

Navigating Urban Sustainability: Assessing the Role of Urban Planning and Policy in Mitigating Anthropocene Impacts in Indian Cities

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ABSTRACT

This article explores the complex interrelationships among the Anthropocene era, anthropogenic landscapes, and urbanization, with a particular emphasis on India's struggles. One prominent feature of the Anthropocene—human-induced environmental changes—is the rate of urbanization. The article highlights the negative effects of unrestrained urban growth, such as rising greenhouse gas emissions, the creation of urban heat islands, and the disappearance of natural cover, all of which lead to a reduction in biodiversity and ecosystem services. The study traces the changes made by humans to the environment across thousands of years, reviewing historical viewpoints on anthropogenic landscapes. Urban areas are anthropogenic environments that are changed by human activity and play a significant role in this development. The article emphasizes how vital it is to take environmental issues into account when building metropolitan areas, particularly in light of the unfavourable effects seen in India, like the disappearance of wetlands and native vegetation. The article looks at the global backdrop and investigates how urbanization and globalization are related. Given the considerable influence that urban areas have had on the Anthropocene controversy, it emphasizes the

necessity for landscape scientists to investigate systematic changes that occur within and around cities. In order to create a resilient and sustainable future, the idea of a "good Anthropocene" is presented, which calls for drastic changes in societal structures, cultural norms, and human conduct. The report highlights the absence of a thorough strategy for sustainable city administration by providing a methodical overview of environmental issues in Indian cities. It also covers current initiatives in India to foster sustainable urbanization and eco-friendly smart cities, which are being sponsored by the European Union's International Urban Cooperation Program and the Danish Royal Embassy. The article's conclusion asks for a greater comprehension of the functions and contributions that environmental units provide to the integration of environmental issues into urban planning and design. It emphasizes how important it is to step up efforts, embrace systems concepts, and deal with global issues brought on by urbanization and globalization in order to have a positive Anthropocene future. For scholars and decision-makers attempting to negotiate the challenges of sustainable urban development in the Anthropocene, the findings offer insightful information.

INTRODUCTION

The term "Anthropocene" refers to a geological epoch in which people are the primary cause of significant and persistent environmental changes, such as those seen in climate change. The modern era is referred to as the Anthropocene because of how dominant human activity has become in the earth's history (Nijhuis and Jauslin, 2015). The Anthropocene's fast urbanization is one of its key characteristics. metropolitan centers are thought to be the center of human activity, and as life advances more quickly, people are congregating in metropolitan areas. It is estimated that by 2050, around 66% of the world's population would reside in urban areas. Nonetheless, a sizable body of literature has surfaced recently emphasizing the drawbacks of unchecked, rapid urbanization. According to Kennedy et al. (2009), cities are one of the main sources of greenhouse gases that contribute to climate change. In addition, urban heat islands were created by increasing the impervious surface through the removal of

vegetation. Natural cover fragmentation and change endangers species distribution, energy flow, nutrient cycle, and biodiversity. The low return on ecosystem services is indicative of this.

