.7 of the aforementioned Agenda. Considering biophilia as one of the guiding principles of sustainable development, it is concluded that when applied in urban areas, it is a principled conception capable of reconciling urban progress and human relations with nature, providing an increase in individuals' well-being and contributing to the expansion of green areas in urban spaces, as well as collaborating with sustainable precepts. The contribution of this study lies in the need to establish a new paradigm for human interaction with the environment through development that promotes harmonious interaction with nature. To achieve the intended scope, the present research employed the hypothetico-deductive method, starting from the concept of biophilia to analyze whether its principles and guidelines can inspire sustainable actions, involving bibliographic and documentary research.
Keywords: Agenda 2030; biophilia; green urbanism; sustainable development.

bem-estar nas áreas urbanas, especialmente na realização da meta 11.7 da referida Agenda. Considerando a biofilia um dos princípios orientadores do desenvolvimento sustentável, conclui-se que, quando aplicada em áreas urbanas, trata-se de uma concepção principiológica capaz de conciliar o progresso urbano e as relações humanas com a natureza, proporcionando um aumento no bem-estar dos indivíduos e contribuindo para a expansão das áreas verdes no espaço citadino, além de colaborar com os preceitos sustentáveis. A contribuição deste estudo reside na necessidade de estabelecer um novo paradigma para a relação humana com o meio ambiente por meio de um desenvolvimento que promova uma interação harmônica com a natureza. Para alcançar o escopo pretendido, esta pesquisa empregou o método hipotético-dedutivo, partindo do conceito da biofilia para analisar se seus princípios e diretrizes podem inspirar ações sustentáveis, envolvendo pesquisa bibliográfica e documental.
Palavras-chave: *Agenda 2030; biofilia; desenvolvimento sustentável; urbanismo verde.*

Introduction

Biophilia, a concept that integrates nature and man that has already gained prominence internationally, is still timidly debated and implemented at the national level. Its core lies in the connection between human beings and biotic factors, as a kind of original relationship, thus, the integration and harmony with what is coming from the environment would be a presupposition for a greater quality of human life.

Likewise, sustainable development is a topic in vogue at the international level due to its relevance to making possible the reconciliation between the environment and human beings, in order to make possible the coexistence of the well-being of individuals and a balanced environment without human experience consisting of an extractive relationship with nature.

The indispensability of outlining a new sustainable paradigm is such that the 2030 Agenda was elaborated with its 17 sustainable development objectives, in a global plan, so that States seek to qualify their progress as opposed to just quantifying it.

This international commitment, signed by more than 190 countries, includes the commitment to bring implementations that turn existing cities and settlements into more sustainable, safe, and green environments, included in objective 11.7 of the aforementioned Agenda.

In this way, the present analysis finds the following question as problematic: How does biophilia, as a set of restorative principles regarding human connection with the environment, contribute to the principles of sustainable development outlined in the 2030 Agenda? To answer the question, the present research will seek to analyze whether biophilia can be considered as a possible integrating instrument of that objective and ascending agent in the quality of human life in large urban centers.

The study is of great relevance in the face of the environmental crisis, which has been causing planetary climate change, directly affecting the quality of human life, whether in rural or urban areas.

This crisis has resulted in species extinctions, an increase in climate instability in large urban centers, as well as an increase in the risk of the emergence of new diseases, making latent the need to recover the biophilic relationship between humans and nature and, to convert the extractive development into sustainable development.

To achieve the outlined objectives, the research will be divided into three distinct sections. In the first part, we will explore the transformation of the human relationship with the environment, considering the phenomena of geological eras evolution and the industrial revolution, and how these changes have impacted human quality of life and ecological balance. Additionally, we will seek to highlight the human connection with nature through the biophilic concept and its guiding principles.

The second section will focus on analyzing Goal 11.7 of the 2030 Agenda and studying biophilia as a possible guiding conception in the pursuit of sustainability. To do so, we will explore Brazilian legislation aimed at environmental conservation in public spaces and analyze its potential contribution, or lack thereof, to fulfilling the international commitment made by the country.

Finally, the third section will delve more deeply into the connection between the biophilic concept applied in urban centers and sustainable development in its three main dimensions: environmental, social, and economic. Our aim will be to align the objectives of both, aiming to provide a healthy environment and a high quality of life for humanity.

