

Impacts of Urbanization on the Environment and Ecosystem: A Study Involving the Effects of Development and its Solutions

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Abstract:

Change will always be a part of life. It is an irrefutable law for change to occur, and we humans will always have a desire for such change to happen. Improvements lead to a desire for change, and convenience and the development of our state of life will always occur. Changes would require supplies, with said necessities usually being the natural resources around us. The usage of these resources usually leads to urbanization, which can be described as the population shift between rural and urban areas. The changes that this process has provided have been immense and can be felt across the globe, elevating standards of living, providing profound knowledge, new discoveries, and more inventions that further the experience of living. However, not everything urbanization brings is positive. This research aims to provide a more vivid understanding of how urbanization has affected not just us but also the environment — the planet we live in. The study will provide more insights into the impacts of urbanization provided for humans around the world. This will show how the environment cannot exactly keep up with the speed at which urbanization provides development and what we should all do to improve upon this. The existence of urban growth is a key-driver to urban residents' vulnerability to environmental stress within cities. This paper aids this hypothesis by elaborating the detailed impacts and factors of urbanization on land use change on the environment and the ecosystem.

Keywords: Change, Environment, Ecosystem, Development, Natural Resources, Urbanization, Urban Growth

I. INTRODUCTION

1.1 Background of the Study

Humans have the desire for change - of knowledge, convenience, discoveries, inventions, thus stems an increase in population, education and awareness, and security; which results from urbanization. Every country has a regional divide that separates urban and rural areas. Places that have been converted to urban areas from rural areas when a transition to urban was required because of discoveries. According to Talukdar (2018) taken from Kingsley Davis, "urbanization is defined as the shift of population from rural to urban areas or a change in the ratio of the total population living in urban areas. Urbanization describes both the increasing footprint of urban areas and the increasing percentage of the urban population; this is closely linked with modernization, industrialization, and the sociological process of rationalization."

Convenience, decent living, expansion, development, and education are all benefits of urbanization. Construction of highways, state-of-the-art buildings using

cutting-edge technologies, medical advances, improvements in food and nutrition approaches, and many more physical manifestations of urbanization's positive impact are just a few examples (National Geographic Society, 2019).

Though urbanization has its positive effects, the paper discusses the alarming negative effects. One of the most important aspects concerning the effects of urbanization is the gradual transformation of rural to urban, which exposes one to deforestation, landslides, desertification, flood, erosion, and other landmark occurrences that are responsible for the majority of environmental and natural disasters experienced today, such as hurricanes, earthquakes and other natural disasters.

As discussed by Jiang et al. (2013), the environmental consequences of urbanization extend far beyond the boundaries of cities. Agriculture intensifies on remaining undeveloped land in fast urbanizing areas and is likely to spread to other places, placing strain on land resources.

Many variables influence city expansion, including migration, economic activity, modernized lifestyles, and political services, among others. Many countries have their own definitions of what constitutes an urban area (Nanzip, 2020).

An area's economic climate necessitates long-term land management. Land use management and spatial information, as well as changes through time, are critical for planning and decision-making management. The relationship between urban growth and land use changes, as well as their effects on the cityscape, has been established. The purpose of this paper is to satellite the data that can be utilized to monitor urban areas. Future growth and development of a sustainable land use strategy, continued urbanization tendency will enhance land and resource use, as well as exacerbate environmental issues that have already presented risks to our planet and cost our economy billions of dollars. As a result, planners, governments, planning agencies, and others should quickly recognize these issues and include environmental considerations into land use planning and decision-making processes.

1.2 Statement of the Problem

The issue with such improvements is that those engaged do not devote enough attention to preventing waste from occurring as a result of inventions. Man faces a wide range of problems, particularly in his quest for progress and advancement. The paper is created to address the relevance and urgency of information-lacking research, with regards to the impacts of urbanization in the environment. The paper gathered three main studies that entails the effects and factors corresponding urbanization, elucidating a detailed preface of the effects and the possible solutions on the impacts of urbanization, undermining the topic will not only help future studies but as well as, broadening and investing extensive research to the said issue.

