

# Climate Change and Green and Blue Infrastructure

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## 1 ABSTRACT

The living environment faces challenges and risks due to the consequences of globalisation. Climate change and its crisis set a complex scenario, leading us to rethink about planning solutions and how to adapt our living spaces. In order to mitigate current social and environmental challenges, cities play an essential role and have big potential to promote a different (and better) scenario. Often, denser cities are the focus of such climate adaptation, but what about smaller cities and rural areas? How does globalisation affect these places? This paper intends to build analysis from literature about the influences of globalisation on the current living environment, how public spaces in small cities could potentially be adapted to mitigate climate change challenges, and how Green and Blue Infrastructure (as a strategy and scalable method of adaptation) could help cities (local and regional level) to promote liveability for more than humans in the future. Furthermore, two different scenarios are presented and analysed in order to develop a reflection on the consequences of globalisation in Jaboticabal (Brasil) and a public space project in Horn (Austria) as examples of how public spaces in smaller cities could be adapted in order to tackle socio-ecological aspects.

Keywords: urban landscape, climate change, globalisation, public space, green and blue infrastructure

## 2 INTRODUCTION

Climate change is a multilayer phenomenon. As Neyran Turan says, climate change “is an environmental, cultural, and political phenomenon that is reshaping the way we think about ourselves, about our society, and about humanity’s place on Earth.” (Turan 2016). In the field of architecture and urbanism, these aspects are also leading professionals to rethink about how to overcome this phenomenon within built spaces.

Certainly, “there is more to say about climate” (Graham et al. 2026), specific activities from human activities on the planet intend to intensify the climate change as well as social and environmental injustices, leading the existence of several beings into deeper vulnerability towards the future.

Therefore, different aspects regarding ‘how we do things’ and ‘how we live’ (as professionals and as civilians), must be critically reviewed in order to develop functional adaptation plans for the current built spaces. As Keenan says, “a diverse set of disciplines and perspectives is required to understand the impact of climate change and to exercise some measure of agency over its causes and ills.” (Keenan 2026), it emerges the question of what is architecture’s and urbanism’s role in this scenario. How to adapt everyday life spaces in order to tackle wellbeing and climate change? How is the transformation of spaces happening in smaller cities? How is the scenario in smaller cities and rural areas away from mainstream cities?

Architecture and urbanism play as stronger influences on the built environment. The climate and the environmental need to be restored and tackle contemporary and future socio-ecological challenges. There is the urge to think about Earth as a host to life itself rather than only a host to cultural diversity (Graham et al. 2026) and to take into consideration ecological systems, the cohabitation of beings (human and nature), and the efficiency of sources (use and consumption).

In order to develop the analysis of this paper, a literature review mainly from political ecology perspectives should be developed. Firstly, a review on globalisation and the influences on climate change. Secondly, the literature addresses the topic of how to better integrate nature-based solutions in public space planning, highlighting how relevant it is to enable public spaces as part of society's engagement aspect as well as for coexistence with nature. In the final part of this paper, two different scenarios in small cities are presented in order to develop analysis and reflection on the consequences of globalisation in a small city in Brazil and a public space project in a small city in Austria.

## 3 GLOBALISATION, CLIMATE CHANGE AND ITS CRISIS

Globalisation has highly influenced society’s ways of living, and with the predominant focus on the economic development, our living environment has changed and faces negative impacts. The environment started to change rapidly after 1850, but especially after 1945 (Moore 2017). From a political ecology perspective, Ulrich Brand et al. (2020) outline the influences on the rapid change, as “the ongoing expansion

of the unsustainable production and consumption of commodities and the accelerated use of resources at the globe scale, a focus on economic growth at almost any cost and fierce world competition, the development model of resource extractivism in Latin America and elsewhere” (Brand et al. 2020). The consequence of a predominant capitalist society is clearly, as Brand complements, the accelerated “climate change, loss of biodiversity, the economics crisis, rising inequality within many societies, the crisis of democracy” (Brand et al. 2020) and more.

