Human and environmental health at risk: An approach to the practice of urban burning

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ABSTRACT

High temperatures have provided risks to human and environmental health at various levels and scales in several countries around the globe. This work aims to contribute to a reflection on urban burning practices with a view to the impacts on human and environmental health. It presents a consistent and updated theoretical basis on the problem, having as an urban space to reflect on the problem, the city of Araguaína in Tocantins. Several countries have recorded an increase in the case of urban and rural fires and large fires with traces of devastation and deaths, as occurred in Chile, the United States, Canada and Brazil.

Keywords: Human and environmental health, Practice of burning, Environmental crimes, Society and nature.

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INTRODUCTION

The global temperature of the last 12 months (June 2023 to May 2024) were the highest consecutive highs on record. The information was released by scientists from the European Copernicus observatory and ratified by the World Meteorological Organization (WMO).

On April 22, 2024, the International Labor Organization (ILO) published a report on the impacts and consequences of climate change for long periods that affect workers exposed mainly to those who work outdoors. The result addresses the impacts of excessive heat, ultraviolet radiation, extreme weather events, air pollution, vector-borne diseases and pesticides.

The beginning of the year 2024 marked the Chilean population with records of large fires that resulted in the death of hundreds of people. The fire reached urban areas leaving trails of destruction and deaths. In Chile, on 02/11/2024, about 3 thousand houses had been destroyed by fire in the Las Pataguas sector in Viña del Mar, with 131 deaths and several missing (ESTADÃO, 2024).

In August 2023, in the USA, more precisely in Maui and Lahaina on the island of Hawaii, a large fire occurred that resulted in the death of more than 100 people. According to the non-profit research group, the National Fire Protection Association (ANPI), this fire was the most lethal in the US since 1918, when, at the time, 453 people died in Minnesota and Wisconsin[4].

Regarding public health, the result of a study published estimated the impact of forest fires and burnings that occurred in South America between 2014 and 2019 in the journal Environmental Research Health. The results of the study indicate that 12 thousand premature deaths per year recorded in the period can be directly associated with pollutants released by the burning of vegetation, of which 55% of them occurred in Brazil (Bonilla, *et. al*, 2023; Silva and Santos, 2023).

As for poor air quality, people's exposure can be through skin contact, ingestion or inhalation, which is one of the most susceptible ways as pointed out by the World Health Organization (WHO) Report. Since the 1970s, studies on the effects of air pollution on health have been carried out in metropolises such as the cities of São Paulo, Rio de Janeiro and Mexico City. (Silva and Santos, 2023; Ribeiro and Assunção, 2002).

Located in the northern region of Brazil, the state of Tocantins has the cerrado as its predominant vegetation, bordered to the south by the states of Goiás; to the east with Piauí; to the Northeast with Maranhão, to the Southeast with Bahia, to the Northwest with Pará and to the Southwest with Mato Grosso.

Every year, in the urban areas of several cities in the State of Tocantins, a high percentage of fires are found, whether in backyards, abandoned lots or those that serve as garbage dumps by the population, as well as in roads and public areas, squares and areas intended for the construction of sidewalks.

[4] 'Global boiling': Hawaii fires leave 93 dead, the worst disaster of its kind in the US in 1 century.

It is worth emphasizing that the current text does not bring a discussion based on the cultural and symbolic elements of the use of fire, to mention: rituals and religious practices for example. As a culture, fire is used for contemplation of indigenous peoples, conversation circles, dancing in circles, opening banners in areas for planting, among other forms of use (Silva and Santos, 2023).

In Geertz's (2008) view, when portraying the cultural dimension in a certain aspect, he understands culture as a "pattern of meanings transmitted historically, incorporated in symbols, a system of inherited conceptions expressed in symbolic forms through which men communicate, perpetuate and develop their knowledge and their activities in relation to life" (GEERTZ, 2008, p. 66).

In opposition to the cultural issue of the practice of burning without prior authorization, we have the Brazilian legislation, which characterizes burning as a crime, provided for in the Federal Constitution of 1988, for causing damage to health and the environment. The gases produced by the fires are harmful, causing, among other consequences, respiratory diseases in the population, asthma, rhinitis, redness of the skin, irritation of the eyes and can even contribute to cardiovascular diseases, for example. (Silva & Silva, 2006; Silva and Santos, 2023).

