



Person-environment relationship, urban sustainability and public policies in the coronavirus pandemic: literature review

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ABSTRACT

The COVID-19 pandemic has significantly affected urban habits around the world and, in the face of social isolation and other sanitary measures taken, there are concomitant benefits to the urban environment. The current study seeks to analyze the scientific literature on the person-environment relationship, in the urban context, during the coronavirus pandemic. An integrative literature review was carried out, based on the search for scientific articles in the Web of Science (WOS), ScienceDirect and PubMed databases, from January 2020 to January 2022. An integrative literature review was carried out, based on the search for scientific articles in the Web of Science (WOS), ScienceDirect and PubMed databases, from January 2020 to January 2022. Three combined keywords, in English, were used for the selection of articles: environmental perception, environmental concern and Covid-19. The results showed that the sustainable urban environment was important for better coping with the pandemic, especially in the period of social isolation, in which contact with the green environment provided an increase in urban resilience. It is concluded that the strengthening of the person-environment relationship and socio-environmental responsibility represent a promising strategy to build a greater commitment of society to the environment after facing the covid-19 crisis.

KEYWORD: Covid-19. Environmental perception. Environmental concern. Urban green space. Well-being.

1 INTRODUCTION

The coronavirus has become a harmful agent that has infected thousands of people around the world, being responsible for at least 557,814,521 cases and 6,367,417 deaths worldwide by June 2022 (Worldometers, 2022). In view of this, the urban population was forced to remain socially isolated, as a result of public policies implemented as a strategy to reduce transmission curves and mortality from the virus.

Among these policies, the laws and decrees that started to establish voluntary and compulsory social isolation stood out, as well as the prohibition of gatherings and events with public. With this, we sought to reduce viral circulation and protect the population, given the lack of vaccine, medication, beds and health professionals for the monitoring and treatment of those infected (Luo; Hendryx, 2021).

In the urban context, the improvement of air quality, the decontamination of rivers, streams and lakes, the reduction of acid rain and the appearance of wild animals, were indicators of the impact of social isolation on the environment. With the end of social isolation, the idea of urban sustainability, combined with an improvement in the quality of life, spread, including with the increased demand for urban constructions that respect the environment and sustainability. (Guo *et al.*, 2022).

At the same time, urban green spaces have become important sources of resources to face the pandemic, with emphasis on sustainable urbanism. Parks, forests and natural spaces for urban recreation have become sought after by the population, in search of well-being and stress relief, since, with the pandemic, in addition to the fear that the coronavirus has caused in people, financial concerns have intensified. and the psychosocial crisis arising from mass social distancing (Guo *et al.*, 2022).

Against the grain of the crisis that devastated the world, the environment benefited, mainly with the reduction of greenhouse gases (CO₂, for example) and with the reduction of other pollutants, such as sound and visual. As a result, animals appeared in places not previously seen, such as dolphins, jellyfish, whales, fish, jaguars, birds, among others, which made news around the world. (Ninyà et al., 2022).

In this vein, studies such as Mallick (2021) and Buzási (2021) have analyzed how urban growth in line with urban resilience has been applying concepts of sustainable development that respect the environment. An example of this is the Prediction-Adaptation-Resilience (PAR) tool, which makes it possible to study heat waves that raise temperatures in cities, mainly because of the waterproofing of the soil by concrete.

Also Bautista-Puig *et al.* (2022) define 03 (three) essential elements for understanding urban resilience, namely resistance, continuity and recovery. The first deals with the idea of the resistance of the urban system to financial interests and the ambition of unbridled urban growth. The second deals with the need to maintain the policies employed for environmental protection. Finally, the third deals with the adaptation and transformation of green spaces based on anthropic action.

In this way, the present study seeks to analyze the scientific productions on the person-environment relationship, in the urban context, during the coronavirus pandemic. First, the contributions of the studies will be presented from the perspective of environmental protection policies in Brazil, for the understanding of the impacts of human action on urban nature. Then, public policies during the Covid-19 pandemic and their impacts on the environment, subjective well-being and pro-environmental behavior will be highlighted. With this understanding, the aim is to obtain subsidies for the planning of public policies that foster urban resilience and respect for the environment.