To answer the research problem and fulfill the objectives outlined, the

research will be exploratory and descriptive, guided by the study of bibliographic and documentary references through a hypothetical-deductive approach.

1 Biophilia and human well-being

Biophilia, a word derived from Greek that combines "life" (bios) and "love" (philia), addresses the inherent dependence of human beings on being connected to biotic factors to promote their well-being (Wilson, 1984). Thus, it highlights that, due to the evolutionary process undergone by our species, there is a natural affinity between humanity and life forms and their environments. Therefore, from this deep historical connection with nature arises the need for human interaction with the environment and access to biological diversity as a conditioner of social well-being. This deep bond, rooted in evolutionary interaction, indicates a tendency towards prioritizing environmental conservation by individuals.

Although Wilson (1984) does not expressly list biophilic principles, when discussing the profound connection that nature has on human well-being, it can be inferred that recognizing the importance of biological diversity and its interactions with human cultural construction are guidelines that lead to adherence to the ideal of sustainability. Both propose the conservation of biodiversity and the promotion of sustainable practices through awareness and education, as premises for a healthy society (physically and psychologically) and a more balanced lifestyle.

The theory of biophilia corroborates the Declaration on Bioethics and Human Rights, which recognizes the ecological dimension and its connections with the environment, as constituent elements of the identity of individuals (Unesco, 2006).

This interaction with what is natural had its sharp decline with the demographic phenomenon of population expansion and mass migration to urban centers, in order to assume the job opportunities generated by the Industrial Revolution (Herzog, 2013).

This migratory movement from rural areas to cities led to a massive urbanization process that impacted and modified the natural elements of the environment, due to the lack of urban planning (Herzog, 2013; Ribeiro *et al.,* 2019). This made the large centers increasingly segregate themselves from contact with nature and turn to human constructions, with green spaces being limited to small public areas, such as squares and parks, which are commonly disconnected from areas functioning of urban life (Herzog, 2013).

Silva (2013) points out that this growth without planning caused serious

structural problems, such as high levels of pollution, and environmental deterioration, in addition to unsustainable consumption patterns that accentuated social inequalities. Nevertheless, Odum (1988) had already predicted that these physiognomic changes would occur on the planet in the face of the rural exodus.

To better understand the problem presented, it should be noted that the United Nations (2018) predicts that by 2050 the urban world population will reach 68%, and in Brazil, the urban population will exceed 90%, however, our relationship with nature has been modifying for some time.

What happens is that humanity has revolutionized its behaviors and customs over the years. Until about 10,000 years ago, before humanity entered the era known as the Holocene (Campello; Amaral, 2020), individuals had nomadism as their main means of subsistence hunting and harvesting vegetables from the wild nature. Thus, this lifestyle imposed by climatic instability, caused by the ice age, promoted a physically active life, since the distances covered could reach ten kilometers per day (Herzog, 2013).

These hunting and gathering activities developed by our ancestors and their nomadic lifestyle had little impact on the environment and wildlife, and their rotational practices facilitated a rapid recovery from damages. This Era was characterized by a profound relationship between humans and nature. This intrinsic connection with nature is reflected in the biophilic principles, which highlight the natural affinity of humans with biological diversity, the need for connection with the natural world, and the appreciation of the sensory and aesthetic experiences offered by nature (Herzog, 2013; Wilson, 1984).

However, with the arrival of the Holocene Era, the need to move around to hunt or gather fruits and vegetables was no longer necessary, due to the domestication of animals and the beginning of the practice of agriculture. This decrease in human mobility and stagnation in certain places, inaugurated the concept of property, started the process of sedentarism, and consequently, changed the individuals' relationships with the environment, accelerating its degradation and intensifying the transformations caused by man's new predatory and extractive relationship with the environment into which he was inserted (Herzog, 2013; Stoppani, 1873).

> The appreciation of the idea of property, the advent of modern science with the Cartesian theory – which made it possible to create unprecedented instruments for intervention in the natural environment –, as well as the development of mercantilism and agricultural and industrial exploitation brought a profound change in this panorama, in which Nature came to be seen as an object endowed

> with economic value and available for free use by man (Campello; Lima, 2020, p. 85, free translation[1]).

