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The Anthropocene and Disasters: Near Future, Will It Come?

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Abstract

The Anthropocene Epoch can be characterized not as the increasing effect of humans/cities on the continental soil but as a temporal section in which the planet's surface, the atmosphere, oceans, and nutrient cycle systems began to be changed/dominated by humans/urban. Together with the urbanization trend, the impact of cities and people is the driving force that started the Anthropocene Epoch. Global problems began to emerge with increasing trends, and irreversible disaster scenarios such as climate change, sixth mass extinction, biological destruction, and disasters were brought to the agenda. The increase in the diversity, frequency, and intensity of disasters increases the vulnerability and exposure of cities and people to different hazards, triggering disasters or making them worse. Events resulting from the Anthropocene Epoch "will the near future come?" also raises questions.

For this reason, this study was created based on the assumption that the "Anthropocene Epoch includes disasters and cities play the main role here". In the context of this study, the historical process of the Anthropocene Epoch will be discussed, and the role of cities in this process will be determined. Finally, it will be investigated what will await humanity and cities shortly and which issues should be addressed in cities will be focused on.

Keywords:
Anthropocene, Urban planning, Future, disaster, Catastrophe

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INTRODUCTION

Human activities now significantly affect the entire planet, including its oceans, climate, atmosphere, and soils. The human influence has become so great that geologists (earth scientists) have proposed and argued over a new geological period: the Anthropocene Epoch. This epoch emerged for the first time in geological history as a force shaping both the surface morphology of the planet and the workings of the Earth system of a single species (Homo Sapiens).

The term “Anthropocene” was first used by Stoermer and later popularized by Paul Crutzen (Crutzen, 2002). The etymological origin of the Anthropocene combines two Greek words: Anthropos, meaning "human" and kainos meaning "new". It takes its final form with the suffix -cene, which adds the meaning of "recent" to the root it is added to (Peters, 2012, p.265). Looking at its origins, the Anthropocene is briefly defined as the "new human epoch" (Polat and Kahraman, 2021). The term refers to the gradual emergence of planet Earth from the current geological epoch, the Holocene (Steffen et al., 2011), while it is increasingly used to describe the transition to the full anthropogenization of planet earth, while it remains a suggestion and is being worked on to formalize it (Zalasiewicz et al., 2008).

In 2008, British geologist Jan Zalasiewicz and colleagues put forward the first proposal to adopt the "Anthropocene Epoch" as a formal geological range and then worked to formalize it. These scientists say that the Earth has recently moved from the Holocene to the Anthropocene epoch, that the effects of humans on the global environment are causing signed changes in the Earth's surface, mainly since the Industrial Revolution, that these can be reflected in the last stratigraphic record, leading to the beginning of the Anthropocene Epoch suggested in his studies that it might be possible (Zalasiewicz et al., 2008).

After the Anthropocene Epoch was introduced, the concept was understood that active human intervention in the processes leading to the geological evolution of the planet (Hamilton, 2014) was a major “push factor” that changed the environmental systems in the world (Rafferty, 2020), especially since the Industrial Revolution (Certini & Scalenghe, 2011, p.1272) has been used for a geological epoch, that a new period, which indicates that chemical and climatological forces have become a dominant force replacing them (Oxford University Press, 2019).

In short, the term Anthropocene is synonymous with the threat posed by human activity to planetary systems. Global urbanization (concentration of growing population in urban settlements) is the driver and accelerator of many processes (McPhearson et al., 2021).

The 21st Century is an “Urban Anthropocene” (Hillel & Oliveira, 2014), that is, a “Urbanocene” (West, 2017). It is a fact that urban populations are increasing in number, and nature is accelerating its cycles to serve its own needs, thus upsetting the ecological balance of the planet. It is a fact that the results of these degradations caused by the cities are reflected in

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the cities (disasters). From this point of view, it can be said that the future of urban settlements will determine the end of the world. So, what is the best way to manage the Urban Anthropocene?

Since the middle of the 20th century, humanity has become a global geological force in its own right. Humans have built and continue to build a world (cities) on the planet OF their kind. While artificial cities cause climate change, melting of glaciers, rising sea levels, extinction of species, and an increase in severe weather events such as floods, droughts, and hurricanes, they bring devastating effects on natural cycles such as biodiversity, nitrogen and phosphorus cycles, and microbial evolution. It is clear that this situation has driven the world away from the Holocene into a brand-new geological period, the Anthropocene, due to the significant influence of man on the planet. The problems of the Anthropocene have become particularly acute in cities as cities function as microcosms of global change: overpopulation, greenhouse gas emissions, resource scarcity, pollution, migration, and social inequality.

About the Anthropocene, significant discussions are about whether we have entered this new epoch. Can we describe a specific moment when it began? What are the main atmospheric, biotic, and environmental changes that have already occurred, and what changes can we expect in the future? Can we predict the unpredictable? What is the role of cities in all these processes? Research questions such as "The Anthropocene Epoch includes disasters and cities play the major role here" have formed the assumption in the study.

In this study, the first signs of the Anthropocene Epoch (golden spike) created by humanity will be discussed first, and the driving force of the settlements in changing the geological time with the increase of urbanization in this temporal section will be explained (1st part - I did it myself). This process will explain how the effects that push the planet's boundaries while changing the natural cycles cause disasters in the cities that host most of the world's population (part 2 - my urban found). Then, the extent of the disasters that await us shortly will be discussed (part 3 - After the Anthropocene). As a result of the theoretical and conceptual research, the Future of the Anthropocene and which issues should be addressed in cities will be discussed in the conclusion section.