James Roberts also notes about the consequences and negative impacts from the processes of globalisation (production and consumption), he says, “generations of increasing fossil fuel use, industrial development, population growth, and related processes of population and resource degradation have led to broad scale ecological and climatic changes that are no longer easy to deny.” (Roberts 2020). The way entire ecosystems and ways of living are increasingly threatened, it is a reality that should not be taken as ordinary or denied, even though it seems complex to be solved.

Regarding diagnosis and care, Fitz and Krasny also present a perspective on the dramatic socioecological scenario of our planet. As they borrow from the medical term of critical care, they discuss the world’s environment condition and urge of care (Fitz & Krasny 2019). Our living environment is in danger and our ways of living and doing things need to be rethought. Fitz and Krasny call it the violence of petro-capitalism and say how it led our planet to suffer, to experience an accelerated environmental crisis and to lead human life and the environment to a war with our economy system, meaning that “not all human activity, but very specific “activities of corporate industry” cause the present day catastrophic ecological disruptions.” (Fitz & Krasny 2019). After technological and economic transformations – industrialisation, globalisation, urbanisation – it is time to review the consequences of the process and acknowledge factors that are leading our living space and our environment to collapse and review tactics to overcome the contemporary threats, mitigating climate change.

Climate change is a phenomenon and can be acknowledged in different ways. As Hulme analyses, climate change can be observed, quantified and measured (Hulme 2010), and one of the ways to analyse, is as an inspiration for global networks of reinvigorated social movements. He says, “Seeing climate change as a manifestation of the nefarious practices of globalisation, this framing warrants the emergence of new forms of activism, both elite and popular, to change these practices and to catalyse change in political, social and economic behaviour.” (Hulme 2010).

As architecture and urbanism “are always concerned with the future” (Fitz & Krasny 2019), and in order to promote a better future for all, it is necessary to consider “a long-term commitment to planetary care based on human and non-human livability” (Fitz & Krasny 2019) and in different scales, from private to public, from houses to schools, from neighbourhoods to cities and regions.

## 4 GREEN AND BLUE INFRASTRUCTURES AND PUBLIC SPACES

### 4.1 Green and Blue Infrastructure

More than fifty years ago, Odum said that society should – and must – find a way to deal with landscape as a whole (Odum 1969). Climate change and its crisis can lead to the extinction of different species, including human beings. It is necessary to acknowledge that humans do not live only by food and fiber, but also “need a balanced CO<sub>2</sub>-O<sub>2</sub> atmosphere, the climate buffer provided by oceans and masses of vegetation, and clean (that is unproductive) water for cultural and industrial uses.” (Odum 1969). The predominant economic development system influences on the dynamics of the urban and non-urban, transforming the space and quality of living. As example of a strong factor from the current system is the development and predominance of monocultures. The preoccupation of “obtaining as much production from landscape as possible”, is leading to an unbalanced ecosystem, which strongly influences the acceleration of climate change and still do not provide fair livelihood, food, water or safe environment for many people in the world. Additionally, the stronger climate crisis’ impacts on everyday life are, the bigger the need for action by various stakeholders, politicians and civil society to take action towards climate-friendly and biodiverse urban development adaption (Ahn & Knierbein 2023). The time for radical action is now.

The non-urban is every time more occupied by the urban fabric, and oppressing the urban hinterlands with a loss of wildness (Brenner & Schmid 2012). Nowadays, many cities are not only lacking quality public spaces but experience the absence of green spaces and are facing consequences of the ongoing economic

development system, even by the influence on weather seasoning and air quality. “Every year, more than seven million people die from pollution-related causes” (Vieira et al. 2023), despite the several further challenging consequences from current times.