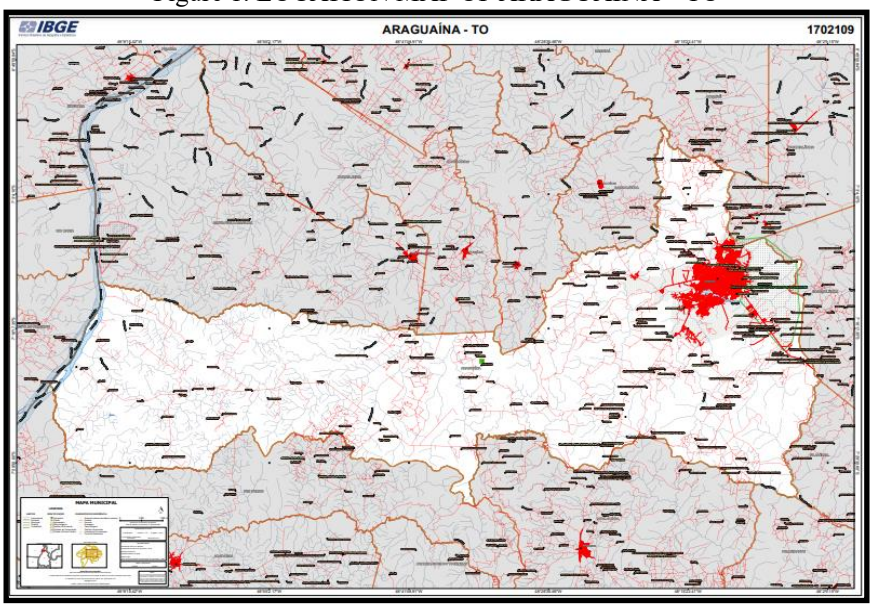
In the northern region of Brazil, fires occur in both rural and urban areas. In the city of Araguaína it is no different. It is customary to see periodic changes in the atmospheric air, due to pollution caused by smoke and soot resulting from forest fires, urban burning, and suspended particles from dust. It should be noted that burning practices also occur in the city in winter periods.

The main objective of the text is to contribute to a reflection on the risks to human and environmental health with the use of urban burning practices. The text mentions the social and environmental aggravating factors related to such recurrent practices in the city of Araguaína-TO.

The municipality of Araguaína is part of the State of Tocantins, in the northern region of Brazil. According to information available at IBGE (2022), the municipality has a population of 171,301[5], with an area of 4,000.416 km2, 42.78 inhabitants/km2, latitudes 7º 11´ 28" south and longitude 48º 12'26" to the west, it borders the cities of Babaçulândia, Nova Olinda, Piraquê, Santa Fé do Araguaia and Wanderlândia, see figure 1.

[5] https://cidades.ibge.gov.br/brasil/to/araguaina/panorama. Accessed on 09/15/2023

Figure 1. LOCATION MAP OF ARAGUAÍNA – TO



Source:https://geoftp.ibge.gov.br/cartas_e_mapas/mapas_municipais/colecao_de_mapas_municipais/2020/TO/araguaina/1702109_MM.pdf. Accessed on 05/20/2024

METHODOLOGY

The result of the work follows the methodology adopted by Silva and Santos 2023 when they developed a study on urban fires in the morada do sol II sector and in other sectors of the city of Araguaína-TO. Other studies addressing the theme were also of paramount importance as theoretical support.

As for photographic records, they have been widely used by (Silva & Silva, 2006; Silva & Silva, 2017; Monteiro & Silva, 2018, Silva and Santos, 2023) in activities that require fieldwork.

In the research, the photographic records used serve as proof of the fires and the possibility to expand the debate since, at the moment of the "click" for the record, the captured image will contribute to the discussion. The choice of public roads is justified, since, in order to register other outbreaks, it would be necessary to enter homes to the outbreaks that are located mainly in backyards.

The text has a qualitative character and was carried out with the theoretical and methodological basis of texts published in scientific journals. Information from international, state, and local news sites was used.