TRANSITION TO ANTHROPOCENE -I DID IT MYSELF-

Man's struggle for existence in nature has led him from being a part of the ecosystem to the point of making nature suitable for his own needs. This struggle of man with soul has caused and continues to destroy nature on different scales. Traces of this destruction are recorded within the geological processes. Human activity impress affects the environment, from biogeochemical cycles to the evolution of life. For example, the carbon released into the atmosphere by human actions since 1750 has increased atmospheric CO2 to a level not seen for at least 800,000 years and possibly several million years (IPCC, 2014).

There are stratigraphic "Golden Spike" in the Geological Timeline that changed the course of history. These points and transitions indicate that the Anthropocene was not made in a day nor was it created in the same way; that is, human activities in the world have had some effects from the past to the present (Ellis et al., 2016, p.193). The strongest acceptability of these effects is the necessity of "stratigraphic, atmospheric and biotic variables at the same time" on a global scale.

Human impacts on the ecosystems in which they live, human-ecosystem interactions have increasingly deepened after a series of chronological transitions: (i) the establishment of settlements, the cultivation of agriculture and domestication of animals, the transition from hunting and gathering tribes to metropolises; (ii) global and regional connectivity/interaction through trade; (iii) transcontinental discoveries, imperialism and industrialization, and (iv) globalization, urbanization, increased macro traffic and climate change (McMichael, 2004, p.1049; Hassell et al., 2017, p.55).

The ever-present dominance of man over nature has revealed the debate whether the Anthropocene has been ongoing since the middle of the 20th century, recently or for centuries, or even for thousands of years.

Scientists have discussed the exact starting point for the Anthropocene Epoch. From the beginning of the 21st century, efforts to identify the proposed starting point for the Anthropocene Epoch have primarily raised the following interrelated questions: Level of human control – to what extent is the environment on earth under human domination and control?; geographic scale - how much of the world would the Anthropocene have to affect for it to be considered; relevant datasets - What types of information are appropriate and acceptable to use when determining the beginning of the Anthropocene?; What are the auxiliary stereotypes that document long-term changes in the earth system so that the Anthropocene can be considered? Based on how these questions are answered, the alternative suggested starting dates for the Holocene to Anthropocene transition are examined from the first man's discovery of fire to the 21st century, and its urban context is discussed.

First effects in the Pleistocene

The earliest suggested start dates for the Anthropocene date back to the first changes in local environments: up to the adoption of fire by Homo erectus (1-2 million years ago) (Glikson, 2013; Roebroeks & Villa, 2011). The first significant influence of the first people on their environment was probably the use of fire (Glikson, 2013). Critics such as Hamilton invalidate this period as a reasonable starting date since the basic concept is human influences (or even domination) on the planetary system. (Hamilton, 2016).

Another proposed starting point due to the lifestyle of hunter-gatherer people of the period is the Megafauna extinction (50,000 to 10,000 years ago). During the megafauna extinction, about half of all large-bodied mammals and 4% of all mammal species went extinct, which has

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happened in America at most (Barnosky, 2014; Malhi et al., 2016). It has been suggested that this event caused regional warming (up to 1 Co): it is claimed that reflective and snow-covered high-altitude meadows may have been replaced by dark, heat-absorbing forests (i.e., reduced reflectivity). These results suggested that the human impact on the climate began even earlier than thought (Ruddiman, 2003). The beginning of the Anthropocene should be extended for thousands of more years (Doughty et al., 2010).

It is accepted from a synoptic point of view that the arrival of the first man and the extinction of Megafauna are worldwide, and the evidence of a significant human role seems very strong. But because the extinction event is widespread and lasted more than 100,000 years, the idea is also overall that no date can describe the beginning of the Anthropocene. Therefore, according to Lewis and Maslin (2015), the Megafauna extinction was a series of events on different continents and lacked the necessary conditions defined for the Anthropocene.

During this period, archaeological data indicate that the world population dispersed and never exceeded 10 million (Chiarelli, 1998). Humanity, which earns its living by hunting and gathering, has not had fixed places where it has lived continuously.

Agriculture and Global Atmospheric Change

The more frequently suggested candidate date for the start of the Anthropocene is the start of agriculture. This is a global incident with multiple independent agricultural origins in Africa, Eurasia, the Americas, and New Guinea. It spread and increased with the development of urban civilizations over the next 10,000 years (Ellis et al., 2013). The fact that humanity began to engage in agricultural activities also started the transition to settled life (change from nomadic order to settled order) and laid the foundations of the first demographic revolution. This led to the development of villages and cities and eventually created complex civilizations that spread over large areas.

Rice farming and the increasing ruminant (farm) population are thought to have caused an increase in methane concentrations (~11,000 years ago) (Singarayer et al., 2011; Fuller et al., 2011, p.756). Ruddiman (2013) argues that the release of methane causes a greenhouse gas effect sufficient to prevent the onset of the next ice epoch. However, according to Lewis and Malin (2015), auxiliary signs may include fossilized domesticated plant pollen and ruminant remains, but they do not provide signs that collectively document simultaneous changes globally. However, according to Lewis and Malin (2015), auxiliary symptoms may include fossilized domesticated plant pollen and ruminant remains, but they do not provide signs that collectively document simultaneous changes globally. Also, another difficulty with adopting the beginning of agriculture as the beginning of the Anthropocene is that it closely coincided with the onset of the Holocene and made the Holocene epoch redundant.