The contemporary city presents much of sealed area, lacking on green spaces, trees and permeable soil, which is costing a lot for its dwellers (Abuje et al. 2023). Within the accelerated climate change occurrences, people are becoming more vulnerable to extreme nature hazards and living insecurity. The stronger climate change impacts the biosphere, the harder it gets to tackle its crisis and restore biodiversity and dignity of living. Abuje et al. mention that “climate change reinforces the need to make changes in the cities so they can handle new situations and implement green urban development initiatives. Large green areas and more sustainable responses are crucial in dense cities to avoid natural catastrophes and make cities more livable for all.” (Abuje et al. 2023). But, even though it is essential to tackle dense cities (where the urban population tends to grow), adaptations must be approached in different scales: rural areas, smaller cities and even the wildness must be restored, adapted and secured. The opposite from the competitive mindset of neoliberal cities, it is necessary that urban spaces cooperate with one another, promoting from a smaller to a larger green and blue infrastructure that can in sync contribute with the development of an urban ecological system of neighbourhood cities and regional hinterlands.

As Abuje et al. say, “mitigating climate change does not mean, however, that it will not happen.” (Abuje et al. 2023), but it is a reality and new practices must be adapted and implemented as soon as possible in order to mitigate it. Furthermore, Abuje et al. talk about the specific role of public spaces in the adaption of the urban. To have the accessibility to public green spaces and adaption to climate change at the same time might be the share of a common approach: “nature-based solutions in urban planning.” (Abuje et al. 2023).

Green and Blue Infrastructure (GBI) can be beneficial on different levels to the city and its surrounding. Nature-based design solutions can potentially tackle not only challenges during drought and flood seasons, but also by implementing functionality in public spaces, guaranteeing the wellbeing of future generations, to promote space for biodiversity and livelihood as well as improve urban metabolism systems. GBI became strongly known as a concept of stormwater management (Hoyer et al. 2011). As Lamont and Everett explain, “the phrase ‘blue-green’ or green/blue’ infrastructure emerged (...) from a growing awareness of the need for an integrated systems-approach to the management of Green and Blue Infrastructure” (Lamont & Everett 2019). This could be a matter that can provide not only technical solutions for nature hazards, but to benefit the whole living environment in its socioecological sense. GBI can potentially improve urban ecosystem services through different sets of land uses such as, “parks and reserves, gardens and backyards, waterways and wetlands, pathways and greenways, farms and orchards, buffers and windbreaks, squares and plazas, roof gardens and living walls.” (Bellezoni et al. 2020), enabling quality public spaces and social interaction through nature.

## 4.2 The Need of Public Spaces

The spatial organisation of cities and its hinterlands has drastically changed through structural shifts in economical and technological aspects (Madanipour 2019). From a critical analysis of the modernist manifesto and the Charter of Athens, public spaces were considered as “breathing spaces in the overcrowded and badly built cities” (Madanipour 2019), with the main idea to support and serve buildings – a thinking of design from inside out. In the 1960s, when spatial organisation mainly started to be transformed, Jane Jacobs acknowledged the relevance and impacts of the urban landscape on the life of New York City’s dwellers (Hurting et al. 2023), especially when there is no proper public space at all. The modern city and its processes of globalisation have strongly influenced the quality and existence of public spaces. Debates around private and public sector as well as maintenance and management of public spaces became more lively ever since.

The political, economical and cultural significance of the public space has been known since ancient times integrally as part of the city (Madanipour 2019), the urban. As Friedmann explains, there is a relevance of spaces in the cities that conduct everyday life, social reproduction and construction of social meanings (Friedmann 1999). It is also where some of the scales of cohabitation happen; to others (bodies), to buildings, public spaces, to the city. In spite of the fact that political aspects (necessarily) unfold in the public space arena.

Humans have been influencing these scales of cohabitation, “creating, inhabiting, and readjusting these spaces over centuries.” (Sarkis 2021), and regarding the public spaces, through the development of modern cities, public spaces became often poorly designed, maintained or managed as a leftover space (Bravo 2023). A reality that is unfortunately even more common in the Global South, but also, common to be seen in smaller cities around the world that are not considered as a mainstream city.

