

## **Experiences of Green Infrastructure in Urban Planning.**

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**ABSTRACT:** In the last 16-18 years, people have been moving from rural areas to urban areas or Cities, this scenario is observed globally. Cities or urban area are not only congested but also has suffered from severe pollution. That's why the need to plan cities or urban areas with sustainable and eco-friendly development arises. Green infrastructure works on many aspects, that includes a different aspect with planned developments carried out globally. Green Infrastructure has been shaping political strategies, practical approaches to green space development in urban areas or cities, climate change adoption, disaster risk management. Good quality of Green Infrastructure helps to improve the quality of a healthy life and also helps to improve the beauty of urban areas. These paper addresses the benefits of green infrastructure and also highlights advantages of developing a sustainable city.

**KEYWORDS:** Green Infrastructure, Sustainability, Planning

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### **I. INTRODUCTION**

World scenario says that over 80% of people live in the city area. People live in an urban area so that they require more infrastructure facilities. In urban area industrial zones, commercial zones, residential zones, the recreational zones are present. Parks, playgrounds, water bodies, home gardens, courtyards, streets are major green infrastructure which are connected with nature and people. The idea of green infrastructure is a surprising matter. Green building is part of green infrastructure. Green infrastructure's main approaches are storm water management, less heat stress, climate adoption, better air quality, sustainable development, clean water, and healthy soil, as well as the quality of life increases. Quality of life through recreational and more effective shelters provided in and around the city. Urban green infrastructure can also mean 'low carbon infrastructure' in that sustainable transport system, sustainable drainage system are consider. Green infrastructure is described as a planned network of natural and semi-natural open spaces, connected with environmental features designed and managed to deliver a wide range of eco-system.[1] Green infrastructure is applied differently in town or city scale and national- regional scale. In town scale District park, playground, neighbourhood parks, green belt(buffer), urban canal, lake, river, and floodplains are included. In national-regional scale reserved forest, protect forest, canals, reservoirs, road and railways, regional parks ,shoreline are included.

#### **1.1 INDIAN SCENARIO**

In India there has been rapid growth of population and rapid urbanization. Due to rapid urbanization more industrialization is needed in country. These industries pollute the environment and more waste is generated. PwC worldwide reports that Indian industries produced 10 -12 million tonnes of waste every year. The Indian government doesn't control it and citizens do not participate to reduce it, also no action taken by government on it. The problem that Indian cities are more and more polluted , congested and not sustainable to human life. Indian government provides the infrastructure facilities but it does not sufficiently manages them. Now a days' Indian government is moving toward a sustainable environment and healthy life for citizens. This sustainability of the environment comes under green infrastructure. The Indian government is more focused on water management and urban green space terms. In water management issues related to urban flooding, diminishing water bodies, and depleted ground water table. Also focus on storm water drainage planning in urban areas to reduce flood effect on the city, Promote the rainfall infiltration into the soil, Reducing the volume of rainwater runoff through interception.

Atal Mission for Rejuvenation and Urban Transformation (ÁMRUT) and Smart City Mission (SCM) scheme from the government improving the services in some cities . Under that mission city improvement, city redeveloping, and greenfield improvement are focused on. New solid waste management techniques for more cities creates a healthy environment. Green energy corridor project maintains energy requirement. Vehicle Emission intensity decrease with implement Bharat Standard VI vehicles.[2]

## II. SUSTAINABLE CITIES

Sustainable cities are classified into three categories like Sustain urban transformation, climate and Future urban vision. Sustain urban transformation involves sustainable urban transportation, energy efficiency, sustainable city and innovations. Climate involves climate change and governance. Future urban vision involves a vision of the future city and sustainable and easy lifestyle of the citizen.[3]

A sustainable city involves making the city more effective for living and creating a healthy environment for residents. In an urban area, heavy energy consumption sources are Buildings . To promote energy – efficient building construction in the urban area. The city contributes 50-70% of greenhouse gases emission from different sectors. Retrofitting technology of making the older building to stronger and new that is energy efficient .

A smart sustainable city is a new concept for a sustainable environment. Urban cities connect with smart technologies and low consumption of natural resources. Every device connects with a digital wireless platform and makes life easy and sustains environment .

One key point of achieving sustainable green cities will be to reduce dependency on natural resources like water and electricity, water management techniques, use of natural material to constructing a building. City government to planning and help in the policies to the development of their types of systems. Open space in city is used for the Green zone, using a green buffer zone concept. Sustainable green infrastructure benefits not only environmental purposes but also benefits socio-economic purposes.