The population, which did not exceed 10 million at the end of the Pleistocene epoch with the start of agriculture, increased to 50 million with the beginning of the first settled society around 5000 BC (2,500 people per 250 Km2 for the first farming communities, and 5000 for the next pre-industrial and urban phase) (Chiarelli, 1998). With the beginning of comprehensive agriculture, cities with over 5,000 around 2,500 BC were 3, increasing to 17 at the milestone (Population Commission, 1976).

The Collision of the Old and New Worlds

Another suggested date is the Old and New Worlds' collision around the 16th century. The arrival of Europeans in the Caribbean in 1492 and the subsequent annexation of the Americas resulted in the most significant human population shift in the last 13,000 years. The economic and cultural link between Eurasia-Africa (Old World) and America (New World) heralded the beginning of a globalized economy and the Columbian exchange (Diamond, 1997; Crosby, 2003). The collision of the Old and New Worlds exchanged domesticated plant and animal products between regions (Mann, 2011). This cross-continental movement and accidental transfers have resulted in a rapid, ongoing, radical reorganization of life on Earth without geological precedent (Lewis & Maslin, 2015; Chiarelli, 1992). Although the criteria for this starting date, the movement of species between continents, are signed by a strong biological signal, there are also debates on whether it does not cause a change in the functioning of the world system by itself (Hamilton, 2015). This date point is a controversial sign for the Anthropocene (Zalasiewicz et al., 2015).

During the collision of the Old and New Worlds, the world population in the 16th century was 395 million, while the urban population of over 5,000 people was 30. At the end of the 17th century, the population increased to 550 million, and the urban population of more than 5,000 remained at 30 (Population Commission, 1976). It is estimated that the estimated number of cities with over 5,000 inhabitants did not change in the 16th and 17th centuries due to continental mobility, the establishment of new settlements, and deaths from diseases.

Industrial Revolution

Many scientists have suggested the beginning of the Industrial Revolution as an actual date for the beginning of the Anthropocene. Crutzen and Stoermer (2000, p.17) state that the industrial revolution, which caused global-scale atmospheric changes (carbon dioxide and methane), is the key indicator of the beginning of the Anthropocene. Rapid fossil fuel use and rapid social changes have been important events in human history (Crutzen & Stoermer, 2000; Zalasiewicz et al., 2011; Steffen et al., 2011).

Human energy use has risen sharply with fossil and land change. Overall, these industrial societies used four or five times more energy

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than their agricultural predecessors (while the farming community used 3-4 times more than hunter-gatherers) (Sieferle, 2001). The result of energy-related (fossil fuel) processes and activities (urbanization, etc.) has led to a significant increase in human footprint on the environment. Between 1800 and 2000, the human population increased from about one billion to six billion. In particular, the use of energy, influenced by urban areas, has increased approximately 40 times, and economic production has increased 50 times (McNeill, 2000).

Rapid societal changes and the acceleration of fossil fuel use have produced significant and unique transformations in Earth's natural history. Although, the lack of stratigraphic evidence has made this landmark controversial for some scientists. Crutzen and Stoermer (2000) mark the last part of the 18th century as the Holocene-Anthropocene border and point out that the effects of global human activities were noticed. Certini and Scalenghe (2011), on the other hand, questioned whether the Anthropocene began in the late 18th century, rejecting Crutzen and Stoermer's increase in greenhouse gases as a starting sign. They argued that "a change in atmospheric composition is not suitable as a criterion for describing the beginning of the Anthropocene" they argued that GHG levels do not reflect the significant overall impact of humans on the general environment, so more indicators are needed (soils and anthrosols) (Certini & Scalenghe, 2011, p.1270-1273). Other discussions indicate: The Industrial Revolution was a local event that did not co-occur in Northern Europe (Lewis & Maslin, 2015); Many parts of the Earth's surface had already been altered by pre-industrial human activities (Kirsch, 2005); Industrialization was slow to spread from its origins in western Europe, and there has not been industrialization at the same time globally (Malhi, 2017).

The Industrial Revolution accelerated population growth; in the two centuries between 1750 and 1950, the population increased an average of 10 times more than in previous centuries (Chiarelli, 1992). The number of cities with over 5,000 people was 33, out of an estimated 728 million world population in 750 years. After the revolution, it almost doubled every 50 years. In 1950, the number of cities, which was over 5,000, reached 783. While the estimated number of cities with over 100,000 people was 15 at the beginning of the 19th century, this number increased to around 314 at the end of the 20th century. In 1950, there were 83 cities with a population exceeding one million. Urbanization has grown with the effect of the industrial revolution. Industrialization and the emergence of the factory system triggered the migration from rural to urban. While the urban population was at 5%, this rate was 30% in 1950 (Population Commission, 1976).

