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Green Urban Planning: A Tool For Sustainability Of Smart Cities

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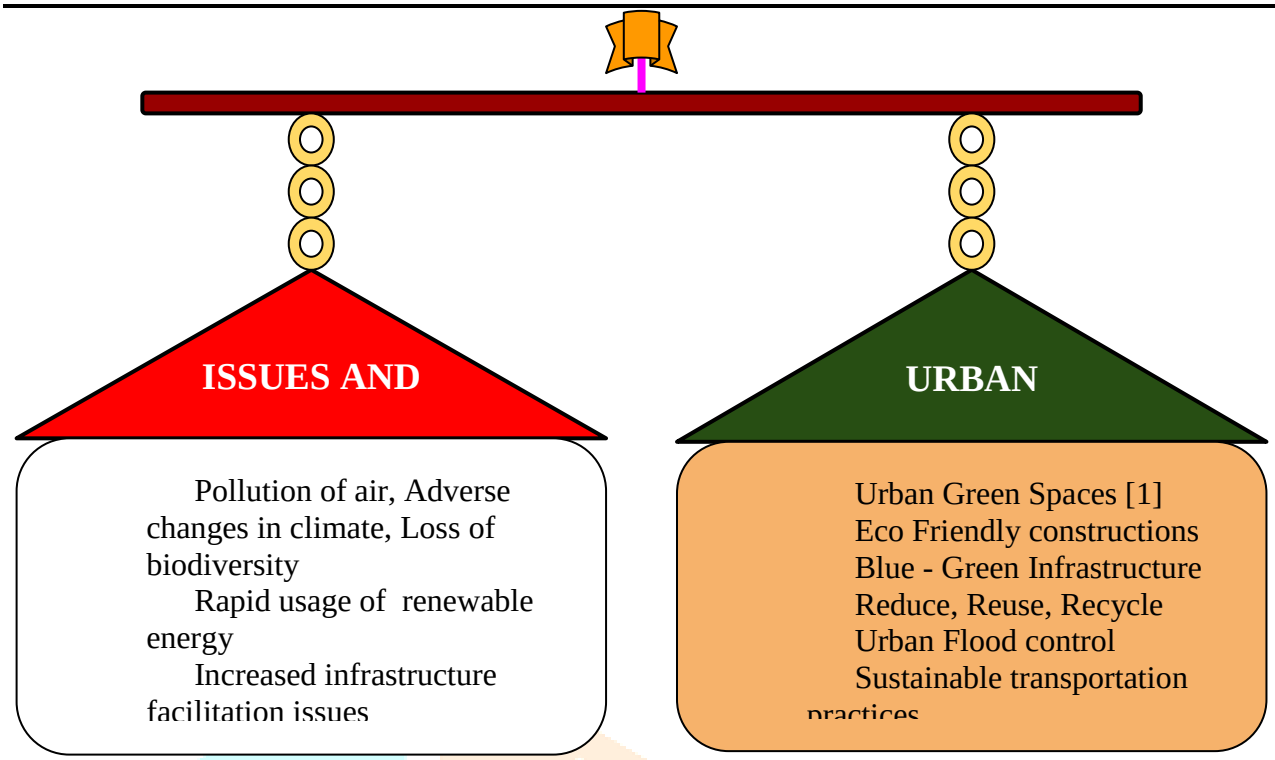
Abstract: The biggest challenge for the global population who continues to survive in Smart cities is sustainability. To enhance people's quality-of-life we need to address the accelerating challenge of leading a healthy lifestyle. sustainable planning, enables the benefits of green urban planning without undermining effects of environmental degradation. This is where Green urban planning becomes an essential tool for sustainability of smart cities. By integrating ecological principles into the fabric of urban development the smart cities evolve in harmony with nature and human well-being. This paper explores how green urban planning serves as a critical tool in achieving the sustainability of smart cities.

Key words: *Environment, Healthy Lifestyle, Population, Smart Cities, Sustainability,*

Introduction

"Is Urbanization a boon for the economy or a curse to the environment?"