2 METHODOLOGY

This is an integrative literature review, based on the search for scientific articles in the Web of Science (WOS), ScienceDirect and PubMed databases, based on the combination of the following keywords in English: Covid-19, environmental perception and environmental concern, referring to the period from 01/2020 to 01/2022. The use of terms in English was employed because it is the main language adopted in the consulted databases. The steps applied in this review were based on the PRISMA methodology – Preferred Reporting Items for Systematic Reviews and Meta-Analyses (Moher *et al.* 2015).

In addition to the databases, public authorities' websites were used to analyze current data on contamination and deaths from Covid-19, such as Saude.gov.br and

Covid.saude.gov.br. It was also used reports about the researched theme, which were used to corroborate the results found in the selected scientific articles.

For the selection of articles, three filtering steps were used: general search in the databases, floating general reading and specific reading. The first stage was characterized by the search for articles in the databases, observing the limit years, the full availability of the articles and the area of knowledge, that is, environmental sciences.

Subsequently, the second phase was configured from the reading of the titles, abstracts and skimming of the articles found, excluding those that did not fit the research object, such as patents, vulnerable populations, communication and marketing in the pandemic, among others. others.

Finally, in the third stage, the articles selected in the second stage were read in full, excluding those that did not address the focus of the research, that is, environmental perception, urban sustainability and public policies in the coronavirus pandemic. In all, forty-seven articles were selected, the results of which will be shown below.

3 RESULTS

The study on public policies and the person-environment relationship in the urban context during the coronavirus pandemic was addressed in 47 studies, the results of which will be presented in three topics, namely: Impacts of human action on nature and protection policies to the environment; Covid-19, public policies and benefits to the environment; and Person-environment relationship, well-being and pro-environmental behavior during the pandemic.

The impacts of human action on nature and environmental protection policies

Anthropogenic action has interfered with the balance of nature, either through the degradation of natural sources, such as rivers and forests, or through the inappropriate and sometimes illegal disposal of waste. In this vein, the three essential elements for human survival (air, water and soil) are daily impacted by human contamination at irreversible levels (Machado; Garrafa, 2020). Natural water sources that bathe cities, such as rivers and streams, are contaminated by the irregular disposal of physical, chemical and biological human waste. As a consequence, there is a change in the availability of usable resources for human use, such as drinking and planting (Karunanidhi *et al.*, 2021).

In order to curb the impacts caused by human action, public policies are created with the aim of protecting the environment and natural resources (Escario *et al.*, 2022). As an example, we have the elevation of the right to an ecologically balanced

environment, as a fundamental right, guaranteed by Article 225, "caput", of the Federal Constitution of 1988, reproduced below in full: *Art. 225. Everyone has the right to an ecologically balanced environment, an asset for common use by the people and essential to a healthy quality of life, imposing on the Government and the community the duty to defend and preserve it for present and future generations .*

The balance of nature, however, suffers the impacts of human action: either by the degradation of forests (Chen *et al.*, 2021), or by the exploration of ores (Silva, 2021), or by the removal of oil (Ukhurebor *et al.*, 2021), or by the irregular disposal of waste (Souza *et al.*, 2020). Against this ecological damage, there are public policies, which seek to reduce environmental impacts and restore fauna and flora through the declaration of obligations that create environmental responsibilities. Among the measures created by law, we have the Environment Policies (Law nº 6.938, of August 31, 1981), Water Resources (Law nº 9.433, of January 8, 1997) and Solid Waste (Law nº 12.305, of August 2, 2010), which, based on the discipline of rights and rules, began to provide for joint responsibility between public managers (representatives of the State) and citizens.

The sharing of responsibility, in the solidary modality (art. 3, IV of Law 6.938/1981), between State and Society, made the hypo-sufficiency of the environment shine in the face of human greed. In this way, permanent preservation areas were created and recognized by law, such as the sources of rivers and streams, mangroves, the slopes of hills and mountains, riparian forests, among others (Law nº 12.651, of May 25, 2012). In addition, projects were created to preserve these protected areas, such as the Seeds Project, developed by Cooperativa Ayõpare, from the Ashaninka People, from the Amônia River, in the Amazon, to encourage the collection of seeds, through the purchase and resale via cooperative of collectors (Nascimento, 2021).

In the meantime, science has been creating and defining modern concepts for times of behavioral change, through which the concern for the environment is present, in which the subject must see himself as a part. Among the terms that emerged are: environmental perception (Lopez, 2021), person-environment relationship (Zacarias; Higuchi, 2017) and pro-environmental behavior (Afonso *et al.*, 2021) (Coelho *et al.*, 2021).