RESULTS AND DISCUSSIONS

An increase in temperatures has been recorded and perceived in various parts of the globe by different populations, as illustrated in figure (2). Studies revealed by NASA point out that between the months of July 2023 and April 2024, the highest temperatures in the historical series were recorded.

In April 2022, PAHO/WHO released the update of the air quality database that presents, for the first time, ground-based measurements of average annual concentrations of nitrogen dioxide (NO2), a common urban pollutant and precursor to particulate matter and ozone. It also includes measurements of particles with diameters of 10 µm (PM10) or 2.5 µm (PM2.5) in diameter (Pan American Health Organization and World Health Organization, 2022).

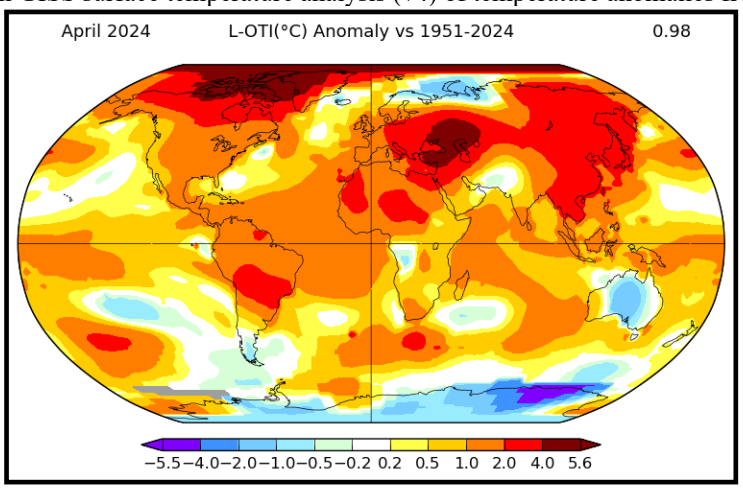
According to PAHO/WHO

> Almost the entire population of the world (99%) breathes air that exceeds the quality limits recommended by the World Health Organization (WHO), which threatens their health. A record number of more than 6,000 cities in 117 countries are monitoring air quality, but people living in them still breathe unhealthy levels of fine particulate matter and nitrogen dioxide, with people in low- and middle-income countries suffering the highest exposures (PAHO/WHO, 2022).

It should be emphasized that there was a revision of the WHO Air Quality Guidelines. After the review, the WHO found that in low- and middle-income countries, air quality is in line with the limits recommended by the WHO in less than 1% of cities.

In the area studied, high temperatures, low air humidity and strong winds are also present in the city of Araguaína-TO. The local news has a series of reports on the topic under discussion. According to the news site Surgiu[6], edition of May 31, 2017, for the first time, Araguaína joined the Fire Protocol Program, created in 2005, with the objective of developing actions to combat fire outbreaks in urban and rural areas.

Figure 2 - Global map with GISS surface temperature analysis (v4) of temperature anomalies from 1951 to April 2024



Source: https://data.giss.nasa.gov/gistemp/maps/. Accessed on 05/20/2024

Several actions are developed by the municipal and state public authorities in relation to the control and fighting of fire, however, it has been unable to eliminate the practice of burning in the

6 http://surgiu.com.br/2017/05/31/araguaina-adere-ao-protocolo-fogo-para-diminuir-focos-de-incendio-na-regiao/. Accessed on 08/24/2024

urban environment. The Municipal Protocol for the Control and Prevention of Fire Use, together with environmental agencies and organized civil society, aims to prevent and combat fires in the city and region as mentioned by (Monteiro & Silva, 2018).

The idea is to mobilize and raise awareness in society that the environment is a common good, not only the responsibility of the government. It also aims to prioritize the best quality of life and environmental and human health. The Protocol is from Naturatins, an agency belonging to the State, but from the adhesion, it became part of the municipality.

In the city of Araguaína (TO), urban fires during periods of drought are routine by the population residing in the city. Due to air pollution, cooling becomes slow, even at night, especially in periods of drought. According to AYOADE (1991), the climate of urban areas is more impacted by human action, causing changes in the chemical composition of the atmosphere, not allowing the cooling of the earth's surface, even with the decrease in insolation.