The world had seen the evolution of human civilization in 2 phases: the first one began with a shift of nomadic lifestyle into a more settled habitat like initiation of agricultural practices, domestication, usage of metal artifacts being its distinct characteristic while the second one was a much more flourished phase. The second phase saw a gradual shift in terms of infrastructure, architecture and the transit from rural to urban due to industrialization, trade playing the prominent role. The contemporary world is now experiencing the 3rd wave of urbanization, the appearance of **Smart cities -** a blend of technology, environmental and cultural aspects. They use AI driven modern technologies to enhance the working, allowing a seamless flow of operations within it for better quality of life to its residents. However, this rapid urbanization rate has been providing a fatal blow to the environment, disrupting nature's balance resulting in permanent damage to the atmosphere. The major challenges and issues pertaining to urbanization and Smart cities in specific are:



The 3rd wave of urbanization is associated with rapid migrations from villages and towns to cities and metropolises to quench the thirst for employment and to avail better facilities. According to a study more than 70% of the population across the globe will be found in urban areas by 2050 [1]. This naturally causes imbalances and the unequal distribution of resource sharing. **Sustainable** use of the meagre resources has to be enabled for a better and equitable life for all. Brundtland report 1987, defines sustainability as - " the state of meeting present needs without compromising the ability of future generations to meet their own needs". Sustainable smart city planning naturally converts it into a **Green City** through the adoption of **Green Urban Planning** where it acts as a catalyst for sustainable development.

Green Urban Planning is the accumulation of all of those activities which enrich the environmental, economical and sustainable social wellbeing in a society enhancing the livability and quality of life through sustainable practices like eco friendly infrastructure, construction of green spaces, usage of non renewable energy sources for transportation, industrial activities, and many more as such.

Green cities act as a tool and measure for sustainable development. The 8 attributes of a green city given by **Subadyo** are[2]:

1. Green Planning
2. Green Design
3. Implementation of green building
4. Green waste
5. Green transport system
6. Efficient use of green water and energy
7. Green environment
8. Green community

Literature Review

This paper is a framework for green urban planning and its adoption into smart cities to ensure sustainable living. This is a work developed based on various references from research articles, journals, standard blogs and websites. Some of the prominent aspects used in the papers are as follows:

S. No.	Authors	Title of the Paper	Content
1	Chu Xiao Hui, Ge Dan, Sagr Alamri, Davood Toghraie [1]	Greening smart cities: An investigation of the integration of urban natural resources and smart city technologies for promoting environmental sustainability [1]	This paper gave a descriptive - analytical study on usage of smart technologies in collaboration with urban green spaces for sustainable living in smart cities. [1]
2	Azizi, L., Kouddane, N. [2]	The green city as driver of sustainable Development [2]	This paper focused on the concept of Green cities and compared it to the present sustainable cities dwelling into the depths providing a framework for a more resilient and environmental friendly cities.
3	Di Marino, M., Tiitu, M., Saglie, I. L., & Lapintie,K. [3]	Conceptualizing 'green' in urban and regional planning – the cases of Oslo and Helsinki. [3]	This paper studied the Green urban concept and their approaches linking it to the regulatory practices.
4	Abdullah Addas [4]	The importance of urban green spaces in the development of smart cities [4]	This paper enumerated the role and impact of Urban Green Spaces (UGS) on sustainable cities to enhance air quality. [4]
5	Cilliers, Elizelle, Diemont, E. , Stobbelaar, Derk, Timmermans, W. [5]	Sustainable green urban planning: The Green Credit Tool [5]	This paper focused on Green Credit Tool stating it to be an integrated approach for sustainable urban planning enhancing the qualitative green urban planning.
6	Maria Korkou, Ari K.M. Tarigan, Hans Martin Hanstin [6]	The Multifunctionality concept in Urban Green Infrastructure Planning: A systematic literature Review [6]	This paper briefed the 5 major themes of green infrastructure found at present bridging the gaps recommending future Directions.

7	Mell, I. [7]	Rethinking the 'green city' – contemporary research, teaching, and practice in urban Greening [7]	This paper gave a comprehensive view on the present status of Green city concept and its depth in realization.

Objectives

1. To analyse the effect of green urban planning in maintaining the sustainability of smart cities.
2. To identify and evaluate key components of green urban planning for sustainability of smart cities.
3. To investigate how green urban planning influences the healthy lifestyle of smart cities.