The acknowledgment of Jane Jacobs about the relevance of urban landscape, in the 1960s, from a female voice, she also argued about how urban development practices were detached from real human needs (Hurting et al. 2023). Hence, thinking of public spaces as a potential urban space to adapt and tackle climate change (also a current human need), it could also mean to tackle everyday life struggles in social and environmental matters. An example of a social aspect, which design must think about regarding public spaces and the urban environment, is the vulnerability of certain groups as feminized bodies, LGBTIQ+ groups, or people with low incomes (Hurting et al. 2023), disabled and older people. It is necessary to develop planning that is socially and environmentally sensitive and to introduce gender-sensitive planning. On the other hand, climate matters regarding air quality and seasonal aspects.

## 5 TWO DIFFERENT CONTEMPORARY SCENARIOS

In August 2024, a dramatic occurrence of many simultaneous fire spots occurred in many cities and regional parts of Brazil. One of these places was in Jaboticabal, a small countryside city in São Paulo State, located in a Cerrado biome. With approximately 71.000 inhabitants, the city has mainly of its hinterlands’ landscape occupied by monocultures (mostly private owners and local sugar industry). At this time of the year, the dry season, the fire occurrence had an even faster spread turning the situation harder to control. The devastation of small forests as well as of agro-industrial monocultures was predominant, but also, the bad air quality led some families to leave their houses or to stay inside, covering their door and window gaps with wet towels.

Besides this specific event from 2024, it became “common” for cities in the central region of Brazil to have sand storms between July and October (dry season), not only due to the larger area without protection of vegetation cover and native vegetation (BBC News Brasil 2021), but also, from commercial activity affecting the air quality, “from biomass burning, which releases large quantities of gas particles into the atmosphere.” (Vieira et al. 2023). Regarding the enormous influence from the agro-industrial sector, Brazil displays an overall challenging social and environmental scenario for its inhabitants. Jaboticabal is only one example of many small countryside cities that lack government attention to the environmental consequences due to patterns of globalisation. The modernisation of mainstream cities also led to small cities lacking quality green public spaces and wilderness, that could potentially improve social and (living) environmental matters (such as during dry seasons).

Regarding a social aspect of social interaction with the city in such countryside areas, it is common to drive (usually with private vehicles) from private to semi-public spaces and to have almost zero interaction with the city, which is a common routine of everyday life. For these citizens, a common type of public life during a free time varies from visiting local public events (such as yearly church events, the city’s anniversary events or rodeos’ concerts). Lower income inhabitants enjoy to sit in front of their houses and watch the street (specially when the weather is too hot to stay inside). The younger population usually meets at gas stations with friends or drive to a neighbour city and visit indoor shopping malls. The lack of quality green public spaces and urban liveability is a common character of these cities, influencing a bigger alienation within the citizens, a weak relationship with the city (and with nature even) and possibly the migration to mainstream cities. The need to enable quality public spaces is essential to unfold social interaction and cultural meaning. Public spaces are also necessary in order to coexist with the built environment on a public level. Generally, to pursue safe public spaces is crucial to promote a human-oriented approach to cities (Bravo, 2023), including the possibility to reestablish the relation and cohabitation of humans with nature and biodiversity.

A different scenario, now in Horn, a small city in Lower Austria, shows how smalls cities can restore public spaces promoting quality public space combined with green and blue infrastructure and climate change adaptations. The project Stadtsee Horn, designed by the landscape architecture office YEWOLANDSCAPES (located in Vienna). Around 150 years old, the city lake Horn was once a paid access swimming area and the access was only possible during summer season. Even as private, the lake usually had an importance for the city inhabitants as a place for social interaction. Through time, the lake area became outdated, both in its



function as well as its appeal. The access to the lake became deteriorated and partially risky for elderly and disabled people. The main goals of renovating the area were to open up the restricted swimming area to everyone all year round and to create appealing spaces for sports, play, culture, leisure and gastronomy. Furthermore, the aim was to restore the area promoting social interactions for locals and visitors, as well as to become a climate adapted space.