The United Nations Brundtland Commission's Agenda 21, which included all of its components in 1987, gave guidance on how to achieve urban sustainable development. In this regard, a great deal of study was also done (Wu, 2013). Nevertheless, it has been determined that the current urban expansion paradigm is unsustainable and has eventually severely damaged the ecosystem (Millennium Ecosystem Assessment, 2005). According to a study on Australian cities, increasing the tree canopy by 10% can result in a 19% reduction in the urban heat impact (Osmond and Sharifi, 2016). As a result, it is abundantly evident that taking environmental concerns into account is crucial for sustainable urban planning and design. Since the 1990s, urbanization in India, the second-most populated country in the world, has increased dramatically. Economic opportunities are the primary driving force behind India's urban development plans and strategies. The preservation of the urban environment is given very little thought. Urban centers grew erratically as a result, with the peri-urban environment suffering the most. Numerous recent studies have documented a notable decline in the environment as a result of India's unchecked urbanization. The most notable ones are the disappearance of priceless wetlands and natural vegetation cover. In spite of all of this, there is currently no systematic approach to the sustainable management of Indian cities that addresses environmental transformation and protection. Anthropogenic landscapes and urbanism often handle these two themes independently from one another. However, there is an unbreakable relationship between city and manufactured landscapes. Urban settings are anthropogenic, or "human made," by definition. Furthermore, the services and resources that urban inhabitants utilise generate anthropogenic landscapes both inside and outside of cities. The archaeological record has long been used to investigate urbanisation and human landscapes. The roots of urbanisation may be discovered roughly 6,000 years ago. Having been developed early in human history, artificial landscapes are substantially older, having achieved importance with the beginnings of the Neolithic Revolution roughly 10,000 years ago (Ruddiman 2013). For a very long time, people have been modifying their environment and building unique man-made landscapes. Urban settlements and the landscape changes necessary to suit subsistence demands are both instances of anthropogenic landscapes. Since the introduction of tools, people have impacted the environment in both planned and unintended ways, as revealed by historical chronicles. Therefore, even when anthropogenic landscapes were formed early in human history, the scope of anthropogenic landscape change rose as full-time settlement grew in size, population density, and length.

Urban areas are the most anthropogenically altered landscapes. In this review, we first define human landscapes before examining the history of urbanism and its various manifestations. We then look at the connections that were made between archaeological landscapes and urbanism. Lastly, we consider the lessons that may be drawn from historical landscape usage and urbanism to place our debate in the context of today. We contend that urban theory, which was created for modern landscapes (Sorensen & Okata 2010), might be helpful in conceptualizing and placing ancient landscapes in perspective. As a result, we believe that ancient urbanization and anthropogenic landscapes can be interesting in modern settings.

It is apparent that the Indian government has begun to place more emphasis on the creation of eco-friendly smart cities across the nation in recent years. With the support of the Danish Royal Embassy and the European Union's International Urban Cooperation (IUC) Program, TERI conducted groundbreaking work in this area through policy discussions on "Making Liveable Cities: Challenges and Way Forward for India." It seeks to establish sustainable urbanization in India that is "people-centric." Studies highlighting sustainable liveability in the quickly expanding metropolitan centers have also been conducted by a number of other academics (Saitluanga, 2014). According to historiography, the foundation of contemporary urban planning was created in the middle of the 19th century in response to changing circumstances brought about by the industrial revolution. As a result, cities across the world are at varying levels of development and use the bulk of natural resources while housing and supporting the greatest number of people. Surface changes brought upon by urbanization are significant. Deep structures include a city's physiography, climate, geology, and bioclimatic zones. These profound structures continue to exist as important players in both history and the future. Resilient urban form is more common in city designs that are in harmony with the deep structure of the surrounding area. It should also be more practical and affordable. Deep structures are crucial in determining the kind, capacity, and quality of municipal infrastructure, including transportation, water and power supplies, sewage systems, building scales, and neighbourhoods. These are all supporting structures that ought to be both aesthetically pleasing and able to support life (Axelsson et al. 2013). The obvious shortcoming, though, is that, in terms of sustainable city management, relatively little thought is given to the ecological state of the cities. Few studies addressing the environmental concerns for urban sustainability were conducted locally after a specific city. It is still lacking a comprehensive synopsis of the systematic study of environmental problems in Indian cities. This study reviewed other

studies and provided a thorough compilation of information on the topic of "transforming urban environment: Anthropocene effect on urbanization in India."

METHODOLOGY: A qualitative research method was used in this study, and it was heavily supplemented by a comprehensive review of existing literature. This allowed the study to undertake a systematic investigation into the still-underexplored intersection of the Anthropocene and urbanization in India. The research design also allowed for the use of a wide variety of sources and types of data, some of which were not otherwise easily accessible. In total, over 140 sources were consulted. The types of data and evidence used herein come from government reports, academic journals, books, and several well-established online databases.