Environmental perception is defined from the way a person analyses, feels, perceives and interprets the environment, from the subjective analysis that he makes of his surroundings. To do so, some factors are considered, such as contact and exposure to green, the practice of outdoor physical activities, among others (Lopez, 2021).

The person-environment relationship is a binomial through which one seeks to understand how changes in the environment interfere with human behavior and experience. Therefore, if there is a change in nature, consequently man will also change. In times of confinement and social isolation, this bilaterality has undergone major changes, given the reduction in direct contact with nature (Machado; Garrafa, 2020).

Therefore, pro-environmental behavior is the zeal, attention and care employed by man for the environment (Afonso *et al.*, 2021). And this way of acting undergoes changes throughout life, modifying itself based on environmental education and catastrophic experiences, such as windstorms, earthquakes, pandemics and other natural disasters. This is because the impact on the subjective is greater in periods of trauma and phobias, as seen during the Covid-19 pandemic. From this, the subjective dimension of the human being leads to behaviors that lead to the preservation of the environment for present and future generations (Coelho *et al.*, 2021).

Covid-19, public policies and benefits to the environment

Next, in table 1, the selected studies on the public policies implemented during the Covid-19 pandemic will be presented, as well as the beneficial effects on the environment in the face of social isolation and other measures adopted to control global contamination by the coronavirus.

Table 1: Covid-19, public policies and benefits to the urban environment

Author(s)/Year	Article Title	Origin
Aquino <i>et al.</i> , 2020	Social distancing measures to control the COVID-19 pandemic: potential impacts and challenges in Brazil	Brasil
Ribeiro <i>et al.</i> , 2020	Covid-19: reflections on its impacts on air quality and climate change	Brasil
Afonso <i>et al.</i> , 2021	Environmental awareness, pro-environmental behavior and quality of waste management in health services	Brasil
Coelho <i>et al.</i> , 2021	Human values as explanators of environmental attitudes and intention of pro-environmental behavior	Brasil
Cotta, 2021	Environmental education in times of pandemic: An experience at the Liber Teaching Institution, João Monlevade, Minas Gerais	Brasil
Kim, 2021	Changes in car and bus usage amid the COVID-19 pandemic: Relationship with land use and land price	Coreia do Sul
Lima <i>et al.</i> , 2021	Vaccines for COVID-19 - the state of the art	Brasil
Marins, 2021	Emergency aid in times of a pandemic	Brasil
Quéré <i>et al.</i> , 2021	Fossil CO2 emissions in the post-COVID-19 era.	Inglaterra
Mahato; Pal, 2022	Revisiting air quality during lockdown persuaded by second surge of COVID-19 of megacity Delhi, India	Índia

From the elevation of the Covid-19 outbreak in China to the pandemic level worldwide by the World Health Organization (WHO) in 2020 (UNA-SUS, 2020), several public policies were created to put an end to viral transmissibility . Among them, the

confinement ("lockdown") stands out, whereby people were forced to stay indoors, even cogently, for several days, with the aim of lowering the levels of transmission and death by Covid-19 .

In this atypical period, there was a reduction in car and motorcycle traffic, with a consequent decrease in greenhouse gas emissions (Kim, 2021). Carbon Dioxide (CO₂), for example, had its emission reduced by at least 7% during the year 2020 (Quéré *et al.*, 2021). As a result of this reduction, there was an improvement in air quality (Mahato; Pal, 2022), improving visibility during the day (Ribeiro *et al.*, 2020), among others.

In addition to the air, the confinement had an impact on the animals' lives, from the behavioral change of pumas that began to frequent spaces previously only accessed by humans, such as in the Iguaçu Park in July 2020, for example (RPC Foz do Iguaçu, 2020). And not only the felines have changed, as there are records of dolphins (Neitzke, 2021) and jellyfish (Plassa, 2020) swimming in Venice in March 2021, given the absence of surfers, due to the confinement caused by Covid-19. In addition, fish species and other aquatic species spread through areas considered urban, where animals were no longer found due to turbidity, pollution and the anthropic action that repelled them (Rocha, 2020).

The waters also underwent major changes as a result of the confinement caused by the pandemic, such as the improvement in turbidity due to the reduction in boat and vessel traffic. A practical example of this improvement occurred in the Brazilian Atlantic Forest, which has nine hydrographic regions, eight of which are monitored by the Observando os Rios environmental project. Of the 130 monitored points, 95 (73.1%) had fair water quality, 22 (16.9%) and 13 (10%) were in good condition. In the study, no regions with quality other than excellent or poor were identified (Menegassi, 2021).