Great Acceleration

In the second half of the 20th century, the human-environment relationship changed drastically with industrialization, World War II, and the use of the atomic bomb (Steffen et al., 2007, p.618). This so-called

"Great Acceleration" has led to a massive expansion in the human population and significant changes in natural processes with the intensification of human activities (Steffen et al., 2007; Canfield et al., 2010).

Great Acceleration Steffen et al. (2015) summarize the evidence from a longitudinal analysis of natural and social trends from 1795 to 2010 (see Steffen et al., 2015, p.4-7). To detect massive acceleration, a set of socioeconomic and Earth system parameters (24 global indicators) were used to track the impact of human activities on Earth, including population, economics, water usage, food production, transportation, technology, greenhouse gases, surface temperature, and natural resource usage (Figure 1).

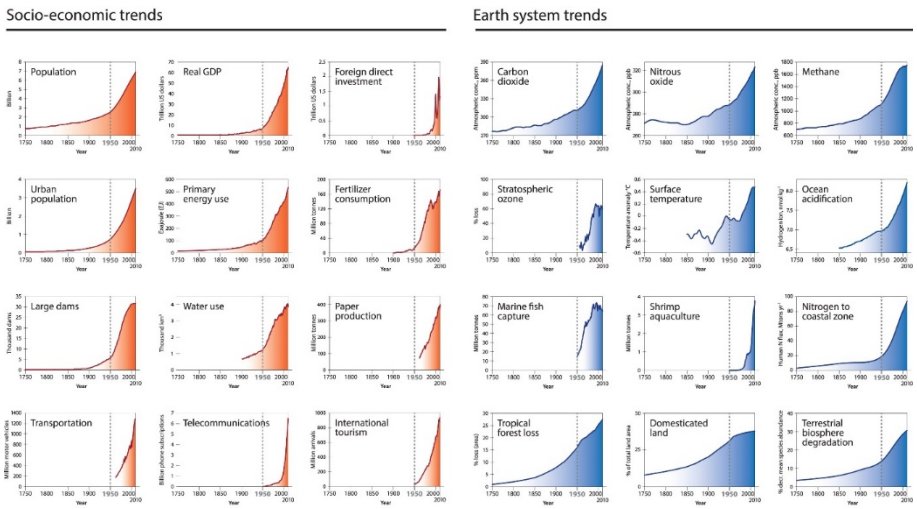

Figure 1. The Great Acceleration (Steffen et al., 2015)

Each indicator has increased dramatically since 1950. Steffen is certainly right about that. In 1950, the world's population was just over 2.5 billion, of which 746 million lived in urban areas. By 2009, the population had more than doubled to over 6.8 billion people, of which 3.42 billion lived in cities. Water consumption has also quadrupled during these years, rising from over 1000 cubic kilometers to about 4000. Another example, is the indicator of global human ecological footprint increased from 63% of the planet's bio-productive capacity in 1961 to 97% in 1975, reaching a level of 150% today; equivalent to the consumption of 1.5 planets per year (Steffen et al., 2015).

In 2016, the Anthropocene Working Group suggested the year 1950 to be the starting point of the Anthropocene since the presence of radiation from nuclear fallout caused by nuclear weapons testing is a detectable signal (Zalasiewicz et al., 2017, p.59). Lewis and Maslin (2015) pointed out that the Great Acceleration (1964) is vital in being the Anthropocene starting point as it fulfills the Global Boundary Stereotype Section and Point criteria. Also, the main advantage of choosing 1964 is the sheer variety of human influences recorded during the Great Acceleration: today and in recent years, almost all stratigraphic records point to human activity (Steffen et al., 2015; Lewis & Maslin, 2015).

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The fact that urbanization is increasing exponentially and an increase in consumption has created another impetus for the Great Acceleration. At the same time, the population was 1 billion around 1830, 2 billion in 1925, and 2.5 billion in 1950. Cities had a strong influence on the graph curves of the Great Acceleration. This effect became an even more driving force at the peak point (1950). This increase in the urban population was defined by Hern Warren (1995) as "biosphere cancer".

URBAN CONTEXT

It is not correct to characterize the Anthropocene with a single event on earth and the basis of human traces in the geological record. But the fact that cities were places of disaster that caused cannot be denied the beginning of the Anthropocene. Cities have been places that have experienced tremendous changes in what is known phase as the “Great Acceleration”.

The world population increased from 600 million in 1600 to about 8 billion in 2021. The world population has grown exponentially (the increase has accelerated since the interval considered the Anthropocene Era) and has recently begun to increase by 1 billion every 12 years. This led to estimates of a population of around 10 billion in 2050. While more than half of the world's population lives in cities today, it is predicted that two-thirds of its people will live in cities by 2050. In 1800, the world population was about 1 billion, and Beijing was the only urban with more than 1 million inhabitants. By 1900, about 16 cities had crossed this dam; this number had risen to 371 at the turn of the millennium and 548 (23 percent of the population) in 2018. If this trend continues, by 2030, there will be approximately 706 (28 percent of the population) cities with more than one million inhabitants worldwide (UN Population Division, 2018).

Land changes began to occur in cities with great speed to accommodate the increasing exponential population. In this process, three-quarters of the land and two-thirds of the marine environment have been significantly altered. Approximately 1 million animal and plant species are at risk of extinction due to the spaces built for humans (IPBES, 2019). Urbanization has increased greenhouse gas emissions, caused average global temperatures to increase by one °C compared to pre-industrial times, and the effects of the climate crisis have been exacerbated. These global changes have revealed an uncertain future not only for the biosphere but for humanity itself and the extinction of other species. Land-use change, including deforestation and modification of natural habitats, has brought many urban disasters. For example, it has been responsible for about half of the emerging zoonoses (diseases that can be transmitted from animals to humans).

