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Urban security in the Anthropocene: an existential challenge[1]

Bezpieczeństwo miast w antropocenie: wyzwanie egzystencjalne

Abstract

The modern urban environment is the embodiment of modernization and progress, a system that takes the Holocene climate for granted. As a result, the Biosphere conditions that have permitted human civilization to flourish are taken for granted. It is clear, however, that anthropogenic environmental impacts are on course to disrupt our way of life in a more significant and widespread manner than those previously experienced by mankind at a global scale. The future of the Biosphere is under threat from global existential risks. However, threats to human safety and urban security at large – despite being probably the most substantial ones ever faced at a global scale – have been largely ignored. Cities worldwide continue their day-to-day activities on a business-as-usual framework. While warnings on impending catastrophes are increasing, most cities appear to be in denial and unprepared to deal with major disruptions. An examination of the pertinent literature indicates that there is a need to redefine urban development paradigms and let the Holocene city go. This paper argues that we should rethink the urban Anthropocene in light of the challenges cities around the world are likely to encounter in the coming years. This includes revisiting the bases of the dominant economic culture and social organization.

Keywords: Holocene cities; urban Anthropocene; climate urban planning; climate adaptation; climate mitigation; urban futures

Abstrakt

Współczesne środowisko miast jest uosobieniem nowoczesności i postępu, systemem, który uwarunkowania klimatyczne holocenu traktował jako pewnik. W konsekwencji warunki biosferyczne, które umożliwiły rozkwit ludzkiej cywilizacji, są także traktowane jako pewnik. Oczywistym staje się jednak, że oddziaływanie człowieka na środowisko wywiera destrukcyjny wpływ na jego życie, i w skali całego globu jest bardziej znaczące i rozleglejsze niż uprzednio. Przyszłości biosfery zagrażają globalne ryzyka egzystencjalne. Jednak zagrożenia bezpieczeństwa człowieka i bezpieczeństwa miast w dużym stopniu – pomimo ich egzystencjalnego charakteru, jakiego nie doświadczyliśmy do tej pory w skali globalnej – są

[1] This paper is conceptually based on the Introduction to Francisco Javier Carrillo and Cathy Garner (Eds.) (2021). *City Preparedness for the Climate Crisis*. Edward Elgar Publishing, pp. 1–13, by the author. The text has been rewritten for this submission.

ignorowane. Na całym świecie życie miast toczy się swoim codziennym rytmem. Chociaż coraz częściej wydawane są ostrzeżenia o nadchodzącej katastrofie, większość miast najwyraźniej im zaprzecza i nie jest przygotowana, by reagować na poważne wstrząsy. Analiza literatury przedmiotu wskazuje, że pojawiła się potrzeba redefinicji paradygmatu rozwoju miast i rezygnacji z koncepcji miasta holocenu. W artykule dowodzi się, że należy przemyśleć wizję miast w antropocenie w kontekście wyzwań, przed jakimi staną w najbliższych latach. Będzie się to wiązało z koniecznością przedyskutowania podstaw dominującej kultury ekonomicznej i organizacji społecznej.

Słowa kluczowe: miasta holocenu; urbanizacja w antropocenie; miejskie plany klimatyczne; adaptacja do zmian klimatu; łagodzenie zmian klimatycznych; przyszłość miast

Introduction

Historically, the greatest proportion of human history has been lived as nomads (Bettinger et al., 2015; Barnard, 2020), with distinctly different ways of relating to Earth (Ingold, 1996). Homo sapiens-sapiens appeared more than 300,000 years ago, but sedentary agriculture and permanent human settlements, two key precursors of urban civilization, did not develop until 10,000 to 12,000 years ago. In this scenario, the Holocene arose approximately 11,650 calendar years ago (Walker, 2009), the geological epoch that is now arguably ending to give way to the Anthropocene (Zalasiewicz et al., 2019).