Thus, the socio-structural changes resulting from sedentarism, from the evolution of villages to cities in the modern conception, increased life expectancy, and transformed the relationship between man and nature, giving it more exploratory contours (Campello; Lima, 2021; Herzog, 2013). This new paradigm established by population expansion and the subsequent creation and mass migration to urban centers, in addition to increased longevity, culminated in a disorderly and non-strategic growth, which caused even more environmental impacts.

Currently, an environmental crisis is underway that transcends borders and reaches global levels. "In an ecological perspective centered on the concept of living, the ecological crisis appears as a rupture in the original relationships between culture and nature, between society and place, between living and habits" (Trevisam *et al.,* 2020, p. 4). Thus, this imbalance originates in the instrumentalization of nature as a means of obtaining profit, transforming what is natural into capitalizable income (Campello; Lima, 2021).

Such changes caused by human action were so profound that a new geological epoch was inaugurated, called the "Anthropocene" (Crutzen; Stoermer, 2000; Campello; Amaral, 2020).

Schimelpfenig (2017) points out that one of the most fearful points of the Anthropocene is the large-scale extinction of species, the increase in climate instability in large urban centers, and the increased risk of emergence of new diseases, due to environmental imbalance (Campello; Amaral, 2020).

> Science no longer denies that human activity has substantially altered all-natural aspects of the Planet, creating a situation of extreme risk not only for other species but for the human species itself. All these geological, climatic, fauna, and flora changes were motivated more by a hedonic desire for productivity and convenience than by the need for the self-fulfillment of our species (Campello; Amaral, 2020, free translation[2]).

1 Original text: "A valorização da ideia de propriedade, o advento da ciência moderna com a teoria cartesiana – que possibilitou a criação de instrumentos de intervenção no meio natural sem precedentes –, bem como o desenvolvimento do mercantilismo e da exploração agrícola e industrial trouxeram uma profunda modificação desse panorama, em que a Natureza passou a ser vislumbrada como objeto dotado de valor econômico e disponível para a livre utilização pelo homem".

2 Original text: "A ciência já não nega que a atividade humana alterou de forma substancial todos os aspectos naturais do Planeta, criando uma situação de extremo risco não só para as outras espécies, como para a própria espécie humana. Todas essas alterações geológicas, climáticas, na fauna, na flora foram motivadas mais por um desejo hedônico de produtividade e comodidade do que por necessidade da autorrealização de nossa espécie"

Consequently, humanity figures in the passive and active pole of the environmental crisis, having provided, through exploratory actions, the imbalance that now also threatens its own subsistence. This change of attitude, in which the human being ceases to integrate nature, to assume the position of usufructuary and explorer, not only caused damage to the environment but also had an impact on their own health and well-being:

> The consequences of these problems present a common point in their origin that resides in anthropic activities, which affect all forms of life on the planet, including the human being himself who, in addition to being responsible for the borderline situation experienced today, also suffers directly with the results arising from this Scenario (Campello; Lima, 2020, p. 86, free translation[3]).

The relationships between health, well-being, and the environment have already been recognized by the World Health Organization, which prepared a document that dealt precisely with how environmental problems can affect the health of the population (Campello; Lima, 2020). Therefore, the concern of having a healthy and ecological urban environment that provides the population with a healthy life comes into play.

> The quality of urban life is directly linked to several factors that are gathered in infrastructure, economic and social development, and those linked to environmental issues. In the case of the environment, it is an essential element for the well-being of the population, as it directly influences the physical and mental health of the population (Loboda, 2003, p. 20, free translation[4]).

As Campello and Amaral (2020, p. 52) point out, "the human being, at the same time that he needs to explore natural resources, also depends entirely on them for his full flowering". This human need for contact with nature, and its benefits, have already been proven through a study carried out in 2016 that pointed out that contact with green areas provides a significant improvement to the health of individuals, contributing to the reduction of cardiovascular problems, overweight and other comorbidities, and reducing anxiety and depression (Amato-Lourenço *et al.*, 2016).

3 Original text: "As consequências dessas problemáticas apresentam um ponto comum em sua origem que reside nas atividades antrópicas, as quais afetam todas as formas de vida existentes no planeta, inclusive o próprio ser humano que, além de ser o responsável pela situação limítrofe vivenciada da atualidade, também sofre diretamente com os resultados decorrentes desse cenário".