In addition to confinement, other public policies to combat the pandemic were created around the world, such as: the mandatory use of masks covering the nose and mouth (Law nº. 14,019, of July 2, 2020); the social distance of 2 meters; the prohibition of public and private events, with or without an audience; the imposition of a fine and simple imprisonment in case of non-compliance with the restrictive measures; mass testing of those symptomatic of Covid-19; mandatory confinement for 14 days in case of positive Covid-19 (Aquino *et al.*, 2020); payment of income distribution social benefits to vulnerable people (Marins, 2021); the partnership with international laboratories to import technologies for the creation and distribution of vaccines (Lima *et al.*, 2021); among others.

At the same time, these public policies to combat Covid-19 had an impact on the environment, as they allowed for a change in habits and behaviors, as well as generated a change in the way people relate to the environment. It should be noted, however, that during the pandemic there was an increase in the use of packaging for delivery and the irregular disposal of masks, for example. However, there were changes

in habits, since the confinement forced people to remain reclusive for days at home, without direct contact with nature. From this, routines were changed, making people more available to engage in recreational activities, such as planting vegetables and carrying out home composting, given the absence of commuting between home and work (Cotta, 2021).

Furthermore, people's behavior during the pandemic also underwent changes, mainly based on pro-environmental ideals, such as valuing and preserving the environment and natural resources. This was made possible mainly by changing the intimate subjective of people who were afraid of losing their own lives at the height of the pandemic that claimed thousands of lives daily. The pandemic, therefore, made it possible to understand that environmental degradation, especially urban degradation, puts human beings at risk from exposure to viruses previously reclusive within the forests. In this way, from the subjective change, there was a reflection of one's own behavior and the consequent pro-environment behavioral change and defense of natural resources (Afonso *et al.*, 2021) (Coelho *et al.*, 2021).

Yet, the National Aeronautics and Space Administration (NASA), through spatial monitoring of polluting gases in 46 countries, identified a drastic reduction in Nitrogen Dioxide (NO₂) levels in the air. According to the study, from 2019 to 2020 there was a reduction of 20% to 50% in the level of this pollutant, which is released into the air mainly by burning fossil fuels from industrial use and human transport (collective and private). (Redação Galileu, 2020).

What can be seen is that public policies to face the Covid-19 pandemic helped to bring about behavioral changes, such as reducing the use of cars and valuing green spaces, for example. In addition, the person-environment binomial is highlighted, which are interrelated through harmonious coexistence and the conciliation of the interests of the person and the environment. It is also concluded that the instantaneous improvement of lakes, rivers and forests from social confinement allows the natural rebalancing of natural resources, but does not allow the reestablishment of the status quo ante, that is, it is no longer possible to return to the environmental levels present before the Industrial Revolution of the 18th century.

Person-environment relationship, well-being and pro-environmental behavior during the pandemic

During the Covid-19 pandemic, many countries adopted social isolation (total or partial), the aim of which was to curb the number of contaminations and deaths (Houvessou *et al.*, 2021). During this period, contact with green spaces and nature generated higher levels of subjective well-being when compared to those who did not have this experience (Maurer, 2021) (Wong-Parodi; Rubin, 2022). Table 6 shows the

studies that address the person-environment relationship, well-being and pro-environmental behavior during the pandemic.

During the Covid-19 pandemic, the world economy suffered major consequences and public administration has been adopting policies to leverage economic indices (Kenward; Brick, 2021). By way of example, we have the Brazilian Federal Government's investment of BRL 1,169 trillion to benefit micro and small companies from the provision of credits (Ministry of Economy, 2021). It is also noteworthy that the urban population was the one that most felt the effects of the financial crisis caused by the pandemic and, in this context, urban resilience shared space with financial need.

From the same point of view, research carried out by YouGov in the United Kingdom shows that 62% of respondents believe that the government should prioritize the environment for economic recovery. That is, more than half of those interviewed believe that the economy should not be recovered at any cost, but rather that efforts should be made to prioritize the environment (Kenward; Brick, 2021).