Trachtenberg (2017) stated that Anthropocene and urbanization are not the same things. The Anthropocene encompasses a series of fundamental earth system processes in which humans changed the planet to live. On the other hand, Urbanization can be defined by the spatial concentration of people, who are the guiding and driving force of

economic, social, and environmental change. The functional link with urban growth is clear: proto-industrialization would not occur if not provided the heat for the rapidly growing numbers of urban households and commerce. But even more: at the global level, it is a fact that there is a severe correlation between urban population numbers and the number of fossil fuels used over 500 years (Fischer-Kowalski et al., 2014, p.20). 80% of greenhouse gas emissions and most wastes are produced by the current urban lifestyle (Ritchie & Roser, 2018). And more than 66% of global energy is consumed by this lifestyle (Fragkias, 2013).

People have had such a significant impact with the acceleration of urbanization on earth that they have changed their geology and created new and different layers. The conversion of more than 50% of the earth's land surface for human use (Hooke & Martín-Duque, 2012) has produced anthropogenically modified materials in multiple terrestrial environments (artificial sedimentary): landfills, urban structures, mine residues, etc. (Waters et al., 2016).

In the long-term perspective, the evidence that will leave a lasting impression (marks) on the face and under the Earth is the cities. Zalasiewicz (1998) noted that this new geological layer would be the future fossils. Over thousands of years, humans have produced materials previously unknown on Earth, such as ceramics, glass, bricks, and copper alloys. The remains of these materials exist as a persistent and pervasive geological signal reflecting the city (Edgeworth, 2015, Topcu & Kubat, 2007). Almost locally unknown before the 19th century, elementary aluminum has seen 98% of its global production since 1950 (Zalasiewicz et al., 2014). Invented by the Romans, Concrete has been the primary building material since World War II. In the last 20 years (1995-2015), more than half of the concrete produced has been produced. This corresponds to approximately 1 kg m^2 of the planet's surface. Concrete and aluminum are spreading rapidly, especially in urban environments (Waters et al., 2016).

The rapid urbanization currently being experienced is another “sudden mineralization” that DeLanda (1997, p.26-27) mentions. In this case, cities are nothing more than the human (Exo) skeleton, a life support system, as Matthew Gandy states (Gandy, 2005). If the structures built by people were to stop, nature would soon take over these structures and possibly devastate them within a few centuries. Millennia later, the concrete layer and building rubble would remain. If this is the case, humans will leave their giant skeletons as urban remains (Polat & Kahraman, 2020). If the rapid post-war growth of urban areas is considered the “golden spike” and the driving force for the Anthropocene, should it be the Urbanocene (West, 2017) rather than the Anthropocene? The idea leaves question marks.

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ANTHROPOCENE AND DISASTERS

The Anthropocene itself could be considered a "disaster" - possibly equating to the asteroid event that killed about 70 percent of the species in the world about 66 million years ago. Beck (1992) has formulated the era we live in as the "Risk Society", where disasters are no longer the exception, and they have become a part of daily life. Dealing with hazards and disaster risks has become a central preoccupation for individuals, communities, and states.

Urbanization processes triggered the change in the Anthropocene, presenting environmental and social challenges unprecedented in scale, scope, and complexity (Polat & Kahraman, 2019, p.324). Cities have been places where people had a share of responsibility in the process when the Anthropocene started and where they will now live in the Anthropocene. They have become spaces open to the devastating effects of the Anthropocene (Trachtenberg, 2017). These catastrophic effects have made themselves intense in the 21st century, such as floods, storms, drought, extreme weather events, and epidemics.

In the 21st century, the nature and perception of global disaster risk have changed dramatically. Disasters such as earthquakes, volcanic eruptions, and tsunamis still occur, but “the risks of the Anthropocene” have expanded due to the increased impact of human actions (flood, fire, etc.). In addition, some dangers that were once thought to be the result of only natural processes are now known to be triggered by human action. In the "new planetscape of impossibly intertwined entangling of earthly biorhythms and colossal human engineering projects", the distinction between "natural" and "human-made" disasters can no longer be made. This reveals that we should reconsider the difference between natural and anthropogenic risks in light of the Anthropocene.

The global EM-DAT International Disaster Database, which records and evaluates data on the occurrence of "natural" and "technological" disasters by individual countries and regions, shows that natural disasters are occurring more frequently than in the past (EM-DAT, 2021). This trend can be attributed to the driving force of human activities in changing the planet's system. It also shows that the occurrence and intensity of significant disasters increase, and the diversification of global risks. The broadening of the scope of global disaster risks is associated with structural changes that link risks in unprecedented ways. Critical drivers of uncertainty include demographic change; geopolitical shifts, political transformations; technological developments, and climate change (Abdenur, 2020).

Climate change is the typical/intersection point of all the mentioned changes, from geopolitical changes to political transformations and the emergence of new technologies. According to the latest reports of the IPCC (2019), climate change will lead to more frequent and severe natural hazards, causing poverty and food shortages and displacing people significantly (IPCC, 2019).