The project presents in its concept the implementation of additional trees, the improvement of water quality with natural and technical filtering, including chosen materials like wood and light colour stones that complement natural aspects of the space. In addition, a playground and sports area, a bicycle path and various design details provide multigenerational accessibility into the space, developing an area that improves social and environmental aspects.



Fig. 1: Fire along road in country city hinterlands of São Paulo State (Foto: Marcelo Moraes/EPTV, 2024). Fig. 2: Sandstorm in Ribeirão Preto (Brazil). City around fifty-nine kilometres away from Jaboticabal (2023).



Fig. 3: Project Stadtsee Horn, Austria (2022). Renovated swimming lake. Foto: Kurt Hörbst. Fig. 4: Project Stadtsee Horn, Austria (2022). Renovated swimming lake, the cultural deck. Foto: Kurt Hörbst.

## 6 CONCLUSION

Globalisation and economic development have set a scenario that strongly influences the transformation of spaces. The dynamics of this development – methods of production and consumption – lead into increasing social and environmental issues. The complexity of climate change as a phenomenon and the consequences of globalisation drive us, civilians and professionals, to rethink contemporary ways of living and ways of doing things.

In the field of architecture and urbanism, social, ecological and long-term design aspects must be taken into consideration in order to plan adaptations of spaces. The dynamics of everyday life, for example, include having safe access to spaces in order to fulfil daily activities. Hence, in order to enable the quality of transitional spaces, it also means to enable the quality of air, water, land, shelter, health, social interaction and wellbeing for all, in dense cities and in rural areas. In order to tackle climate change challenges, it is necessary to adapt smaller cities as much as denser cities with the mindset of socio-ecological aspects and that long-term solutions is not only about making cities for people, but also for the functionality of ecological systems.

Green and Blue Infrastructure as a nature-base solution and public spaces as a spatial and social matter, together, can potentially develop climate-environmental adaptations in the cities and to improve liveability,

which enables not only the mitigation of climate change but also as a chance to restore human relations with nature and to cohabitate it experiencing nature as part of the daily life.

The case in Jaboticabal presents some of the consequences of globalisation processes and how they negatively impact the people living in Brazil. Beyond the deforestation reality, central region countryside cities additionally face the scarcity of nature and quality of public space as the focus remains (mainly) on the development of agro-industrial systems. The project in Horn, Austria, shows not only how a project can facilitate biodiversity and social interaction in the same space, as part of daily life, but also how relevant it is for decision makers and planning influencers to provide meaningful social interventions.

Could Green and Blue Infrastructure also improve and contribute to cities metabolism in order to decentralise resources extractivism from hinterlands? How can scalable Green and Blue infrastructure potentially contribute to denser cities' metabolism? Are questions to be rethought as further steps of this paper.

## 7 REFERENCES

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## 8 IMAGES

Fig. 1: Accessed on: <https://oglobo.globo.com/brasil/noticia/2024/08/24/sao-paulo-registrou-mais-focos-de-incendio-do-que-a-amazonia-veja-video.ghtml>

Fig. 2: Accessed on <https://g1.globo.com/sp/ribeirao-preto-franca/noticia/2023/11/15/tempestade-de-terra-se-forma-e-muda-paisagem-de-ribeirao-preto-sp-video.ghtml>

Fig. 3: HÖRBST, Kurt. Project Stadtsee Horn, 2022. Accessed on: <https://www.yewo.at/projects/stadtsee-horn/>

Fig. 4: HÖRBST, Kurt. Project Stadtsee Horn, 2022. Accessed on: <https://www.yewo.at/projects/stadtsee-horn/>