### 2.1 SUSTAINABLE URBAN DRAINAGE SYSTEM (SUDS)

The sustainable urban drainage system is a core aspect of green infrastructure. Significant losses by flooding are avoided by applying this concept on large scale. Integration of the issue of water and flooding with city planning and disaster management authorities is present. The economic cost of water flow regulation and runoff mitigation avoids costs for property damaged like buildings, infrastructures, commercial forests, and agricultural lands. Urban flooding results in adverse human health and psychological effect. Land-use planning and management strategies increase the capacity to regulate flooding. The crucial issues when dealing with urban flooding to be evaluated are firstly how much quantity of water and infiltrate, secondly how much quantity of water runoff, and thirdly how much quantity of water convey through the drainage system. Urban hydrological catchment represents water analysis and analyzed that data after then creates the effective strategies of flood management. Controlling runoff water to provide more capacity for drainage lines and rules regulation for building planning.[4]

Sustainable Urban Drainage System (SUDS) consists of new technologies used to drain storm water or surface water in a manner that is more sustainable. Examples of these techniques are green roofs, infiltration trenches, filter drain, filter drain, and filter strips, shallow drainage merged with a small pond.

## III. CASE STUDY : POLICIES FOR GREEN TOKYO , JAPAN

Tokyo is the capital of Japan and the largest city in Japan. 37.39 million resident in Tokyo city and the area of Tokyo city is nearly 2194 sq. km. The population density of the city is 6158 persons per square km. It is the densest city in Japan. Tokyo Metropolitan Government launches a 10-year policy known as Green Tokyo. The main aim of the policy was controlling urban flooding in the city.[5]

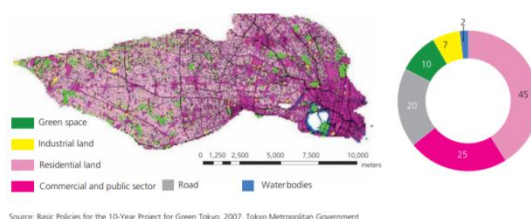


Figure-1- Land Use Plan of Tokyo City

The land-use plan of Tokyo city shows the 10% area under green spaces. Tokyo metropolitan government decided to develop green network based on the city street network. It includes: connecting road side network with large scale greenery, creation of green Iceland in Tokyo, Creation of green space size of 1000 ha. , Double side road tree plantation in Tokyo to 1 million.

### 3.1 CASE STUDY : JODHPUR, INDIA

IIT Jodhpur campus is spread over on 852 acres of land . The land is approximately situated 24km north of Jodhpur on NH-65 towards Nagpur city.

Convenience method of site planning and FSI calculation provides building planning in campus area , approaches of integrated site planning method which was based on availability of land. These all approaches are base on Green Infrastructure planning. The circulation pattern design with well integrated network of corridor linking land use planning, ecological and infrastructure zones.

Main focus of Planners and architectures is on designing and developing the green campus. Many Indian architectural company involves designing residential building and educational building in campus . They also created landscape and master plan of campus.

The salient features of Green campus are :

- Pedestrian Walkways in campus area , bicycles are predominant.
- Learning facility anywhere, anytime connect with information and communication technology connected.
- Smart buildings in campus. And constructed with local method and materials.
- Plantation , soil stabilization , protection from dusty wind to reduce soil erosion is also a major focus.
- Rain water harvesting and sewage recycle treatment technologies are used.
- Segregation of campus waste and recycling of it.

#### **IV. VALUE AND BENEFITS OF GREEN INFRASTRUCTURE**

Green infrastructure addresses water conservation , water management , improvement of eco system of urban area , sustain urban life , etc... Green infrastructure provides benefits in different aspects like hydrological, ecological, social , environmental .

Green infrastructure can provide hydrological benefits in flood prone urban areas. Plantation of more trees and providing more green space in urban area helps in time of flood. Trees can contribute to decrease water flow on down stream , reduces runoff volume , promote infiltration of rain water in to the soil. In case of small scale flood trees are very helpful . So hydrological benefits are reduced runoff ,increased storage , improved ground water level , conservation of water with the help of rain water harvesting and similar more techniques .

Ecological benefits of urban green infrastructure increases property value , which can be beneficial to business and house owner. Now a days tendency of house buyer is predilection toward availability of natural beauty and parks and gardens , so increase value of land.

Social benefits of urban green infrastructure are to improvement of life quality , improvement of physical and healthy life , promotion of mental health. Many researches conclude that green infrastructure helps in reduces mental stress.

Wide range of environmental benefits for GI such as reduced air pollution , reduced flood risk in part of sustainable drainage system. Small contribution in reduction of climate change effect and small scale to reduce summer heat. Greenway movement adopted the idea to protect landscape and fragmentation of environment. [6]

#### **V. CONCLUSION**

The green infrastructure provide solutions for water management which directly or indirectly benefits to public and government. Raising the awareness of green infrastructure planning with the help of government bodies and private bodies. Development of government infrastructure based on GI model. GI concept should be a part of future planning and development ,to some extent it can also be implemented to existing infrastructure .GI provide more sustainable , healthy and safe life for people.

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