ANTHROPOGENIC LANDSCAPES

With the exception of regions covered in ice, at least 75% of the world's landscapes show signs of human touch. Mankind altered half of the planet's landscapes between 0 and 1000 BCE. These changes were largely caused by people and their cities. Compared to cities, which may be categorised in a variety of ways, some of which are controversial, landscapes are more likely to be descriptive. For example, there are strong and fragile landscapes, as well as urban and rural, social and economic, and ceremonial landscapes. Here, landscapes are classified as either natural or man-made, but historical ecology shows that there are nuances even within this straightforward division. Human settlements and subsistence activities are the two main aspects taken into account while discussing anthropogenic landscapes. Thus, large-scale industrial agriculture, plantation agriculture, shifting cultivation, developed villages, agricultural villages, pastoral villages, suburban landscapes, urban residential landscapes, and intensive nonresidential disturbance of landscapes are further distinguished by typologies of contemporary anthropogenic landscapes. However, most categories are too limited to account for all anthropogenic adaptations, given what we know about the past from archaeological studies. Even something as simple as burning the vegetation that covers a space can have a variety of effects on the ecosystem (Bowman et al. 2011). When people are able to get the resources they require, a landscape can undergo significant change. This was the case in central Europe, when mining operations produced lakes where there had not been many before. In the present day, China constructs islands in the South China Sea for territorial and military purposes, while Dubai, the United Arab Emirates, constructs palm tree-shaped islands for wealthy residential use. It is clear that most regions of the world have produced a sizable quantity of artificial

ground through deliberate and inadvertent processes—in the past as well as the present. In long-occupied places, the extent of landscape change is frequently underestimated and challenging to quantify.

Byproducts from mining and industry are not only taken out, transferred, and redeposited for various construction-related purposes, but they are also added to landscape fills or utilised to construct new landscapes. What are referred to as "legacy sediments" are the sediments left behind by a variety of human-caused landscape disturbances, including "vegetation clearance, logging, agriculture, mining, grazing, or urbanisation." Large-scale silt deposits may occur accidentally or on purpose. Many of these sediments and dense fills form the foundations of the cities we live in today. Price et al. note that substantial artificial land is found even in non-industrial places; York, a northeastern heritage city, has eight metres of occupancy fill beneath it. They also mention that Salford and Manchester in northwest England have ten metres of artificial ground. There are also extensive soil enrichment, redeposition, and excavation processes. Cities and the built environment are mutually dependent. Most people who consume clean water, food, and other goods reside in urban areas. Archaeological research indicates that population density raises total economic output. Higher economic growth is linked to urbanisation, which in turn is linked to "the degradation of local and regional environments, threatening basic ecosystem services and global biodiversity." Urban populations created a lot of waste products at the same time, which were either disposed of on the land outside of cities or turned into building materials that were subsequently used as field fertiliser. Interconnected networks were created to enable the procurement and movement of these goods as well as to offer the general public the services they require. Artificial and urban environments may be analysed using concepts from historical ecology (Balee 2006). The long-term implications of artificial landscape-related environmental changes—terracing modifies water flow and retention, deforestation modifies temperature, and farming modifies species composition—may or may not be known. Therefore, anthropogenic landscapes and urbanism interact symbiotically. In addition to the man-made urban landscape, it is useful to consider the spatial relationships between subsistence practices and settlements, as well as the ways in which subsistence needs impact the surrounding environment. Sometimes the habitats of subsistence and cities are merged, and other times they are maintained apart. Our perspective of the urban process and the size and density of urban areas are influenced by our judgements of the degree of colocation between subsistence systems and cities.