Specifically, the paper will address the claim that is, "How can these drawbacks be mitigated in order to assure the continuous pursuit of urbanization and all things related to it, whether directly or indirectly?"

To help obtain the claim, four sub-questions were framed to elicit the needed data:

1. How does urbanization impact environmental resources?
2. Why is it important to understand the relationship between ecosystem and urbanization?
3. What are the factors affecting the impact of urbanization to the environment?
4. What possible solutions can be suggested from this?

The first question expounds the idea of the outcome of the notion and its relevance to the paper. The second question will help determine what methods were used to deduce the overall idea. The third question will elaborate on the specifics and data for every literature utilized. Lastly, the fourth question will strengthen the relevance and urgency of the matter.

II. MAIN BODY AND DISCUSSION

The proponent of this paper would like to emphasize the comprehensive investigation of the study, with respect to the prior knowledge of the authors from the articles used. The main body consists of four parts - (1) the impact of urbanization to the environment, (2) the importance of the relationship between ecosystem and urbanization, and (3) solutions or planning techniques that can be practiced to mitigate the problem. All of these will be elaborated in this part of the paper.

2.1 Impact of Urbanization to the Environment and the Ecosystem

2.1.1. Urbanization to the Environment

The urbanization within areas of the different continents has been increasing. From the latest updates on the global scale of urbanization, more than 4 billion people live in urban areas. It's expected to increase by 7 million by the year 2050 globally (Ritchie & Roser, 2018). The world has been in the stage of development which includes the increasing transfer of residencies to the urban areas, the increasing socio-economic status, and many more. In fact, people are attracted to the success the urban areas have to offer - the availability of jobs, facilities, etc. (National Geographic Society, 2019). Despite having a more developed area, it has its negative consequences that have a huge impact not only to the people but also to the environment itself.

According to the World Population Review, most of the countries in the world are almost a hundred percent on their urbanization rate. However, upon observing the statistics of the countries' population, one country is still at its 34% rate of urbanization but with more than a billion people already living (Most Urbanized Countries 2021). This country is no other than India. In this paper, India will be cited as an example of an urbanized country.

India is a developing country with its GDP ranked 7th and having approximately 1.3 billion people living in. Despite having its economic status elevated due to its agricultural sector, the country is currently suffering an overpopulation (Project Borgen, 2019). As a consequence to this situation, various negative impacts have been identified within the country that are also applicable to other developing countries. These are natural resources exploitation, air pollution, noise pollution, temperature changes, solid waste management issues, and slum development (Rai, 2017).

A. Natural Resources Exploitation

Due to the increasing demand of resources caused by the expensive lifestyle and high-density population, the natural resources are being exploited more than what it would normally produce (Rai, 2017). Since humans are known for not being easily satisfied with what they own, they manipulate these resources into something new and innovative that they can use to live a more comfortable and sustainable life (Jamaican Environmental Issues). The global resource extraction has been increasing from 40 billion tons in 1980 to 58 billion tons in 2005; how much more would it be now that we

are in the year 2021 (Facts and figures 2016). These natural resources also include the land insecurity we have once rural areas are converted to urban areas. Although this would greatly benefit the global economy, it also greatly affects the environment.

B. Air Pollution

Urbanization means an increasing number of the population which connects to the increasing use of automobiles, industrialization, production, etc. Having these around builds up all the pollutants that gradually pollute the air. These pollutants are also known as greenhouse gases that also affect the ozone layer in many ways (Rai, 2017). Not only to the environment, but also to the living organisms residing within an environment that affects their health as they breathe in various toxic chemicals (Team, 2021). This problem also affects humans indirectly through the effects the air pollution brings to the resources (plants and animals) that we take in.

C. Noise Pollution

Urbanization has altered soundscapes by the transition from rural and natural areas to urban ones with the relevant presence of anthropogenic noise coming from automobile traffic and machinery (Zhan et al., 2021). This is what we call noise, which is defined as a pervasive disturbance or an unwanted sound that is significant as the pollution we experience in the air and water (Noise Solutions, 2021). It does not only affect the nature of sound movement but also to the health of humans which causes psychological and physical ailments (Rai, 2017).