4 Original text: "A qualidade de vida urbana está diretamente atrelada a vários fatores que estão reunidos na infra-estrutura, no desenvolvimento econômico-social e àqueles ligados a questão ambiental. No caso do ambiente, constitui-se elemento imprescindível para o bem-estar da população, pois a influencia diretamente na saúde física e mental da população".

It is precisely in this aspect that biophilia emerges. It presents itself as a set of principles reconciling urban progress and human connections with nature, with urbanism turning to the implementation of nature in its projects, in order to increase the quality of life of its inhabitants (Moraes *et al*., 2020).

Through biophilia, what is sought is to move beyond green areas, which are already provided for in legislation that deals with urban planning and are commonly restricted to parks and squares. It seeks to affect the interaction between citizens and nature, facilitating their access (Moraes *et al*., 2020).

By favoring the interaction between humanity and nature, and promoting environmental recovery in urban areas, sustainable urbanism will be implemented in cities, which in addition to providing a healthy environment for the population, contributes to the achievement of one of the objectives set out in the Development Objective. Sustainable 11 of the 2030 Agenda, an international commitment signed by Brazil (Moraes *et al*., 2020; Pereira; Nadalin, 2018).

2 The importance of biophilia to achieve Objective 11.7 of the 2030 Agenda

Faced with the environmental crisis that triggered climate change, aggravating food shortages, water instability, and accentuating social and economic problems in several countries, it was necessary to put together an action plan, which had an international collaboration to try to curb the transboundary contours that the consequences of this crisis present (Pereira; Nadalin, 2018). To this end, the United Nations organized the 2030 Agenda to ensure human rights, which has 17 Sustainable Development Objectives – SDGs:

> The 17 Sustainable Development Objectives and 169 targets […] demonstrate the scale and ambition of this new universal Agenda. They consider the legacy of the Millennium Development Objectives and seek to make progress on unachieved objectives. They seek to ensure the human rights of all and achieve gender equality and the empowerment of women and girls. They are integrated and indivisible, and blend, in a balanced way, the three dimensions of sustainable development: economic, social, and environmental (UN, 2016, p. 1, free translation[5]).

5 Original text: "Os 17 Objetivos de Desenvolvimento Sustentável e as 169 metas (…) demonstram a escala e a ambição desta nova Agenda universal. Levam em conta o legado dos Objetivos de Desenvolvimento do Milênio e procuram obter avanços nas metas não alcançadas. Buscam assegurar os direitos humanos de todos e alcançar a igualdade de gênero e o empoderamento de mulheres e meninas. São integrados e indivisíveis, e mesclam, de forma equilibrada, as três dimensões do desenvolvimento sustentável: a econômica, a social e a ambiental".

SDG 11 provides for sustainable cities and communities, with 10 objectives, which together aim to "provide safe, inclusive and sustainable cities and settlements" (UN, 2016, p. 271). As Campello (2020) points out, SDG 11 is a material duty, which consists of the state's obligation to the population to protect the full enjoyment of their human rights, in the face of environmental damage caused by the ecological crisis.

In the present analysis, it is worth highlighting objective 11.7, which aims to "provide universal access to safe, inclusive, accessible and green public spaces by 2030" (Pereira; Nadalin, 2018, p. 287), an objective that was adequate across Brazil, to include broadly all groups in situations of vulnerability.

According to an IPEA report, green public spaces are defined as "public areas with environmental amenities, such as squares, parks, nature reserves, etc" (Pereira; Nadalin, 2018, p. 287).

In Brazilian legislation, according to law 9.985 of July 18, 2000, which establishes the National System of Nature Conservation Units, the concept, and purpose of parks are:

> The preservation of natural ecosystems of great ecological relevance and scenic beauty, enabling scientific research and the development of environmental education and interpretation activities, recreation in contact with nature, and ecological tourism (Brasil, 2004, p. 14, free translation[6]).

In this same sense, the Secretariat of Infrastructure and Environment of the State of São Paulo (Sima, [20--], free translation), adds:

> Parks are conservation units, terrestrial and/or aquatic, normally extensive, intended for the protection of representative areas of ecosystems, and may also be areas endowed with notable natural or landscape attributes, geological sites of great scientific, educational, recreational, or of tourist interest, whose purpose is to protect exceptional attributes of nature, reconciling the full protection of flora, fauna and natural beauty with use for scientific, educational and recreational purposes[7].