Photographs 1, 2 and 3. Panoramic view from the São João neighborhood to the city center partially covered by smoke from various fires

Source: Marivaldo Cavalcante da Silva, 2023

Taken from the top of the São João neighborhood, on 1º de Janeiro street, photographs 1 and 2 were intended to demonstrate the difference in air pollution - in order to show the changes visible to the naked eye of the "cloud" of smoke spreading the suspended particles in the city of Araguaína-TO. It is salutary to mention that the use of the cell phone to take the photographs ends up filtering a little and improving visibility. This smoke can hinder the visibility of buildings and residences early in the morning, in addition to contributing to traffic accidents, putting society at risk pedestrians, motorcyclists, drivers and the population in general.

For the theoretical framework of the risk society, the concept of "risk society" used by Giddens can be highlighted. For the author, there are strong and objective reasons to believe that we are going through an important period of historical transition. In addition, according to the author, "the changes that affect us are not confined to any area of the globe, but are understood almost everywhere" (Giddens, 2007 pg. 13).

Corroborating Giddens' idea, Fernandes points out that:

> The current world is considered to be at risk, because from the social, economic, political or nature point of view, it tends to be out of human reach and escape its monitoring and protection (Fernandes, 2002 p. 185)

The authors mentioned about the society of the rich contribute directly to the understanding of the risks provided by the practices of burning both in urban and rural environments, by the way in the introduction of the text there is already relevant information about the dimension of impacts on human and environmental health, as a result of the predominant risk of setting fires.

The dispersion of the smoke cloud that covers the city depends on the winds and other elements of meteorological variables. Photograph 3 was taken at 18:12 on 08/08/23 also in the São João neighborhood on Rua Gonçalves Ledo.

The throat is dry, the odor that the fires provide is intense, the eyes burn, it causes fatigue and dizziness, it causes difficulties for better breathing among other problems, including pulmonary problems. It is salutary to mention that the situation illustrated does not come only from urban fires (Silva and Santos, 2023).

In health, with the burning of biomass and expansion of smoke particles (Bonilla, et. al 2023) states that:

> Air pollution from fires is detrimental to public health. Smoke particulate matter from biomass burning in the Amazon Basin can travel great distances, affecting air quality across several countries in South America. (Bonilla, et.at. pg. 2)

With the burning of garbage and organic and inorganic materials, it expels smoke and soot into the atmosphere. In this place, it is common for nearby residents or even carters to dispose of antlers and residential garbage. The intentionality of the burning carried out to clean the area and eliminate the accumulation of discarded material is evident (Silva and Santos, 2023). The fires are seen as a quick and economical way to "get rid of" the garbage accumulated and deposited by the population itself, shown in image 1 and photograph 4.

Image 1 and photograph 4. It shows an area that was completely burned in the morada do sol II sector in Araguaína TO

Source from: Marivaldo Cavalcante Silva, 07/07/2023 at 11:37

It is possible to verify the burning of all vegetation in the allotted area without any housing as shown in photograph 4. However, this area would have a purpose for public use. There are several residences on the streets around the completely burned block.

It was possible to notice that part of some roofs of several residences were completely black with the accumulation of soot. With this, it can be inferred that smoke and soot also enter homes, commercial points, hinder the visibility of pedestrians, car drivers, motorcyclists, heavy vehicles, and can even contribute to the occurrence of accidents. This criminal practice of setting fires in urban areas also modifies the landscape and "expels" small wild animals and birds and, in some cases, nests and chicks can be burned.

In an interview given to Conexão TO,[7] published in the August 28, 2017 edition, general practitioner Frederico Teixeira Leite says that respiratory diseases are aggravated by fires, especially in children. Asthma attacks worsen, causing patients to seek health units more frequently. The population suffers from the soot that the fires release into the air, causing allergic skin problems, rhinitis, sinusitis and eye irritation.