Green spaces are classified by articles into three types: spaces for mandatory activities, maintenance activities and discretionary activities (Lucchi; Buda, 2022). Online research carried out in Seoul, South Korea, demonstrated that the use of green spaces increased after the pandemic outbreak when compared to the period before the Covid-19 pandemic (Gim; Oh, 2021).

Air quality during the new Coronavirus pandemic was the object of analysis and study by Liu, Shao and Wang (2020), mainly regarding the fear of Covid-19, concern about air pollution and behaviors that generate a reduction in air carbon. In the work of these authors, it was proven that the closer to the virus, the greater the fear and phobia of COVID-19, resulting in low-carbon behaviors, which were positively associated. The result obtained showed that the greater the fear of the pandemic, the greater the reduction in carbon emission levels in the environment (Liu; Shao; Wang, 2021). This is due to social isolation, a decrease in the flow of vehicles and people and the consequent reduction in human mobility, mainly from the intensification of the use of home office activities (Góes; Martins; Nascimento, 2021).

At the same time, Severo, Guimarães and Dellarmelin (2021) pointed out that three factors should be considered to understand the impact of the Covid-19 pandemic on the environment: environmental awareness, sustainable consumption and social responsibility. The research carried out showed that Covid-19, elevated to the category of pandemic in 2020, is largely responsible for changing people's behavior, reflecting such changes in environmental sustainability and social responsibility.

Also, Huerta and Cafagna (2021) found that the financial aspect, the size of green spaces and violence against women impacted the use of urban green spaces (EVU). The first factor concerns neighborhoods with low-income population, whose

public policies did not allow access to green spaces without paying fees and taxes. The second question addresses the size of the spaces compared to the number of users, which does not support them in use and frequency. Finally, the third cause is related to fear on the part of women who stopped going to green spaces because they did not have security guaranteed by the State. In the same study, they concluded that the use of EVU represents an effective mechanism for reducing stress, increasing the physical and mental well-being of people who use these spaces.

Another study addressed the use of houseplants to face the Covid-19 pandemic, especially during the critical period of social isolation and low contact with green spaces. The results showed that having plants inside or outside the home helped in coping with the pandemic, enabling more positive emotions and improving subjective well-being, especially when plants are placed at strategic points and when combined with adequate natural lighting (Urrestarazu, 2021) (Wong-Parodi; Rubin, 2022).

A study carried out in Malaysia, which has more than 32 million inhabitants, showed that the Covid-19 pandemic generated a transformation in the relationship between people and the environment and in pro-environmental behavior. This was possible due to the effect caused by the pandemic, as it generated greater concern among the Malaysian population with socio-environmental issues based on the consumption of environmentally sustainable products (Ali *et al.*, 2021).

In contrast to the studies presented, Klosch, Wardana and Hadler (2021) point out that the interest in sacrificing oneself, that is, in having the environment as a priority, during the Covid-19 pandemic, decreased in Austria. According to the authors, the factors that led to this result were the crisis caused by the pandemic and the economic impact generated.

A study carried out in Sweden, whose population exceeds 10 million inhabitants, showed that the practice of outdoor recreational activities during the Covid-19 pandemic encouraged pro-environmental behavior. This became possible, since contact with urban green spaces increased people's connection with nature, even improving the person-environment relationship (Beery; Olsson; Vitestam, 2021).

It appears, therefore, that the use of urban green spaces has awakened the urban population to a behavioral change, which began to seek lakes, forests, rivers and green spaces for urban recreation to better face the pandemic.

4 CONCLUSION

The present study sought to analyze the scientific productions regarding public policies and the person-environment relationship, published during the coronavirus pandemic. In this way, it was possible to reflect on the impacts of human action on the

environment, as well as discuss public policies during the Covid-19 pandemic and their benefits to the urban environment, well-being and pro-environmental behavior.

The analyzed studies showed a greater connection between people and the environment during the period of social isolation, mainly with the increase in urban resilience. It is even stressed that part of the urban population understands that the idea of post-pandemic economic recovery should not come at any cost, but respecting the environment and air quality.

It is concluded that the changes regarding the reduction of the emission of polluting gases, both of industrial origin, and the use of cars in the urban environment, the investment and preference for green and open spaces, as well as the adherence to the cultivation of domestic plants, in addition to contributing to people's health, are essential for protecting the environment. Finally, it is perceived that environmental awareness, added to the strengthening of the person-environment relationship, represent a promising strategy to build greater society's commitment to the environment after facing Covid-19.

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