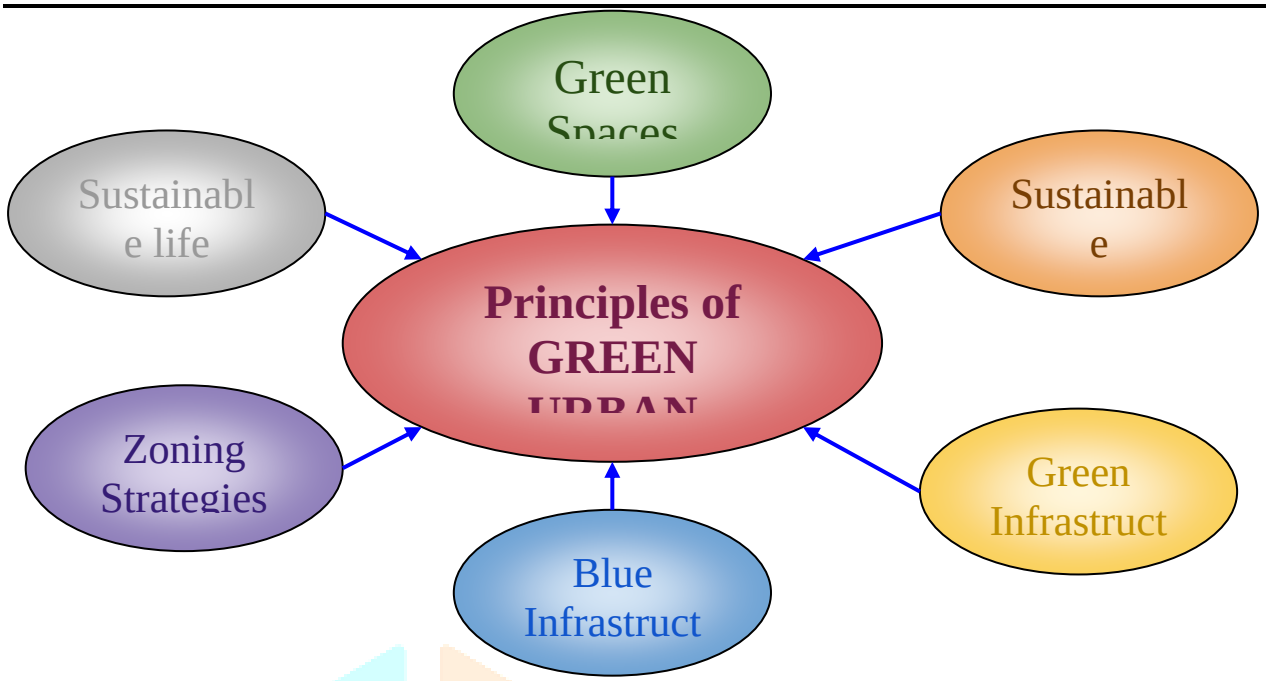
Discussion

Principles of Green Urban Planning

1. **Green spaces** - Increased facilitation of parks, greenways, street trees in between commercial and industrial spaces to improve air quality, encourage people to spend quality time with nature, and provide for suitable biodiversity.
2. **Eco Friendly infrastructure**

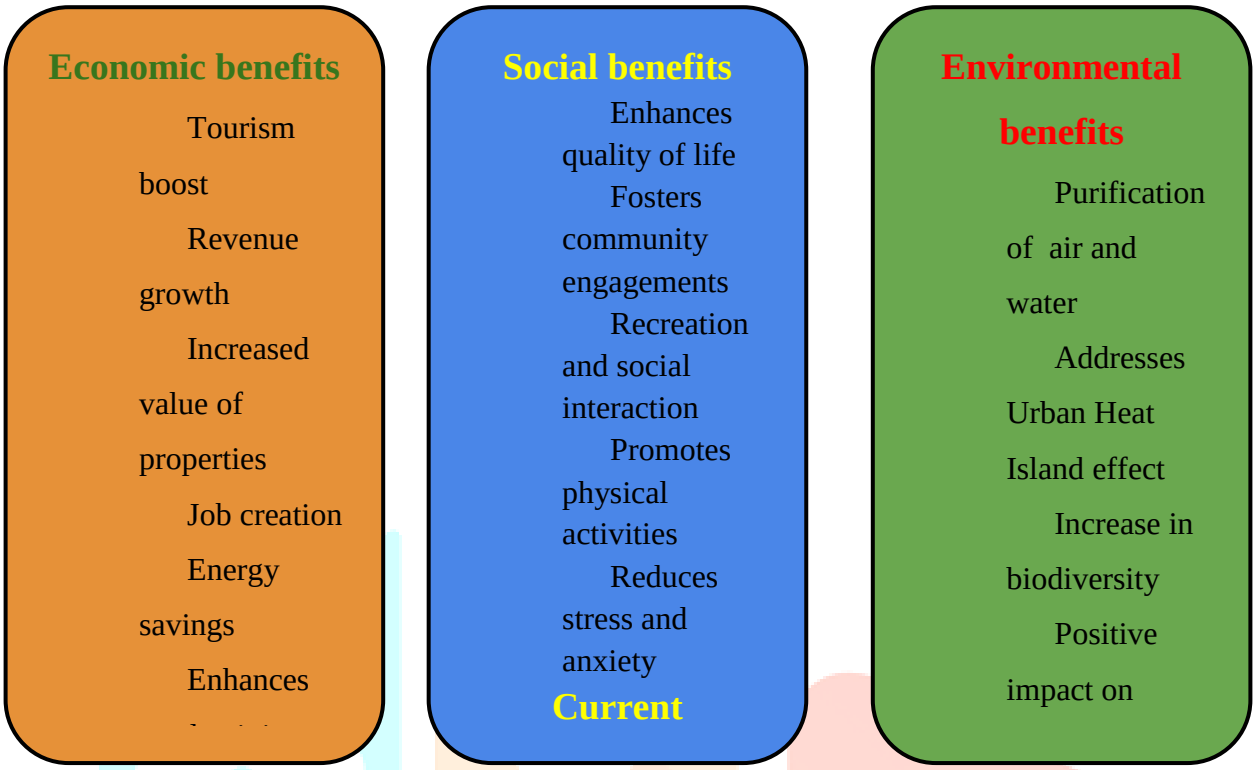
S#	Green Infrastructure	Blue Infrastructure
1	Usage of eco friendly materials in building constructions by reducing cement, concrete, metals which inturn reduces the pollution associated with it **Eg:** Wipro Pune Office	Usage of eco friendly materials incorporating natural water themes, blue - green systems which acts as a natural coolant **Eg**: Udaipur
2	Construction of green roofs, green walls, terrace gardens, green houses in households, offices	Blue based constructions i.e. water based ones help to maintain micro level biodiversity in households
3	Energy - efficient buildings - reduce energy consumption	Flood preventive constructions - smart grids
4	Permeable pavements, air quality detection sensor system	Precision irrigation, smart metering, stormwater management