6 Original text: "A preservação de ecossistemas naturais de grande relevância ecológica e beleza cênica, possibilitando a realização de pesquisas científicas e o desenvolvimento de atividades de educação e interpretação ambiental, de recreação em contato com a natureza e de turismo ecológico".

7 Original text: "Os parques constituem unidades de conservação, terrestres e/ou aquáticas, normalmente extensas, destinadas à proteção de áreas representativas de ecossistemas, podendo também ser áreas dotadas de atributos naturais ou paisagísticos notáveis, sítios geológicos de grande interesse científico, educacional, recreativo ou turístico, cuja finalidade é resguardar atributos excepcionais da natureza, conciliando a proteção integral da flora, da fauna e das belezas naturais com a utilização para objetivos científicos, educacionais e recreativo".

However, as McCormick (1992) points out, there was a distortion of the conception of parks as green areas, providing more recreational spaces with wooded areas for the leisure of the urban population, than the effective preservation of natural ecosystems.

In addition, the amount of green and conservation areas is not large enough to provide an environmental recovery and provide universal access to the population, for example, according to data from Ibram – Instituto Brasília Ambiental (2018), parks in the Brazilian capital have a 41% of degraded plant area.

In view of what has been exposed so far, the need to establish a new paradigm for urban green areas is latent, with the scope of meeting the international commitment signed by the country to enable universal access to these spaces, as well as to provide an increase in quality of life and well-being for its population, through the reconnection between humanity and nature.

The biophilia used in urban areas thus appears as a viable alternative for the implementation of nature in human coexistence, without restricting this contact to small and punctual wooded spaces that, generally, are far from the environments of functional life in cities, such as the cases of most parks and squares in urban centers (Herzog, 2013; Kellert, 2018; Moraes *et al*., 2020).

The application of biophilia takes place by scale, according to the table prepared by Moraes (2020) and is not limited to public areas such as squares and parks but expands gradually.

The staggered implementation starts in buildings, through spaces with natural lighting, and green roofs (Moraes *et al.*, 2020). It extends through the blocks and streets with the implementation of green patios, afforestation in the streets, and low-impact urban development that preserves the degree of soil permeability (Kellert, 2018; Moraes *et al.*, 2020).

Finally, reaching the neighborhoods, cities, and regions, through the recovery of rivers, reforestation of urban forests and ecological parks with native trees, as well as the implementation of community gardens and orchards, until it is inserted into the areas of formation and coexistence of citizens, such as schools and green public service corridors, through urban ecological networks, among other measures (Moraes *et al*., 2020; Kellert, 2018; Beatley, 2011).

In order to carry out these biophilic projects, ecological and sustainable urban planning, which includes comprehensive measures in the various sectors of urban life, is imperative. The collaboration of the construction sectors, such as architecture and engineering, is primordial for urban management and planning measures, such as the adoption of renewable energy generation, water and

transport management, waste reduction, and protection of green areas, among other measures of management of natural resources and impacts caused (Gauzin-Müller, 2011).

In economic sectors, Gauzin-Müller (2011) emphasizes the need to institute taxes and fees on the use of non-renewable materials, and fees on the generation of polluting waste, in order to reduce extractive economic production. The incentive for companies to adapt to ecological accounting and implementation of regulatory changes on buildings through tax benefits are also proposed to encourage adherence to biophilic projects.

However, although the collaboration of the aforementioned sectors is extremely important, the role of society's participation is fundamental. The implementation of biophilia needs to be democratic, with the cooperation of those interested in the areas of education, health, and ordering community life. Thus, an interdisciplinary approach is imperative (Gauzin-Müller, 2011. p 49).

Biophilic cities are apt means of improving well-being in urban centers, restoring the correlation between humans and nature, as well as influencing the effective quality of life since numerous studies show that the presence of green areas in public spaces serves as stimulators of healthy habits and behaviors (Amato-Lourenço *et al.*, 2016; Kellert, 2018; Newman, 2014).