D. Temperature Changes

One of the notable results of anthropogenic alterations is the urban heat island effect, which means that the urban area is hotter than its surrounding rural area (Li et al., 2016). This has been relevant in any urban places in the world as these areas feel and receive more heat than those areas that are either in the countryside or in the mountains. Due to economic goals, we also have a lot of construction going on in order to keep up with the economic rise which definitely has another effect on the environment. Unplanned construction of buildings in urban areas absorb heat and release this energy after which causes climatic pressure. Additionally, cities often receive more rain than the surrounding rural areas since dust produced by the bustling cities provokes the condensation of water vapor into rain droplets (Rai, 2017).

E. Solid Waste Management Issues

As the population increases, so does the consumption of materials which simultaneously releases solid wastes. These wastes include municipal wastes, industrial wastes, hazardous wastes etc. (Rai, 2017). The rates of waste generation have been increasing globally. It is predicted and estimated that the volume of municipal solid waste will double from 1.3 billion tons per year in 2012 to 2.2 billion tons per year by 2025. And the highest projected rate of waste generation for the Asia-Pacific region is China (Oteng Ababio et al., 2018).

F. Slum Development

Slums are defined as the urban areas that don't have civic and basic amenities (Rai, 2017). Slums rise in population due to urbanization which is the movement of people from rural areas to urban ones. The solution was to provide housing development for the people, however this would greatly cause negative impacts to the environment

(Simorangkir et. al., 2019). Building new infrastructures has an effect on the land use. According to a study, the pattern of land cover has drastically increased over the past decade with the forest cover declining at a very alarming rate (Talukdar, 2018). Furthermore, slums provide risks to the neighboring environment being exposed to human wastes directly. It also adds up to the risk of having diseases due to the contamination of water, air, and land (Rai, 2017).

2.1.2 Urbanization to the Ecosystem

Ecosystem is defined as a particular level of organization composed of living and nonliving components. It provides services and amenities which are conditions driven by nature's energy, to living organisms including humans (Kharel, 2010). Urbanization has given existence to the conversions of ecological lands to development lands which resulted in the conversions of natural ecosystems into human-designed environments (Cui et al., 2019). Impact of urbanization to soil shows the increasing rate of barren soil due to the excess land use of humans to produce more materials. It alters the biological, chemical, and physical properties of soil which also degrades the quality of plant materials produced. Affecting the soil also affects the water quality despite the actions done by the government by passing bills and laws to promote clean water. Pollution still gets its way to contaminate clean waters (Kharel, 2010). However, some studies also show that urbanization may benefit the ecosystem instead. An example would be the positive correlation between the population density and the existence of agricultural ecosystems. Nonetheless, ecosystems may still come to the point where it could no longer sustain urbanization pressures over the long run which declines the services provided by the ecosystem and the loss of biodiversity and natural habitats (Wang et al., 2020).

2.2. Solutions or Planning Techniques that can be Practiced to Mitigate the Problem

When addressing environmental related issues, solutions are drafted to alleviate or to promote little to none damage. But solutions cannot be easily resolved by only suggesting inventions or innovations that can help overcome this, one must need to know the root of the problem; industrialization, commercialization, etc. Solutions derived from Nanzip (2020) include:

1. Urbanization can be solved if the government decides to pass a law limiting births, this can be accomplished by launching public awareness campaigns and counseling programs to educate people about effective family planning methods, which will help to reduce high rates of population growth in urban areas.

2. Congestion is primarily caused by people choosing to use private vehicles instead of public transportation. This decision was taken purely for the sake of convenience and cost savings. Thus, increases the number of vehicles on the road, resulting in increased air pollution and traffic congestion, as well as increased energy consumption. To alleviate traffic congestion, governments should increase public transit and encourage people to utilize it, while reducing the number of private vehicles in urban areas. Air and noise pollution are reduced as a result, and more energy is saved for future generations.