According to (Silva and Santos, 2023), the proximity of fires to inhabited areas causes greater damage to human and environmental health. It is normal for fire to expel smoke into the atmosphere, it is part of nature itself, and if the winds are directed to areas with a greater number of inhabitants, it can further aggravate the situation. (Ribeiro and Assunção, 2002)

[7] http://conexaoto.com.br/2017/08/26/apos-fogo-em-imovel-acoes-de-prevencao-e-controle-de-queimadas-em-araguaina-sao-intensificadas#pp[news]/0/. Accessed in: 08/25/2023

In this sense, Ribeiro and Assunção, 2002) argue that:

> ... Burning is an incomplete combustion in the open air, and depends on the type of plant matter being burned, its density, humidity, etc., as well as environmental conditions, especially wind speed. As it is an incomplete combustion, the resulting emissions initially consist of carbon monoxide (CO) and particulate matter (soot), as well as ash of varying granulometry. Simple and complex organic compounds represented by hydrocarbons (HC), among other volatile and semi-volatile organic compounds, such as polycyclic organic matter – polycyclic aromatic hydrocarbons, dioxins and furans, compounds of great interest in terms of public health, due to the high toxicity characteristics of several of them, also result from this combustion. As in fires, combustion is processed with the participation of atmospheric air, there are also emissions of nitrogen oxides (NOx), especially nitric oxide (NO) and nitrogen dioxide (NO2), formed by the thermal process and by the oxidation of nitrogen present in the plant (Ribeiro and Assunção, 2002 p. 128-129).

Through studies carried out, it has already been proven that exposure to pollutants of different levels, in the short term, respiratory diseases have worsened in the community (Ribeiro and Assunção, 2002; Silva and Santos, 2023). This causes effects on human and environmental health (loss of biodiversity, for example), on education, since it increases the demand for consultations and hospital admissions and mortality.

Furthermore, they are reasons for student absences from schools. In the long term, the objective of the study is to evaluate the effects by comparing mortality with mobility, due to the different levels of air pollution (Silva and Santos, 2023). It is a fact that there are several lung tests that are more effective than the X-ray evaluation, which is the most widely used, probably due to the costs. At another time, X-rays were the most commonly used (Ribeiro and Assunção, 2002).

Photographs 5 and 6 were taken on 07/0/23. Photo number 5 at 9:07 am and number 8 at 9:12 am located on street 9 in the morada do sol II sector. As seen in photograph 8, the fire at the back of the residences located on 9th street. However, this focus began on 8th Street.

The fire department was activated due to the degree of danger perceived by the population (Silva and Santos, 2023). By the time firefighters arrived, the fire had already spread between 8th and 9th streets by about 19:20. About an hour after the start of the fire. The fact occurred on 08/08/23. Once again, it is pertinent to pay attention to the concept of risk used in the text.

Photo 8 is the first record that triggered contact with the fire department. It was held at 17:57. In a way, it generated great tension on the part of some residents. The strong wind and high flames caused a lot of fear. A lot of smoke took over the residences and streets.

Image 2 and photographs 5 to 10. Fires in vacant lots on streets 8 still without asphalt and street 9 in the morada do sol II sector in Araguaína-TO

Sources: Marivaldo C da Silva; Luciana Nunes dos Santos (photos 9 and 10), 2023

For (Silva and Santos, 2023), the practices of setting fires in public areas, backyards, and vacant lots should be understood as an environmental crime subject to punishment. It can also be understood as a lack of respect for others and that causes social (economic and financial) damage and damage to the environment, putting at risk the health of the population and the environment, real estate, energy supply network, traffic accidents, among others.

For (LEITE & PEREIRA, 2017) who developed a study on urban fires: the case of the residential garden of flowers in Araguaína – TO and proved that, since 2006, the practice of burning on public roads occurs year after year in the area where the study was developed.

Another aggravating factor concerns the low humidity of the air, strong winds can also spread fire and suspended particles more quickly. The G1 News Portal[8], in an article published about the low air humidity on September 1, 2017, the state of Tocantins had 46 cities in a "desert climate" due

[8] https://g1.globo.com/to/tocantins/noticia/alerta-de-baixa-umidade-e-expandido-e-46-cidades-tem-clima-de-deserto-veja-lista.ghtm. Accessed in: 08/20/2023

to the atmospheric air humidity dropping to 12% levels. The cities of Tocantins have an alert level ranging from yellow (between 30% and 21%), orange (between 20% and 12%) and red (below 12%).