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A debate that has characterized the climate change and disaster literature in recent years is that climate change (i.e., changes in climate resulting from anthropogenic impact) is a direct driver of disaster risk. Disasters caused by climate change affect every aspect of the economy and society. The dimensions of climate-related disasters in the Anthropocene Epoch can be summarized as follows;

- In the last decade, 83% of all disasters that trigger natural hazards have been caused by severe weather and climate-related events such as floods, storms, and heat waves. The number of climate and weather-related disasters has increased since the 1960s and has grown by almost 35% since the 1990s (IFRC, 2020).
- In the last decade, 1.7 billion people worldwide have been affected by climate and weather-related disasters.
- Severe weather and climate-related disasters (2,355 climate-related extreme weather disasters) have claimed the lives of more than 410,000 people over the past decade.
- The planet's average surface temperature has increased by about 1.18 degrees Celsius since the late 19th century.
- According to NASA, Greenland lost an average of 279 billion tons of ice per year between 1993 and 2019, while Antarctica lost about 148 billion tons of ice per year.
- The global sea level has risen about 20cm in the last century. But the rate in the previous two decades is nearly double the previous century, and it's accelerating every year.
- Since the start of the Industrial Revolution, the acidity of surface ocean waters has increased by about 30%. The ocean has absorbed 20-30% of total anthropogenic carbon dioxide emissions in recent years (7.2 to 10.8 billion metric tons per year).
- In the last two decades, climate-related disasters have nearly doubled compared to the previous two decades, affecting more than 4 billion people. These disasters claimed millions of lives and resulted in economic losses of over US$2.97 trillion (UN Secretary, 2021).
- According to research covering the last 50 years, the number of disasters caused by climatic conditions has increased five times since 1970. It is revealed that more than 2 million people lost their lives from these disasters and the most loss of life was due to drought (World Meteorological Organization, 2021).

The intensity and frequency of extreme weather events have increased and will continue to rise in the coming decades. These events will directly destroy urban infrastructure. However, if the sea level rises rapidly, many coastal cities will likely be submerged by the rapidly growing sea, sinking too quickly to be inaccessible. Here, as Zalasiewicz (2008, p.84-5) points out, "[o]ur drowned cities … would begin to be covered by sand, silt, and mud, and take the first steps towards becoming

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geology. The process of fossilization will begin". Cities have been places where people had a share of responsibility in the process when the Anthropocene started and where they will now live in the Anthropocene. The problems of the Anthropocene became particularly acute in cities as cities functioned as microcosms of global change. The dimensions of some disasters in cities in the Anthropocene Epoch can be summarized as follows:

Disasters, especially climate change, pose risks to settlement and infrastructure. For example, many cities worldwide have settled in earthquake zones, coastlines exposed to cyclones and tsunamis, and dangerous areas such as floodplains and hillsides. The earthquake in Haiti in 2010 killed more than 220,000 people, injured more than 300,000, and displaced more than 2 million people (The World Bank, 2010). In the Indonesian capital, Jakarta, floods in January 2013 (some lasted for weeks) displaced more than 14,000 people and cost nearly $1 billion in damage to homes and businesses (Taylor, 2013).

In recent years, humanity has been feeling many infectious diseases on an increasing scale, frequency, and more closely: Ebola virus disease, severe acute respiratory syndrome (SARS), avian and pandemic influenza, middle east respiratory syndrome (MERS), and the recently emerged coronavirus disease (COVID-19). Emerging infectious diseases occur in urban settings, such as the emergence of COVID-19 in Wuhan, or spread rapidly due to urbanization, such as the SARS epidemics in 2003 and the Zika virus disease in the United States (Li et al., 2020).

The Anthropocene Epoch also includes the challenge of providing health, water, food, energy, etc., to the more than nine billion (2 in 3) expected to live in urban areas in less than 40 years (UN, 2013). About 70% of the Earth's surface is covered by water, but only 2.5% is clean, and less than 1% is easily accessible. Approximately 783 million people (about 11% of the population) do not have clean and safe water. This will worsen with climate change, saltwater intrusion into coastal areas, population growth, deforestation, land degradation, and water scarcity (TWP 2014). The worst-case scenarios will cause suffer more water crises in urban areas.

While cultural and environmental changes in the Anthropocene caused golden spikes that changed geological time, these changes also led to the emergence of disasters. When we look at the golden points of the Anthropocene on the geological time scale, it is clear that people's interactions with the global environment increased, especially with the Industrial Revolution and the Great Acceleration, and almost every indicator emerged in the 1950s.

As seen in Figure 2, as the deep roots of the Anthropocene Epoch increase, the greenhouse gas emissions that cause climate change increase. Along with this increase, there has also been an increase in the number of disasters caused by climate change. The rise in the birth and number of cities is not coincidental with these increasing trends.