Therefore, the measures and consequences of biophilia, applied in urban centers, are in line with SDG 11 and its objective 11.7 to provide safe cities and communities with universal access to green areas, providing opportunities for the effective implementation of sustainable development as human rights, for the fulfillment of the 2030 Agenda.

3 Biophilia in urban spaces to achieve sustainable development

Brazilian legislation has several legal institutes in order to protect fauna and flora. In rural areas, the legal reserve aims to promote the sustainable economic use of natural resources. In the urban area, as far as it is concerned, there is provision for urban green areas, which consist of spaces that can be in the public or private domain, as provided for in the Forest Code:

> […] urban green area: spaces, public or private, with a predominance of vegetation, preferably native, natural, or recovered, provided for in the Master Plan, in the Urban Zoning and Land Use Laws of the Municipality, unavailable for housing construction, intended for the purposes of recreation, leisure, improvement of urban environmental quality, protection of water resources, landscape maintenance

> or improvement, protection of cultural assets and manifestations (Brazil, 2012, p. 5, free translation[8]).

However, what is shown is that many times, these legal provisions have not been efficient to what is proposed, because they keep the green areas attached to certain places and certain audiences.

For an effective and universal sustainable urban development, it is necessary that measures are taken, not only in the environmental sphere but also in the economic and social spheres, in an interdisciplinary and interdependent way. To better clarify, it is useful to bring an analysis of sustainable development in its three main pillars and explore how they relate to biophilia.

The 2030 Agenda, with its objectives for sustainable development, aims to mitigate the problems triggered by the environmental crisis, providing a more equitable and healthier planet. For this, it is based on three dimensions in which its actions are proposed: environmental, economic, and social (UN, 2016).

3.1 Environmental dimension: Ecological recovery and sustainability in urban space

The environmental dimension is the best known of the dimensions that make up sustainable development, being the one that deals with ecological issues. More than necessary, dedication to this dimension is fundamental, according to its importance highlighted by the UN:

"The depletion of natural resources and the negative impacts of environmental degradation, including desertification, droughts, land degradation, freshwater scarcity and loss of biodiversity add to and exacerbate the list of challenges facing humanity" (UN, 2016, p. 6).

In this sense, biophilia effectively contributes to the achievement of sustainable urban development, since it not only achieves but goes beyond it, since, in addition to reversing the harmful process of the disorderly expansion of large cities within urban spaces, native forests, have as its intrinsic value the concrete communion between humanity and nature incorporated into urban daily life (Herzog, 2013; Moraes et al, 2020; Beatley, 2014).

The advantages of biophilia used in cities can be measured on several scales,

8 Original text: "área verde urbana: espaços, públicos ou privados, com predomínio de vegetação, preferencialmente nativa, natural ou recuperada, previstos no Plano Diretor, nas Leis de Zoneamento Urbano e Uso do Solo do Município, indisponíveis para construção de moradias, destinados aos propósitos de recreação, lazer, melhoria da qualidade ambiental urbana, proteção dos recursos hídricos, manutenção ou melhoria paisagística, proteção de bens e manifestações culturais".

ranging from the recovery of degraded and polluted environments, with the increase of green spaces that provide a greater area of permeable land and favor the replenishment of water tables, to the reduction of the high temperatures caused by the heat islands, which jointly contribute to the reduction of the incidence of solar radiation (Yok *et al.*, 2009; Mascaró; Mascaró, 2002; Gauzin-Müller, 2011; Moraes *et al.*, 2020).

3.2 Social dimension: citizenship, well-being, and quality of life

Just as it supports sustainability in its environmental dimension, biophilia also favors the social dimension in urban environments. The social dimension, which is tasked with ensuring sustainable growth in an equitable way to ensure that everyone has a high standard of living, deals with concerns relating to citizenship, health, and education, among other things (Sachs, 1993; Garcia, 2016; Elkington, 2012; Pinto, 2020).

Regarding the exercise of citizenship, this is not only enhanced with the implementation of a biophilic design but also presupposes the participation of society in its realization.

For Gauzin-Müller (2011) Participation in social activities is crucial. One of the actions that make up the area he refers to as environment and local democracy is the engagement of interested parties as well as the opening of a line of communication between the government and society, which is to be informed and consulted. In view of this, citizenship is not only encouraged, but also essential for biophilia to be implemented and maintained in cities (Gauzin-Müller, 2011; Farr, 2013).