The Holocene marked the end of the last glacial period and was characterized by relatively stable and favourable conditions for human development. The period corresponds to the rapid expansion of our species globally, and it witnessed most of the recorded history as well as the rise and fall of civilizations and the transition to modern society. Among all its diverse cultures and forms, the city epitomizes the modern human presence on Earth. Within the singularly benevolent Holocene, towns have been the nesting shapes of human life. This, however, is changing.

Human activities also made an unprecedented impact on the Biosphere during the Holocene resulting in current anthropogenic existential challenges to ecosystems. As described below, the proposed new epoch of the Anthropocene is characterized by a disruption of the environment on a geological scale. In the wake of its dominance and expansion, the human species now faces danger to its very existence. Currently, the exceptionally benign conditions of the Holocene are giving way to conditions that make human survival more challenging. In other words, paradise is gone.

After leaving the Holocene and entering the Anthropocene, we are likely to encounter several unprecedented challenges that threaten our ability to continue inhabiting this planet. City culture has been made possible solely by the unique environmental circumstances of the city as the embodiment of our integration into Earth's system. A fossil record as unique in history as they are fragile: more than

two-thirds of Earth's history (first 10 billion years) was devoid of life, and once life appeared (4 billion years ago), microorganisms continued to be the dominant form of life. In the course of evolution of more complex organisms, conditions for life have also changed. There have been five major extinction events over the last 540 million years (a sharp decrease in the biodiversity of multicellular organisms) and the sixth is arguably underway now (Novacek et al., 2001). Life on Earth has evolved through a catastrophe-filled and turbulent history, rather than a continuous and smooth process. The biosphere is experiencing a 'state shift' that may threaten human life support systems (Barnosky et al., 2012). As a result, urban foundations are liable to be shaken and disturbed.

As an example, the existence of infinite supply resulting from indefinite growth is unlikely to be sustained. The accessibility to basic inputs, such as food, water, and energy, cannot be taken for granted anymore. In comparison with the scale of the challenges that may lie ahead, the ongoing COVID-19 pandemic, after causing such a significant social and economic disruption, pales in comparison. Cities are fragile complexes made up of a great variety of interconnected subsystems, akin to card castles, each subsystem subject to unique risks. If several of these are disrupted simultaneously, the whole city life falls apart.

We must critically examine the axiological and conceptual foundations of our cities and revise their environmental economic, cultural and political bases in order to responsibly face the environmental challenges of the Anthropocene as these unfold. As a result, it is necessary not only to question modern urban living, but also the whole way we inhabit our planet. Unless such an examination is conducted, no mitigation, adaptation or reform for a city will be effective. If the entire Holocene City paradigm is not examined, no fashionable urban development framework, be it smart, sustainable, or resilient, can be effective. In essence, this means letting go of the very lifestyle that brought us here. It is time to say goodbye to the Holocene City.

Methods

This is a conceptual paper based on the frameworks of Knowledge for the Anthropocene (Carrillo & Koch, 2021) and City Preparedness for the Climate Crisis (Carrillo & Garner, 2021). It draws on the progress made on these fields to summarize the most relevant insights regarding the threats to security being faced by the urban Anthropocene.

So, what does 'City Preparedness for Climate Crisis' mean? What makes this issue so important? Essentially, the term is used to identify the historical concurrence of Planetary Boundaries that have been badly disrupted by human activity (Rockström et al., 2009; Castree, 2017) as well as the vulnerability of urban settlements, which grew out of assumptions which are no longer valid. First, anthropogenic impacts have resulted in a 'state shift' of biosphere conditions that allowed human civilizations to flourish (Barnosky et al., 2012). Secondly, the development

of urbanization has assumed a stable integration of city life and its physical environment. This paper is concerned with how urban living is challenged by the escalating climate crisis and how urban areas can best address these urgent challenges. The question is whether traditional urban life can remain viable in its present form. Taking a broader look at several aspects of the Anthropocene existential threat may shed light on the fate of human cosmopolitanism.