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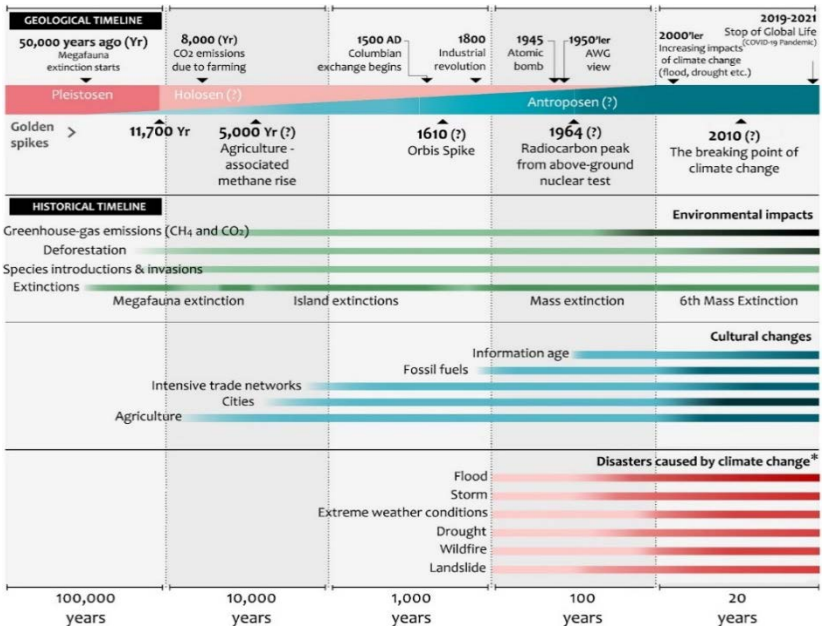

Figure 2. The Deep Roots of the Anthropocene Epoch, Environmental Impacts, Cultural Changes and Its Connection with Disaster (created by the authors with reference from Ellis et al., 2016; Polat & Kahraman, 2021).

AFTER THE ANTHROPOCENE?

Bostrom (2008) defines the risk of a global catastrophe as "a hypothetical future event which could damage human well-being on a global scale, even crippling or destroying modern civilization". From the point of view of risk, Anthropocene-specific risks superimposed new risks on old ones or exacerbated pre-existing risks. From volcanic eruptions and earthquakes to nuclear proliferation and epidemics, the Anthropocene presented more challenging risks to survival.

Our period is not the first period of high unpredictability in history. But political, geopolitical, technological, and climate changes have accelerated the pace of social transformation to change people's perception of time radically. Only twenty or thirty years ago, most people could make plans for everyday life and the near future. Today, people cannot predict the significant political and economic changes in the world in half a century and their daily lives in ten or twenty years (Hariri, 2018). People living in the 21st century will likely experience a more devastating change. It is predicted that future generations will live in a different world. This speed of social change and uncertainty makes it difficult for human society to identify, understand, and overcome emerging risks (Abdenur, 2020).

The Commission for the Human Future has issued an urgent Call to Action to tackle the ten significant catastrophic risks facing humanity and our civilization. The risks included in the report titled "Surviving and Thriving in the 21st Century" are (The Commission for the Human Future, 2020):

- The decline of critical natural resources and an emerging global resource crisis, especially in water,
- The collapse of ecosystems that support life and the mass extinction of species,
- Human population growth and demand, beyond the Earth's carrying capacity,

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- Global warming, sea-level rise, and changes in the Earth's climate affect all human activity,
- Universal pollution of the Earth system and all life by chemicals,
- Rising food insecurity and failing nutritional quality,
- Nuclear arms and other weapons of mass destruction,
- Pandemics of new and untreatable diseases,
- With the advent of powerful, uncontrolled new Technologies,
- National and global failure to understand and act preventively on these risks.

Abdenur (2020) also suggested global disaster risks and distinguished Anthropogenic and non-Anthropogenic risks. The non-anthropogenic category includes hazards outside of human action, such as an asteroid impact. However, human activity can exacerbate or trigger risks long ago considered inherent in some cases (climate change risks). These risks are an inevitable end. To better understand the extent of climate risks, one should also consult the 2019 IPCC report. The report explains that if emissions continue to rise, average global temperatures will increase 1.5°C above pre-industrial levels (probably between 2030 and 2052) and could exceed it. The report describes disaster scenarios for these possible situations (IPCC, 2019). Table 1 includes the "Typology of Global Catastrophic Risks" mentioned by Abdenur (2020) and IPCC (2019).

Table 1. Typology of Global Catastrophic Risks (Anthropogenic) (Abdenur, 2020; IPCC, 2019)

Type	Drivers	Sample scenarios
Artificial intelligence (Superintelligence) (Bostrom, 2014)	Learning computers become super intelligent and excessively autonomous, taking unexpected actions and/or out-compete humanity.	Robots manipulate social groups in ways that provoke wars. Robots can independently choose targets to attack with weapons and at scale.
Biotechnology (Noun & Chyba, 2008; Lipsitch & Relman, 2015)	Bioengineered organisms such as viruses, bacteria, fungi, plants, or animals can disrupt ecosystems or become (through intentional or unintentional action) high-virulence pathogens.	A human-made virus escapes from a laboratory and causes a global pandemic.
Cyberattack (World Economic Forum, 2018)	Offensive maneuver by state or non-state actors targets computer information systems, infrastructure, networks, or personal computer devices, sometimes as part of cyberwarfare or cyberterrorism and causing physical damage.	Rogue actors destroy the critical infrastructure of countries or regions, such as satellite systems.
Environmental disaster (Lovejoy & Nobre, 2018)	Overpopulation, economic development, and non-sustainable agricultural practices may lead to widespread deforestation, water scarcity, or species collapse.	Amazon reaches a "point of no return" due to widespread deforestation.
Experimental technology accident (SIPRI, 2019)	Humans and/or robots create a device that causes widespread destruction.	Biotechnological innovation is weaponized and leads to a pandemic.
Global Warming (World Economic Forum, 2020)	Increasing levels of greenhouse gases provoke climate change, and sea-level rise prompts loss of biodiversity and stress for food and public health systems.	Global warming leads to the spread of infectious diseases.
Nanotechnology (Umbrello & Baum, 2018)	New technologies, such as molecular manufacturing, lead to new arms races.	Rogue company or state weaponizes nanotechnology.
Warfare and mass destruction (Toon et al., 2019)	Weapons of mass destruction are deployed in ways that cause widespread damage.	Nuclear warfare.
World population and agricultural crisis (Singh, 2018)	The rapid increase in human population, for instance, due to medical developments, outpaces increases in	Population surge leads to mass starvation. Lack of food and nutrients