3. To avoid housing scarcity, the government should improve the lives of rural residents; one effective and humble approach regarding this is to ensure the viability of village and small-scale industries. Through this, rural residents will prevent from

flocking to already-overburdened cities and will rather attract city-folks to go to rural areas in search of simplicity and comfort.

4. In cities and towns, social mechanisms should be built to eliminate inequality and ensure that essential amenities and infrastructures such as health, modern roads, clean water, sanitation, and education reach those who have previously been denied access.

5. To lessen the impact of pollution and poor sanitation on the urban population, sustainable urban sanitation facilities should be developed by converting fecal waste, wastewater, and other organic waste to methane.

6. Government should construct industries, promote private investors, and stimulate entrepreneurship by providing more resources in urban areas to create more jobs. This will go a long way toward encouraging hard work while also lowering the city's unemployment rate.

7. In order to prevent water pollution, air pollution, and land pollution, governments should adopt rigorous legislation directing garbage dumping in open areas. These will aid in the prevention of disease transmission and pollution in urbanized settings.

With a caring future, the problems that arise as a result of urbanization can be handled. Governments should adopt some rules or policies to prevent urbanization issues. These initiatives should be available to everyone in the city and municipalities. Although urbanization is a necessary condition for modernization, we can mitigate the effect of it. We just need to learn how to save the planet and conserve our natural resources.

III. SUMMARY, CONCLUSION & RECOMMENDATIONS

The researchers' earnest purpose is to examine and elaborate on a study that covers a deep, extensive, and pressing research issue. One of the most catastrophic human influences on the global ecosystem is the conversion of Earth's land surface to urban activities. Over the last decade, the pattern of land cover has shifted dramatically, with forest cover disappearing at an alarming rate, this stemmed the acceleration to the loss of highly productive farmland, influences energy demand, exploits natural resources, degrades habitats, and lowers biodiversity. These consequences can be seen on a variety of levels. The alarming emergence of urbanization poses direct danger to high-value ecosystems. The constant rate of land conversion over the next few decades will most likely occur in biodiversity hotspots that have remained relatively unaffected by urbanization.

The existence of urban growth is a key-driver to urban residents' vulnerability to environmental stress within cities. This paper aids this hypothesis by elaborating the detailed impacts and factors of urbanization on land use change on the environment and the ecosystem. The development of a built environment, particularly industrial sectors, has been recognized. Though forest stability may be possible in the future, the rate of settlement is increasing at an alarming rate.

Various people believe that one of the key-drivers of land use change is urbanization. It transforms natural landscapes for a variety of reasons, including housing, transportation, recreation, and so on, through land use change. The conversion of natural land to urban land has offered room and possibilities for billions of people to live, work, and improve their living standards.

As a result, it is critical to safeguard, rather than ignore, the entire natural ecosystems and environment on which humans hugely rely on for survival. Humans must not continue to use urbanization as a tool to control the natural ecology and for personal gain. The requirement for a fundamental shift in our perceptions of urbanization. It's basically a name for the process of cities expanding in size in response to rising population and demand for goods and services. What humans must understand is that without our decisions about how to use land and its resources, urbanization will not drive land use change in an environmentally harmful way.

IV. RECOMMENDATIONS

The proponents would like to extend their recommendations with regards to the totality of this synthesis paper with these following ideas:

1. Look more into the situation of a specific country to also provide solutions fit for its Status;
2. Elaborate more on the quantitative analysis of urbanization. Examples would be the land use and solid waste rate of the area being studied;
3. Research on the factors affecting the underlying concept of the increasing rate of urbanization; and
4. Include the economic side of the impact behind urbanization and compare it with the relevance of the environmental side.

These are all the recommendations needed to be addressed in order to achieve a better understanding behind the concept of urbanization and its impacts to both the environment and the ecosystem. Having these could also provide further information that could provide us with a number of possible solutions in order to keep the environment and the urbanization balanced.

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