It is proposed that the Anthropocene is a geological epoch that now follows the Holocene (Crutzen & Stoermer, 2000). The term is defined by the overwhelming impact of human activity on Earth, showing up in geo-stratigraphic records (Zalasiewicz et al., 2010; Zalasiewicz et al., 2019). The starting date of the Anthropocene is in dispute, but a favoured milestone is what is known as the "Great Acceleration" which refers to the expansion of human impacts since the mid-20th century (Steffen, Broadgate et al., 2015; McNeill & Engelke, 2016). The enormous importance of these facts and the observable and potential consequences for the Biosphere have led to the term "Anthropocene" being used to encompass these broader implications for society, the economy, and culture (Malabou, 2017; Castree, 2017; Cohen & Colebrook, 2017; Clark & Szerszynski, 2020), including transformative movements from within specific disciplines such as Sociology (Dietz et al., 2020), Economics (Rees, 2020), Architecture (Turpin, 2013), and Political Science (Hickman et al., 2018; Wainwright & Mann, 2018). This work adopts the wider use of the term insofar it conveys an essentially transdisciplinary 'Anthropocenic turn' in contemporary culture (Oldfield et al., 2014; Hamilton et al., 2015; Carrillo, 2019; Dürbeck & Hüpkes, 2020; Krogh, 2020).

Environmental impacts resulting from anthropogenic activities threaten to disrupt our way of life in more profound ways and on a larger scale than anything we have ever experienced before. Anthropocene challenges are often equated with climate change or global warming in the public imagination and the media. Throughout this narrative, even when the reasons are acknowledged as a consequence of human action, the tone emphasizes some form of discomfort caused by climate change and weather hazards that can be resolved through greater resilience, improved infrastructure, and improved technology. The terms "global warming" and "climate crisis" have been so diluted and politicized that they are being replaced by the seemingly more compelling "climate crisis" or "climate emergency" (Carrington, 2019; Ripple et al., 2019).

As a matter of fact, the Climate Emergency is only one of the nine anthropogenic vectors of Earth System disruption, each posing potential serious threats to the physical fitness of our planet for human habitation. They are: i) Climate Change, ii) Novel Entities (anthropogenic objects, materials and bio-actants), iii) Stratospheric Ozone, iv) Atmospheric Aerosol Loading (anthropogenic particles in the Atmosphere), v) Ocean Acidification, vi) Biogeochemical Flows (Nitrogen and Phosphorus cycles), vii) Freshwater Use, viii) Change in Land Use and ix) Biodiversity Loss (Extinction rate). In order to keep humanity within a "safe operating space",

each of these nine "planetary boundaries" requires a delicate balance (Rockström et al., 2009). Therefore, crossing any of these Planetary Boundaries would pose an Existential Risk to humanity (Barnosky et al., 2012; Steffen et al., 2015).

A significant anthropocenic milestone is being reached even as this paper is being written: what I am calling the Techno-Bio Inversion. As a result of the added mass of human-created materials and objects, the global mass of biomass has been exceeded for the first time in history. According to Elhacham et al. (2020), the total biomass of all creatures on Earth has fallen to about 1.1 trillion metric tons, which is almost half of the biomass present at the dawn of human civilization. In comparison, the mass of the "Technosphere", or human-processed matter, is estimated at approximately the same as the biomass; however, it is increasing rapidly at an annual rate of 30 billion tons. This figure is expected to double to approximately 2.2 trillion tons by 2040.The natural and artificial worlds are being inverted today. However, there is a limit to the increase of the Technosphere and the decrease of the biosphere due to their material constraints and their relationship with each other (Moore, 2016).