	agricultural productivity or dovetails with an abrupt decline thereof.	
Climate Risks - Extreme heat (IPCC, 2019)	Extreme heat increases due to climate change are increasing every year.	With a 2°C increase, sweltering days in the mid-latitudes will be about 4°C hotter than pre-industrial levels. Exposure of 28% of the world's population (2 billion people) to extreme heat every 20 years.
Climate Risks - Rising sea levels (IPCC, 2019)	With the effect of global warming, the glaciers are melting and the sea level is rising.	It is expected to increase by 0.36-0.87 meters in 2100 compared to 1986-2005. By 2100, 49 million people will be affected by 56 cm of sea-level rise.
Climate Risks - Impact on Species (IPCC, 2019)	With the effect of climate change, the structure of the habitats of the species changes and species extinction occurs.	With a 1.5°C increase, 6% of insects, 8% of plants, and 4% of vertebrates are projected 2100 to lose more than half of their climatically determining geographic range.

The risks in Table 1 are issues that directly concern the "Urbanized Planet". The top five risks that are certain to affect cities shortly are “flood, mass movements (wet), storm, extreme weather conditions, drought” (EM-DAT, 2021).

In addition to the words of sociologist Bronislaw Szerszynsk, “It is important to realize that the status of the Anthropocene is less about what humanity is doing than the traces that humanity will leave behind” (2012, p.169); it can be said that “the traces that humanity will leave behind with the Anthropocene seem to be evident (urban remains), so what will people do in the future?”

CONCLUSIONS AND RECOMMENDATIONS

Numerous dates have been proposed for the beginning of the Anthropocene, such as the emergence of agriculture and cities about 10,000 years ago, the Collision of the Old-New Worlds, the Industrial Revolution, and the Great Acceleration. Within the scope of the research, it was concluded that the most vital candidate point, which includes human control level, geographical scale, relevant data sets, and auxiliary stereotypes, was in the mid-20th century.

Urbanization contributed to the evidence leading to the beginning of the Anthropocene Era. Urban societies, both as the driving force of the Anthropocene and as regions where solutions need to be found, also represent spaces where change can best be managed and monitored. The results of "the Anthropocene", initiated by urban people with their own hands, are intensely felt in the urban spaces they live in.

The fact that the Anthropocene Epoch began to push the “planetary boundaries” has recently brought with it calls that are variously called “planetary administration” (Steffen et al., 2011); “earth system governmentality” (Lövbrand et al., 2009); and “deliberative global governance” (Dryzek & Stevenson, 2011, p.1873). Indeed, this shows that the need for new or extensively strengthened frameworks/policies/management is urgently needed for the near future to come. In addition, when the assumption is made that "although urbanization has existed for thousands of years, in its current form, it functions as an accelerating aspect of the Anthropocene", it is now necessary to reshape the nature of urbanization to balance the planetary borders and the border. We need to transform urbanization processes for a desired or “good” Anthropocene (Strategic Spatial Planning).

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Recently, it has been tried to propose solutions in planning in the context of "green," "sustainable," "smart," "flexible," "zero-carbon," and "resilient" cities. But in light of the scale of the problems faced, how effective can these initiatives hope to be? There is a great need to inject a good dose of realism into our vision of the future when planning; because the Anthropocene stands on a hard ground of uncertainty and unpredictability in planning. Because accepting the uncontrollability of extreme climatic events that can occur anywhere, at any time, is in contrast to the predict/produce solution approach of planning.

We can never restore the Planet. So how do we move forward in this changing world we've created if we can't turn the clock back?

The changes and transformations that took place in cities with the effect of the Great Acceleration are too complex to be handled with today's traditional planning approach. Social, economic, spatial, and ecological relations and connections in terms of urbanization and urban cycles in the Anthropocene must be reconsidered with the understanding of Strategic Spatial Planning. Thus, it will be possible to understand the cities of the contemporary global world that are formed by human influence and to plan correctly/well.

For this reason, the planning paradigm needs to move towards an orientation that will produce solutions by considering the problems of the 21st century. Understanding "Strategic Spatial Planning" should be adopted as one of the most flexible methods. Short, medium, and long-term solutions should be provided by producing scenarios (such as disaster scenarios - good, reasonable, bad). It is urgently necessary to make resilient/flexible/adaptable strategic decisions with alternatives for cities.

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Resume

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