As citizenship is an element of remarkable value for a more fair and democratic society, in order to encourage it, environmental education is also one of the necessary and fundamental measures for an efficient biophilic project (Gauzin-Müller, 2011; Bonzi, 2017).

Biophilia also influences the well-being and quality of life of individuals. Dependence on a connection between human beings and nature (Wilson, 1984), makes contact, or the lack of it, have an impact on the quality of life of society in urban everyday life (Kellert, 2018).

Several studies point to positive results regarding the connection of nature to human health. The Healing Gardens theory of Roger Ulrich (1992), as an example, was related to biophilia by Susan Erickson (2012), when she added that nature effectively collaborates for beneficial health outcomes for patients in a hospital environment.

Applied to the urban environment, biophilic urbanism is related to reducing the risk of physical and mental illnesses, in addition to stimulating self-care behaviors, such as the practice of physical exercises outdoors (Beatley; Newman, 2013; Farr, 2013).

In view of this, biophilic environments increase the quality of life and well-being, in addition to promoting the fundamental right to a balanced environment, according to article 225 of the Federal Constitution of Brazil, which, as explained by Campello and Amaral (2020), is a presupposed element. for the dignity of the human person (Herzog, 2013; Bonzi, 2017; Brasil, 1988).

3.3 Economic dimension

Finally, the economic dimension of sustainability is also impacted by biophilia since it provides the sustainable economy approach, idealized by John Elkington (2012), who proposes that profit is not the only parameter and objective of companies, but that, considering also people (human capital) and the planet, forming what came to be known as the "sustainability tripod".

Qualitative, not quantitative, growth is the main objective of the economy within sustainability. Thus, biophilia, by providing a gain in human capital, since the quality-of-life increases, generates a reduction in public health spending for the economic sector (Campello; Silveira, 2016; Moraes *et al.*, 2020).

For the planet, the gains are the most easily perceived, as already mentioned in the environmental dimension. Nevertheless, the planetary benefits are intricately linked to the part of the sustainability tripod corresponding to profit, since, with urban biophilia, atmospheric pollution rates are reduced, through the carbon sequestration promoted by urban forests. This feat has already been financially measured by the city of Austin, USA, which, when carrying out studies, concluded that the compensatory value for the reduction of carbon footprints could reach 16 billion dollars (Mascaró; Mascaró, 2002; Gauzin-Müller, 2011; Nowak *et al.*, 2016).

The reduction in the need for electricity is another economic gain that can be seen in the capital of companies, since with greater afforestation, the urban heat islands are reduced and there are greater shading areas on the buildings, reducing the need for air conditioning inside the buildings, and consequently increasing the profit margin with the reduction of financial liabilities (Rosenzweig, 2013; Moraes *et al.*, 2020).

Thus, biophilic urbanism also provides sustainable development in terms of

its economic dimension, by promoting the "junction between the right to development and the right to a healthy environment" (Silveira; Sanches, 2015, p. 318).

Given that a substantial portion of the world's population lives in urban areas, it may be argued that urban growth and the sustainable management of these spaces are essential for both the present and future generations. The importance of the issue was expressly recognized by the UN in recognizing "that urban development and sustainable management are fundamental to the quality of life of our people" (UN, 2016 p. 12).

As biophilia can mitigate the negative impacts of activity, exploitation, and degradation promoted by humanity, the participation of society and economic sectors has already proved indispensable, however, it will only be possible to engage these sectors through public policies.

Places that have implemented public policies to promote the expansion of green areas have already obtained satisfactory results, as in the case of Singapore, which expanded its green areas through strategies that articulated society, companies, and the government. For this, social participation, the promotion of ecological sciences and technologies, and the implementation of parks and green corridors were encouraged, which serve as places to develop research and promote education on biodiversity (Yok *et al.*, 2009; Newman, 2014).

As a result, the population's quality of life has increased, leading Singapore to occupy the eleventh place in the Global Human Development Index – HDI ranking in 2014, ahead of countries such as the United Kingdom and Sweden (Yok *et al.*, 2009; Newman, 2014; Moraes *et al.*, 2020; UNDP, 2015).