Table 1: Eco friendly infrastructure classification



3. **Sustainable Transportation -** Renewable energy generators like solar cells, windmills and locomotion aids like bicycles for shorter distances can reduce the half combusted carbon monoxide release into the atmosphere to a greater extent positively impacting the ozone layer depletion.
4. **Land use and zoning strategies** - They are the integration of all the practices which maximizes the green spaces, promoting efficient land use, redeveloping brownfields, zonal classifying natural lands and resources for better understanding and policy execution thereby restricting certain projects in vulnerable areas and encouraging biodiversity in them.
5. **Sustainable life practices** - It becomes the responsibility of every individual to play their part for environmental sustainability as their individual minor effects make a major difference as a whole. They can work in
    a) Waste management in households by using only eco friendly materials instead of plastics and adopting the principle of 3 Rs - Reduce, Reuse and Recycle
    b) Renewable energy sources for power generation and usage in households

Benefits of Green Urban Planning in Smart Cities



Challenges and Barriers

1. **Cost and funding issues -** The financial constraints associated with the establishment and maintenance of green infrastructure is sensitive and hefty. Hence there are fewer scope for funding here.
2. **Technological integration** - The environmentally friendly technology which does not result in non degradable e-waste is yet to be invented and this technology should be able to work efficiently without errors.
3. **Balancing multiple priorities** - It becomes tedious for the government to handle multiple things simultaneously like construction of green infrastructure, development of sustainable transportation, provision of proper housing without overcrowding and with anti-flood constructions, economic development and so on.
4. **Policy and governance -** The gap between policy making and its execution is way too large and it takes a great amount of time, willpower and energy to realize a good beneficial policy.
5. **Public awareness and participation -** It isn't the sole responsibility of the government to work for the betterment of society, it should also be done from the citizens side as well. Only when the people in the society collectively decide to work for a better and sustainable living space by taking actions accordingly can there be some real positive changes observed in the society.

Recommendations and Future Directions

- **Incorporation of Green Urban Planning in curriculum** - Education has a vital role in shaping the future of a nation. When these concepts are incorporated, it naturally brings a major impact in the coming generations
- **Government policy making** - The government policies should be made stricter pertaining to the wellbeing of the urban spaces which enables the citizens to act with the accord of social responsibility. It also increases public-private partnerships and avoids projects which disrupt the natural environment.
- **Collectivism** - A single device can replace a whole set of devices in a particular geographic area be it an office, school, home and in any sector like transportation, electronics, etc. this reduces the electronic dependency and its associated e-waste, negative environmental effects.

Conclusion

"Urbanization is not about simply increasing the number of urban residents or expanding the areas of cities. More importantly, it's about a complete change from rural to urban style in terms of industry structure, employment, living environment and social security"

- Li Keqiang

Green urban planning can become an effective tool towards the global journey of attaining sustainability especially pertaining to smart cities. With the future moving more towards cities, it is important to ensure sustainable use of available scarce resources equally. This sustainable management not only ensures ecological, environmental balance but also social, economical development through the practices of harmonial sharing among the fellow citizens. It moves forward to addressing all the challenges faced by the smart cities paving the way for the creation of a more bright, safe and sustainable living space in the major smart cities across the globe.

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