MODERN URBANISM AND THE PAST

How to understand the past and whether or not ancient societies may be related to the present capitalist economy are hot topics in archaeology (Feinman 2013). Regarding the same question, one can query if archaeology can be utilised to understand ancient cities, such as if megalopolis and edge cities existed in the past, or if it can help us understand contemporary urban theory. Both of the questions appear to have positive responses. In contrast to a more straightforward model where elite residences were expected to encircle downtown areas and the poor lived further afield, archaeological research suggests that a concentric city organisation modelled after early 20th-century Chicago, with poorer workers living adjacent to the city centre, more closely approximates the spatial layout of the ancient Maya city of Caracol (Chase & Chase 2007). Important similarities between historical and contemporary events in terms of urban structure and function have been discovered by relatively recent study on ancient urbanism. The primary focus of current archaeological research is on the usage and function of open spaces in urban regions, the historical evolution of urban sprawl, and the role that ancient populations played in the early cities. Incorporating agriculture to offer modern urban landscapes a collective character has also attracted renewed attention. An intriguing contemporary phenomenon has also emerged as a result of the restoration of trees in artificial environments. There is a connection between temperate anthropogenic landscapes and the current growth of urban expansion in megacities, despite the fact that most tropical regions had anthropogenic landscapes that are currently covered by rainforest. Over the last 300 years, a cleared territory with independent farmers has undergone substantial change, turning into a wooded area where most people live in cities rather than on farms. Thus, significant reforestation of previously cleared and altered landscapes is a result of greater urbanisation and urban sprawl under certain circumstances.

Recently, there has been an attempt to scale urban efficiency—defined as "capturing the balance between socioeconomic outputs and infrastructural costs"—and city size in order to comprehend ancient urban settlements by contrasting them with modern environments. In order to effectively replicate the socioeconomic output (gross metropolitan product) and many facets of contemporary city infrastructure, this study employed the number of miles of roadways in metropolitan areas as a proxy. According to Ortman et al. (2014), there was an initial attempt to apply the contemporary scaling principles to the ancient sites in the Valley of Mexico. Approximately 1,500 settlements that dated back 2,000 years were examined in terms of settlement area and population size, and it was argued that these were in line with

the more recent data. However, there may have been far greater variation in the old urban form. Therefore, it may be aspirational but not totally feasible to try to integrate all urban settlements into a comparable scaling framework (Bettencourt 2013, Ortman et al. 2014). Two different urban patterns may be distinguished during the Maya Classic Period, in which the regions inhabited, population density, and population size scale along two different lines rather than a single vector. This is true despite the sample size being less than that used for the Valley of Mexico and more recent studies. While it is true that "most urban indicators scale linearly with city size, regardless of the definition of the urban boundaries," the suggested scaling principles were also tested on a variety of city sizes in England and Wales, and the results showed that "population size alone does not provide us enough information to describe or predict the state of a city as previously proposed, indicating that the expected scaling laws are not corroborated."

SEEDS OF HOPE: COMMUNITY-LEAD INITIATIVES AND SOCIAL MOVEMENT FOR A POSITIVE ANTHROPOCENE

Many people have different ideas on what the Anthropocene actually means. Following Hamilton's (2016) definition, we call this "recent rupture in earth history arising from the impact of human activity on the earth system as a whole" the Anthropocene. Caused by cross-scale interactions between the local and the global, Anthropocene dangers stem from globalised social, ecological, and technological processes. Systemic change necessitates more profound and extreme modifications, as is increasingly clear, if we are to shift the Earth system's trajectory and pave new paths for a better Anthropocene. A deeper comprehension of the interconnected nature of resilience and sustainability initiatives, and of systems more generally, is being developed. The term "dystopian Anthropocene" refers to a future in which human societies face comparable or even worsening environmental problems as a result of pollution, climate change, and ecosystem degradation; economic models and development trajectories focused on growth; the use of law to maintain the status quo; and, generally speaking, extreme inequality and social and environmental injustice. Conversely, we define "good" Anthropocenes as ones in which these trends are turned around and future generations enjoy ecological, social, and environmental prosperity while minimising negative impacts on all levels of society. We believe that in order to achieve the future we imagine, there will have to be significant changes in how people think, behave, and adhere to cultural norms. However, we are not alone in believing that this transformation might begin by fostering the "seeds" of hope that exist in communities across the globe. These seeds, along with well-defined future orientations that engage with diverse worldviews, values, and political

and economic power structures, can help shift society towards more normative objectives. Social movements, new economic tools, initiatives, organisations, and ways of functioning are some of the seeds of a positive Anthropocene that aim to promote a sustainable and prosperous future by considering the internal and external drivers of these interconnected systems and the cross-scale dynamics at play. It is essential to integrate systems methodologies fundamentally and scale up present projects and breakthroughs if transformation is to be effective and scale at the rate needed to address global concerns affecting both human society and non-human actors.