On 08/21/2023, the METEORED.tempo.com news portal[9] released a forecast reporting intense masses of hot air that spread throughout Brazil with temperatures reaching close to 40ºC in several locations in the Brazilian territory. Given this information, it is worth a little reflection on the mental health of people who set fires in urban areas usually.

It is pertinent to highlight that culture is one of the main spaces where these practices take root, in which these authoritarian powers are established, but curiously, culture is also the space where all this can be radically questioned (RICHARD, 2005). Based on the author, the proposal is not to treat the practice of setting fire as a culture, given that several justifications have already been highlighted in the text.

Thus, in addition to having defined culture as an ***inherited habitus – emphasis added***, it can also be a place of response to official hegemony, a way of identifying with the established and promoting greater visibility on the powers that constitute us and that reproduce themselves socially. Thus, it is necessary to make an inference from the current environmental legislation and to demand from managers the proper inspection and application of fines when appropriate (Silva and Santos, 2023).

According to Municipal Law No. 3,100/19, the fine for anyone identified committing this type of crime within the urban perimeter of Araguaína varies between R$45.00 and R$85.00 for every 12 square meters of burned area, according to the type of material burned. In addition, the amount of the fine can be doubled on weekends, holidays, between 6 and 6 am, or in case of recurrence (ARAGUAÍNA, 2023).

However, the amounts may be even higher, since the municipality's inspection also uses the Federal Law on Environmental Crimes 9.605/98 as a basis, which provides for a fine of R$ 5,000 to R$ 50 million according to the type of fire. As stated in the law, it also prohibits any type of burning on public roads and in public or private urban properties, also including burning on the sides of highways, rivers, lakes, or forests (Silva and Santos, 2023.

Also according to (Silva and Santos, 2023) in 2022, the municipal government of Araguaína fined dozens of people for causing criminal fires in the city's urban environment. The inspection is carried out by the Department of Economic Development and Environment of Araguaína, which last year registered 73 infraction notices. To be able to monitor the entire urban perimeter of the city, the inspection team has an urban burning hotline by phone (63) 99976-7337, which works on an on-call basis until 8 pm every day.

[9] An intense mass of hot air spreads across Brazil and temperatures are close to 40°C in several locations! (tempo.com). accessed on 09/19/23

There are several ways to make complaints. They can be made by calling the Civil Defense of Araguaína, at (63) 99973-9794 or 199; to the Fire Department, at 193, and to Naturatins (Instituto Natureza do Tocantins), at number (63) 991067787 (PREFEITURA DE ARAGUAÍNA, TO. 2023).

FINAL CONSIDERATIONS

Year after year, the same practice of setting fires in urban areas is repeated in the city of Araguaína. As a suggestion, to contribute to the collection for fires in vacant lots, is the use of geotechnologies with drones to record images and be attached to the IPTU collection system already pointed out by Silva and Santos in 2023. Alternatives also need to be discussed and implemented in an intersectoral way in municipal management to curb and inhibit criminal practice and reduce social risks in general, and seek a better interaction between society and nature.

The survey reveals that fires and the practice of urban burning are frequent in Araguaína. The impacts compromise the human and environmental health of urban areas, with a reduction in atmospheric air quality and economic and health losses to the population. It is necessary to engage the population in reporting when witnessing the fires because it is perceived that there is a risk assumed, in addition to characterizing a criminal practice.

It is necessary to think about the process of (de)culturalization of the practice of burning in urban environments. In addition, the highest incidences occur in periods with long droughts and low relative humidity of the air. Despite the fact that local, national and international media are always warning of the various types of risks that society is exposed to. It should be emphasized that hundreds of people have died in recent years due to large fires that have reached urban environments.

For months during the year, the population needs to be careful with walks and physical exercises both outdoors and indoors (gyms) since the smoke enters the establishments causing discomfort, irritation in the throat, eyes and can cause dizziness and fainting.

With this, when intense fires are occurring in the vicinity of these establishments, try to avoid breathing for a long time the toxic smoke resulting from the burning of organic and non-organic materials. On the other hand, the situation is so serious that the smoke from fires coming from large areas devastated by fire, spreading to several states and regions of the country. Sometimes, between continents.

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