Although Anthropogenic Global Existential Risks have increasingly disrupted the climate conditions that prevailed through the Holocene, the inner logic of the modern city remains unaware of their effects. Our cities have developed in and for the Holocene. Since the dawn of human civilization, the Holocene has been the space of possibilities for urban life. Therefore, as the Anthropocene is taking over the present epoch, it is imperative that the whole concept of the globalized modern city be urgently revised and re-designed, not just from the point of view of structural function, but also from the human perspective of living on Earth and the externalities it generates.

As it relates to the Neolithic village and how it evolved into the megalopolis of today, we need to examine how the transition from nomadic hunters and gatherers to agriculture and human settlements happened. In addition to examining the internal dynamics of urban growth (Smil, 2019), it is also necessary to examine the historical interaction between cities and their surroundings. Furthermore, human settlements need to undergo radical transformations, in order to achieve the ability to cope with anthropogenic impacts, and, above all, to reinvent Earth citizenship.

Results

There is a relatively short window of opportunity for a viable transition from the Urban Holocene to the Urban Anthropocene with it rapidly closing. A number of concepts have been alluded to above, including Anthropogenic Existential Risks, State Shift within the Biosphere, Safe Operating Spaces, and Planetary Boundaries. Other concepts such as Earth Overshoot (Wackernagel et al., 2002), Carrying Capacity (Ehrlich, 1982), Earth's Critical Zone (Xu & Liu, 2017), and Doomsday Clock (Mecklin, 2020) provide several parameters to gauge the narrowing space of opportunity to redesigning the bases of culture with regard to inhabiting a more-than-human

world. Indeed, aggregate indicators of criticality have been identified, including the rise in global average temperature over pre-industrial levels[2] (Agreement & Paris, 2015). In addition, 350 parts per million (ppm) is the safe threshold for CO_2 concentration in the atmosphere[3]. Alternatively, 'Climate Sensitivity' for the increase in global temperatures as a result of doubling the concentration of CO_2 in the atmosphere prior to industrialization (Goodwin, 2018). The reference can also be made to the remaining MCC carbon budget of CO_2 emissions to the atmosphere before reaching the 1170 Gigatons required to maintain global temperature below 1.5°C[4]. They are all linked and, at the current rate of deterioration, all lead to a 'Climate Breakdown' over the next few decades, which would have disastrous implications for human life (Jonas, 1976; Laybourn-Langton et al., 2019; Taylor, 2019).

In spite of the overwhelming evidence and scientific consensus surrounding anthropogenic climate change, no unequivocal guidelines are available for future action. We are aiming at a moving target in two different ways. Firstly, our reference constitutes an ever-shifting baseline since there is no 'ground zero' for anthropogenic change (Pinnegar & Engelhard, 2008; Thomas, 2019). In addition, the unfamiliar nature and sheer complexity of the Anthropocene (A 'Hyperobject,' as Timothy Morton refers to it) precludes us from being able to forecast and understand it based on prior knowledge (Morton, 2013). As we enter the Anthropocene, we experience a discontinuity between the conditions of life that prevailed during the Holocene and those we are about to confront. It is because of this compound situation that an incentive has arisen to go beyond traditional ethical criteria such as the precautionary principle (Dupuy, 2015, p. 8) or discounting opportunity cost in policy making (Stern et al., 2006). There is a need for new paradigms in order to cope with the sheer scale and potential effects of urban Anthropocene futures (Farber, 2015). These challenges warrant innovative approaches. The imaginaries of post-urban development, post-carbon urban futures must urgently be engaged (Stone, 2012, pp. 172–173; Luque-Ayala et al., 2018: Chapter 13; Hajer & Versteeg, 2018, p. 142; Arabindoo, 2020, p. 2311), transcending the dominant paradigms of urban development.

A perspective of incremental development constrains all of these urban paradigms. Accordingly, a desired state should eventually be reached with sufficient effort and persistence. In fact, two things have become increasingly apparent: that just as the drivers for business as usual will continue to prevail for as long as the industrial capitalist economic culture endures, the Holocene economic culture is nearing its end (Moore, 2016; Snower, 2020). Probably the first and most important common ground among major philosophers of the Anthropocene is that, by definition, even though human activity has produced this complex reality, it cannot be reversed, controlled, or in any way significantly directed by humans. Decentralization of human

[2] The 2015 Paris Agreement set the goal to holding it "to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C": Art. 2, 1.a.