ROLE OF TECHNOLOGICAL INNOVATION ON URBANISATION AND GLOBALISATION IN THE ANTHROPOCENE

There is no way to separate globalisation from urbanisation. Both of these activities are excellent examples of the modern era. Investigating their links to big data, landscape sustainability, and the Anthropocene is crucial. Given that half of humanity still calls cities home, the UN has dubbed this century the "urban century". The extraordinary depletion of natural resources is a hallmark of urbanisation. Worldwide, urbanisation tendencies are continuing to climb. The urbanisation rate is as high as 100% in some Asian countries and as low as 50% to 60% in others. With 70% of its cities located in colonies, Africa is one of the continents experiencing increasing urbanisation. Latin America and the Caribbean, on the other hand, are experiencing an 80% increase in urbanisation. Changes in land use and climate are linked to these tendencies and the dangers they pose. Development is happening at a breakneck pace, putting an incredible pressure on landscapes all around the world. Continent- and region-spanning socio-ecological and economic phenomena link cities. Vast metropolitan hubs can be found in every imaginable geographical setting, from coastal zones to tropical rainforests, from deserts to mountains. In the year 2000, the percentage of land covered by cities and other forms of urbanisation was about 2.8%. Its landmass accounts for about 0.3% of the total.

Meybeck and Vosmarty (2005) note that megacities affect river flows all over the world, which they use to link urbanisation to the Anthropocene. The writers argue that this is a hallmark of our Anthropocene period. Carbon emissions rise, land use and cover shifts are amplified, and land energy is redistributed as a result of urbanisation. Of the world's total energy consumption and emissions, 70% are caused by cities and other urban areas. Due to their reliance on natural resources, cities also house most of the main tools used to change the world. In an effort to drive home its point, the Anthropocene movement has made multiple city tours. Stratigraphic artificial grounds have been found in several cities including

Novgorod, London, Istanbul, Beijing, Mexico City, and Rome by urban archaeologists. These grounds are thought to mark the beginning of the Anthropocene. The aforementioned studies all point to urbanisation as the driving element behind the other Anthropocene trends. A wide range of data formats and types can be used to study how urbanisation affects landscapes.

The environmental impacts of urbanisation and globalisation are complementary, making them inseparable. According to the research, there is strong evidence that the two processes are closely related. This is supported by both global city theory and time-space telescoping theory. Both theories agree that urbanisation is spreading and intensifying across national borders as a result of globalisation. Rapid changes are occurring in the landscape as a result of economic liberalisation, globalisation, and the prevalence of multinational corporations. As a result of industrial globalisation, cities like Singapore are able to better organise their urban spaces. After these two stages are combined, the idea of urbanisation emerges. For the sake of this discussion, "urbanisation" will refer to the changes occurring in built environments as a result of changes in resource use and communication patterns within cities. Because of globalisation, the world is getting smaller and easier to go around. The entry of Earth into the Anthropocene, according to Bradbury and Seymour (2008), is mostly caused by globalisation. In his analysis of the interplay between communication and information networks, Allenby (2008) links the Anthropocene with data and urban areas. The global urban network, according to Sassen (2009), has ecological consequences, on the other hand. Because of their huge population, high energy consumption, plethora of businesses, and heavy reliance on natural resources, cities play a pivotal role in the Anthropocene debate. Since urban areas are pivotal to the Anthropocene discussion, landscape scientists would do well to zero in on the systemic changes taking place there. Equally crucial is the measurement of externalities, or the effect of a metropolis on the ecosystems of other nearby urban and rural places linked to it via globalisation.