The realization of sustainable development and the integration of the biophilic concept in urban areas contributes to restoring the healthy connection of individuals with the environments in which they are inserted. Simultaneously, it contributes to addressing the global environmental crisis while also committing to the realization of sustainable development as human rights, among other issues that appear as goals in the 2030 Agenda.

Conclusion

As pointed out during the present study, the exploitation and degradation of the environment by human actions resulted in an ecological and climate crisis so deep that it transformed the planet earth in a marked way, pushing humanity to establish a new paradigm for the search for its development.

In view the discussions surrounding sustainable development as a new

standard to be adopted by countries to prioritize the prosperity of nature, the economy, and social well-being, this research focused on the issue of whether the biophilic concept contributes to sustainable development principles and to the transformation of urban centers towards a sustainable and inclusive direction, in alignment with Goal 11.7 of the Agenda 2030.

In the first section, significant changes in the human-nature relationship were observed as human abilities developed. From a pure dependence of nomads, who used nature solely for subsistence, it transitioned to an extractive relationship, exploiting it economically. This triggered a geological era of climatic instability, resulting in mass extinctions and new diseases. Human well-being, previously driven by the industrial revolution and urbanization, is now negatively affected by climatic instability and its various impacts. The rural exodus to urban centers, in a disorderly manner, further impaired human quality of life, emphasizing the importance of connection with nature for physical and mental health.

Thus, in the second section, an analysis of biophilia was conducted, presenting an integrating conception of nature in human experience in a more profound way, aiming at rescuing the original relationships between society, its customs, and nature, as a mechanism for achieving objective 11.7 of the 2030 Agenda.

In order to proceed with this analysis, the Brazilian legislation that deals with environmental conservation units within urban areas conducted a study in order to verify whether these norms provide green areas that are factually integrative with society and sustainable, corroborating the fulfillment of the international commitment signed by Brazil on the aforementioned agenda.

As a result of this study, it was verified that there is a need to establish a new model of urban green areas, given that the spaces destined for environmental conservation have a much more recreational character than the preservation of ecosystems, in addition to the universal inaccessibility to areas by the population with less economic power.

Therefore, the analysis of biophilia was positive in the sense of being a guiding principle of sustainability, enabling goal 11.7 and promoting social well-being in urban areas. This is because such a concept is not limited to providing green areas in public spaces, but integrates contact with nature into the functional spaces of urban life, such as buildings, streets, courts, and courtyards within cities, which now include green roofs and are designed to take advantage of natural lighting, as well as initiatives like the reforestation of streets and neighborhoods, and other measures.

Finally, the third and final section demonstrated the compatibility of

biophilia with sustainable development in its three main dimensions: in the environmental one, with the recovery of degraded areas and the protection of those that are conserved, as well as with the stimulus for the implementation of urban greens inside the properties; In social terms, which included increasing equitable access to green spaces in all urban environments, improving overall quality of life, and promoting citizenship through societal participation in the realization of biophilic projects within communities, among other social areas recognized such as environmental education; and in the economic dimension, when looking for qualitative growth that considers human capital rather than merely quantitative growth, financial gains are also enhanced with the adoption of biophilic procedures within corporate spaces to improve the health, and thus the income, of employees while also lowering expenses related to lighting, which takes advantage of natural light, and air conditioning to combat heat islands.

The integration of biophilia principles into sustainable development policies and practices offers a holistic and future-oriented approach to addressing the environmental, social, and economic challenges. By recognizing and valuing the deep connection between humans and the environment, we can build more resilient, healthy, and prosperous communities where nature is valued as a vital and precious resource.

All these sustainable and social gains depend on the implementation of public policies aimed at a biophilic concept, in order to provide the mitigation of the consequences of human extractive actions, recover the compromised environment, contribute to nature to re-qualify human life within the spaces' functional aspects of urban life, and consequently implement the objective 11.7 of the 2030 Agenda, promoting the access of the entire population to inclusive and sustainable urban spaces, thus achieving sustainable development.

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Authors' participation
Both authors took part in all the stages of writing this article.

How to mention this article (ABNT):
TREVISAM, E.; OLIVEIRA, S. C. S. The biophilia concept to promote sustainable development. *Veredas do Direito*, Belo Horizonte, v. 21, e212408, 2024. Available from: http://www.domhelder.edu.br/revista/index.php/veredas/article/view/2408. Access on: Month. day, year.