[3] See 'The Science' at www.350.org.

[4] See 'Remaining Carbon Budget' at www.mcc-berlin.net.

agency is the key result. Thus, the traditional rationale behind political economy and social planning is no longer valid. In light of today's unprecedented events, previous paradigms of urban development are limited in importance. Additionally, feedback loops, cascading effects. and tipping points, (Klose et al., 2019; Lenton et al., 2019) may prevent a return to a familiar (Holocenic) state for centuries or millennia. The Earthly Paradise may have already been abandoned.

Discussion and findings

Urban governance is lagging behind collaboratively creative approaches that are required to enable modern cities to meet the enormous challenges that they are bound to face sooner rather than later. There are a number of operative subsystems within cities that maintain an extremely fragile equilibrium. In the event that a subsystem is disrupted, it may lead to a sudden and devastating domino effect as evidenced by recent events such as major blackouts, floods, water shortages, earthquakes, etc. Subsequently, all of these systems were piled up and reconfigured under the same assumptions pertaining to continual growth and an endless supply. Increasingly, attribution studies (National Academies, 2016; Zhai et al., 2018) conclude that catastrophic climate events on urban centres are linked to man-made disruptions of the Earth System. Adapting to extreme resource scarcity and disruptions in services will be a constant challenge for cities in the Anthropocene. Anthropocene challenges in particular governance, the rule of law, community life as well as collective well-being brought about by increased urbanization and population density.

Since almost every aspect of contemporary urban life is destined to become dysfunctional – or to make manifest how dysfunctional they already are – human imagination will be put to the test: which way will the city go? If there are any city futures at all, they are neither smart, nor sustainable, nor resilient. In all these paradigms, improvement is achieved from taking a caeteris paribus stance: everything else remains the same. Present-day cities are extremely volatile, extremely unpredictable, extremely dangerous, and extremely fragile.

Many warnings have already been issued about the lack of preparedness of our current industrialized and capitalist society to deal with even the most predictable impacts of climate change. A recent project[5] stresses how vulnerability studies "[…] focus on the processes that shape the consequences of climate variations and changes to identify the conditions that amplify or dampen vulnerability to adverse outcomes" (Leary et al., 2009, p. 4). A report by the Urban Climate Change Research Network[6] warns on: "the unique risks that climate change poses to cities through a scientific global data analysis" (UCCRN, 2018). In its report on Adaptation (2019), the Global Commission on Adaptation acknowledges the challenges faced by urban

[5] 'Assessment of Impacts and Adaptations to Climate Change'.

[6] 'The Future We Don't Want: How Climate Change Could Impact the World's Greatest Cities'.

communities (Chapter 5): "Climate change is already bringing more damage, stresses, and suffering to the world's cities […]. Without a determined effort to adapt to these impacts, the economic toll and human pain in cities will inevitably climb – sometimes dramatically […]. As a result, more and more people are in harm's way all over the world, especially in rapidly growing, under resourced cities in developing countries that have limited capacity to adapt to climate change" (GCA, 2019, p. 39).

In itself, urban preparedness is a contentious concept. It is debatable whether or not cities can prepare for Anthropocene scenarios. An open question remains: are cities prepared? Can they be? If so, how?

Accordingly, if there is an urban life during the Anthropocene, we have yet to imagine it. City planning needs to be reset on a number of levels. The root conditions of city life must be redefined. On different scales of human settlement, what are the minimal viable conditions? How can the provision of basic services be guaranteed for everyone? Which alternatives exist for integrating a city with its surrounding region? In order to successfully cope with the unpredictable impacts of the state shift on the Biosphere, what forms of governance and community life will be required? Do cities have a role to play in the building of a critical mass of international cooperation required for effective mitigation and adaptation efforts on a global scale?