CONCLUSION

In conclusion, the Anthropocene has been recognised as a critical epoch in Earth's history due to the substantial environmental effect of human activities. The increasing urbanisation that has led to rising greenhouse gas emissions, urban heat islands, and the fragmentation of natural cover—all of which represent significant threats to ecosystem services and biodiversity—has been one of the most prominent features of the Anthropocene. The current paradigm of unchecked urban development has led to environmental degradation, which is particularly evident in countries like India. This is true even if

international programmes like Agenda 21 advocate for the creation of sustainable cities. Urbanisation is the main feature of this geological epoch, when people control the whole terrain. However, a sustainable balance between the natural and urban settings is required for everyone's benefit. Ecologically conscious urban planning has gotten relatively little attention since its inception. As a result, it led to many environmental issues in the cities, making them less liable. Consequently, in every country lately, there has been an increased focus on environmental management in cities. Regretfully, there isn't much research in developing countries like India to lead researchers in the direction of the present field of study when it comes to addressing the eco-environmental transformation of urban areas. This research aims to explore the strategies that have been used lately to address sustainable urban development and to bring attention to the issues brought about by the eco-environmental transition. After that, a little talk is held to show how these methods are used in the Indian context. In the end, it may be said that integrating environmental concerns into urban planning and design requires a greater understanding of the functions and services provided by environmental units. The study's conclusions may provide researchers a clear direction for where to go with their present body of work in this area. Anthropogenic landscapes, or those modified by human activity, are a hallmark of the Anthropocene. Because urban areas are landscapes that have been altered by human activity, there is a complicated interplay between them and the environment. Historical sources claim that urbanisation has sped up the thousands of years that people have been changing their surroundings. Understanding the past of artificial landscapes and urbanisation may provide important insights for contemporary sustainable urban development.

The evaluation emphasises how important it is to include environmental issues in urban planning and design, especially in light of the Anthropocene. The research on India demonstrates the urgent need for a systematic approach to sustainable city management, particularly in light of the detrimental effects that increasing urbanisation is having on wetlands and natural vegetation. The relationship between urbanisation and globalisation is also explored in the article, with a focus on their connections. The emergence of "urbanisation" highlights the significance of cities in the Anthropocene debate because of their concentrations of people and resource usage. Examining the systematic alterations in the landscapes within and outside of cities is essential given the ecological ramifications of the global urban network. Proponents of a "good Anthropocene" argue that significant adjustments to social structures, cultural values, and human behaviour are necessary to build a strong and sustainable future. The need to scale up

efforts and integrate systems methods to solve the global issues brought about by urbanisation and globalisation emphasises the need for a thorough understanding of the implications of the Anthropocene.

POSSIBLE CONSTRAINTS IN RELATION TO USE OF SECONDARY DATA

- Difficulty in ensuring data quality: Different types of secondary data may have different sources and formats, which can subsequently affect the reliability and validation of the results.
- Narrowness of scope: Secondary data may not address all dimensions of the specific study area and may not be comprehensive in respect of the target population or phenomena studied.
- Outdated Data: Secondary data sources may be outdated as they may have been collected many years back. This makes such data sources applicable to the current situation, almost impossible.
- Prejudices and beliefs: People can impose prejudices and beliefs when attempting to use secondary sources which alters the perspective taken on the ongoing investigation.
- Limited complexity and detail: Secondary data may not be as rich or detailed as primary sourced information, which hampers the very ability to study different intricate issues and relations in depth.

FUTURE RESEARCH DIRECTIONS: INCORPORATING PRIMARY DATA COLLECTION METHODS

As much as this study has relied on using secondary data, further research should involve the use of primary data collection methods, such as:

- Surveys and interviews – Information can be solicited using surveys or interviews from specific Indian populations, such as urban planners, policymakers, and residents, to obtain some relevant information about urbanization and sustainability.
- Case studies: Performing case studies on selected cities or urban projects in India to explore more the possibilities and challenges of sustainable urban development.
- Observational studies: Collecting data from witnesses of the urbanisation process whereby, urban environments and actions of people are studied in order to find out the social, economic and ecological consequences of processes of urbanisation.
- Experimental designs: Presentation of various innovations and urban planning strategies and issues in order to determine their efficiency in achieving certain sustainable development goals.



- Mixed-methods approaches: Use of secondary data and accompanied with the original data in order to support or complement the results and enhance the level of the credibility and trust of the research.

Integrating such primary data collection methods will therefore assist subsequent research to integrate the three interrelated aspects of urbanization, globalization, and the Anthropocene in a more legitimate and nuanced manner.

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