Conclusion

Rethinking cities to meet the needs of the Anthropocene is a monumental task only rivalled by the challenge of articulating the global human experience in order to implement the urgent supranational policies necessary to enact sustainable futures. There is a substantial amount of precedent emerging from different disciplines to foster a deeper understanding of urban climate mitigation and adaptation. Despite this, the topic of city preparedness for the climate crisis has only been addressed partially in different platforms as an analytic category. Consequently, this paper contributes to issues related to the City's coping with the Anthropocene.

Prior publications that fall into the preceding category of the Urban Anthropocene are the first and second UCCRN[7] Assessment Reports, Climate Change and Cities (Rosenzweig, 2011; 2018); as well as Brian Stone (2012) 'The City and the Coming Climate", a good introduction to Global Urban Heating. Andrés Luque-Ayala, Simon Marvin, and Harriet Bukeley (2018) 'Rethinking Urban Transitions', advances post-carbon perspectives transcending dominant urban development and sustainability frameworks. Ashley Dawson's 'Extreme Cities' (2019), convergent with this approach, sets the scenario for the unfolding of human settlements destiny before the Climate Crisis. Douglas Kelbaugh's The Urban Fix (2019) examines aspects of policies and design regarding city thermal management. Zaheer Allam, David Jones and Meelan Tondoo (2020) 'Cities and Climate Change' underscores the urgency to redesign urban policies under alternative economic perspectives along similar lines.

[7] Urban Climate Change Research Network.

Joel Cohen (2019) reviews two of these plus other three books on Cities and Climate Change on an essay. Ash Amin and Nigel Thrift's "Seeing like a City" provides a particularly sensitive harbinger as it conveys the complex network of agents engaged in the Holocene city, thus providing clues as to how it must be reinvented for the Anthropocene (Amin & Thrift, 2016).

Two special issues stand out amongst the most relevant journal literature: *Urban Studies* 57(11), 2020 special issue 'Why does everyone think cities can save the planet?' (Angelo & Wachsmuth, 2020) and the 2020 *Review of World Planning Practice* Vol. 16 special issue on Post-Oil Urbanism, that includes a recollection of the influence of Knowledge-Based Development throughout the Middle East (Alraouf, 2020). Among the individual papers, the assessment of climate planning capabilities from 885 EU cities is noteworthy (Reckien et al., 2018). An in-depth study of Manchester's adaptation capacities within the context of the Ecocities project (Carter et al., 2015) provides excellent insight into issues related to the adaptation of cities. Wamsler et al. (2013) as well as Giordano et al. (2020) are two other references relevant to planning and adaptation. It is worth mentioning two recent doctoral dissertations that have contributed to the advancement of urban climate planning and adaptation: Anja Wejs from Aalborg (2013) and Marina Rivera from Lund (2016).

On the subject of city resilience, sustainability, and technological capabilities, the literature is rich and extensive. Nonetheless, most of the abundant literature on urban planning, while considering a number of environmental issues, does not challenge the terms of Earth habitation, therefore failing to illustrate the functional inadequacies of modern urban design under the Anthropocene.

The 'City Preparedness for the Climate Crisis' program of the World Capital Institute[8] is predicated on the following premises and is subject to adjustment in light of underlying scientific consensus:

- The climate crisis is real, and its causes are human-induced.
- As a result of the climate crisis, cities are facing unprecedented challenges to the extent that Holocene urban planning is out of step with the Anthropocene.
- In order to redesign themselves for the Anthropocene, cities must engage in a rigorous exercise of mitigation, adaptation, and civic engagement.
- Cities are neither the problem nor the solution but the transition to a sustainable future will take place on an urban theatre.
- Alliances of cities can contribute to the advancement of the international preparedness agenda for the climate crisis.

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[8] https://worldcapitalinstitute.org.

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