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URBAN RESILIENCE IN THE FACE OF CLIMATE CHANGE: A LEGAL ANALYSIS OF CLIMATE CHANGE CONSCIOUSNESS IN URBAN PLANNING STRATEGIES IN INDIA

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ABSTRACT

India is one of the most populated countries in the world with a rich history of having a structured drainage system in the Indus Valley civilization and around 5000 years ago India had a foremost town planning. environmental or natural aspects, economic and people's needs should be focused on while making urban planning as urban planning plays a major role in urban development. But in recent times we could see that due to poor urban planning without considering climate resilience, we face serious problems due to climate changes throughout the year. This research focuses on urban planning with climate change consciousness under India's urban planning concept. This research paper seeks to analyze existing urban planning strategies in the face of climate change challenges in Indian cities. The objective of this research is to examine urban planning assess the effectiveness of existing strategies and explore the regulatory compliance with environment law in Indian cities. The research paper aims to identify the mitigation and adaptation measures to be incorporated into urban planning strategies in various Indian cities and evaluate their legal implications. The Doctrinal Research method followed in this research paper. It deals with secondary sources of data and various secondary sources are collected from books,

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journals, articles and case studies relating to the research topic. This research contributes to the evolving sustainable urban development by providing planning for climate change-conscious urban planning strategies. The findings not only enhance our understanding of the climate changes that affect urban cities but also offer practical recommendations to bring urban resilience and sustainability in the face of an ever-changing climate.

KEYWORD: Climate Change, Sustainability, Urban Planning, Urban Resilience, Mitigation Measures.

INTRODUCTION

India is a vast country with a unique and diverse landscape and climate which varies from region to region. Recently India has seen a large number of urbanization due to its dense population but most of the Cities that are urbanized have not equipped with urban infrastructure which focuses on climate change resilience. The concept of urban resilience to climate change is an important topic to be considered for sustainable growth and development for future urban planning. The urban places always require a high standard of living compared to other places, so they put pressure on the environment and society to meet their demands[3]. The climate changes in urban areas affects many millions of people due to high population in urban areas, densely built buildings and lack of green covers and compromises on water bodies led to various extreme climate change and weather events like intensive heat waves, cyclones, drought especially seen in recent years. The Intergovernmental Panel on Climate Change (IPCC) also made many reports warning India to face climate change consequences in upcoming years. Climate-resilient infrastructure is designed to handle extreme weather conditions like floods, storms, and heatwaves. For example, bridges and roads are built to withstand heavy rainfall and prevent flooding. Every government should focus on this climate resilience urban planning to handle extreme weather conditions like floods, cyclones, rise in temperature, etcetera. So that they could bring an climate resilient city across India.

[3] Nirupam Bajpai and John Biberman, CSD Working Paper Series: Towards a New Indian Model of Information and Communications Technology-Led Growth and Development, ICT India Working Paper #62, (December 2021) <https://csd.columbia.edu/sites/default/files/content/docs/ICT%20India/Papers/ICT_India_Working_Paper_62.pdf > Accessed 02 December 2023

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OBJECTIVE

- To know the problems faced by the cities with poor urban planning with reference to several cities in India.
- To Investigate the urban planning strategies adopted by Indian cities, focusing on their integration of climate change consciousness and resilience-building measures.
- To compare International Best Practices that promote urban resilience in the face of climate change, drawing lessons applicable to the Indian context.
- To suggest some idea to create/improve a climate resilient urban city in India.

HISTORY

A. ANCIENT INDIA:

Historically, India's urban places have undergone dynamic transformations, responding to demographic shifts, industrialization, and changing environmental conditions over years. In ancient times we had a rich planning strategy to adopt all kinds of climatic and geographic aspects. When we focus on ancient civilization in India, The Indus valley Civilization gives us an understanding of the advanced urban planning system and Cities like Mohenjo-Daro and Harappa gave a well-planned grid of streets, advanced drainage systems canals and carefully designed houses which built on forecasting for all the climate conditions. This shows the utilization of the natural resources with well-structured urban layout which gave environmental sustainability which protected the urban development without damage due to climate changes which would be a good example for climate resilience infrastructure to urban planning.

The ancient Indian architectural treatise like Vastu sastra gave some principles on how to make a town planning through the harmonization with the nature like sun, wind, soil, etc., and optimal utilization of land and the structure in the urban areas are built on considerations with climate conditions. The best example we could quote is the ancient city of Jaipur in India, designed according to Vastu principles which reflects these ideals with its grid layout and meticulous attention to spatial organization.

B. COLONIAL ERA - BRITISH PERIOD AND POST INDEPENDENCE:

After Britishers colonized India, the Britain style planning has been influenced in shaping urban planning in India which mostly neglect the indigenous knowledge in sustainable urban development. Cities like New Delhi were designed with the British ideology and neglect the

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indigenous knowledge in sustainable urban development. During the 1950's, India witnessed rapid industrialization which increased the requirement for urbanization and led to unplanned urban planning. This made people to follow western pattern planning where they started forgetting the indigenous knowledge of urban planning

PROBLEMS WITH POOR URBAN PLANNING WITHOUT THE CLIMATE CHANGES CAUTIOUSNESS: CASE-STUDY

As India is rapidly urbanizing, it makes a lot of developmental threats like Lack of urban planning with climate change resilience results in intense heat waves, drought in summer season, floods during monsoon season and extreme coldness in winter season. The residents of these urban communities suffer due to reduction of trees and water bodies due to urbanization, poor drainage network and water storage infrastructure and these are all due to poor urban planning without climate resilience. When we see *Chennai*, the climate is like 6 months of summer with high heat waves during March to June each year and 6 months of rainy season with more rainfall happening around October to December each year. Poor sewage and water management making our natural lakes like Puzhal Lake, Korattur Lake, Chembarambakkam Lake, etc. and rivers like Cooum River, Adyar River and Kosasthalaiyar River which are natural flood buffers remain perennially full of sewage and wastewater, wastewater disposal from industries also pollutes those water bodies with chemical effluence causing the water bodies to froth. Also, the poor solid waste which has been dumped in those water bodies and drainage pipes causes clogging and this results in flooding each year. Also due to the unplanned urban planning which encroached the water bodies in and around the city, there is no place in water bodies to store the excess storm water from heavy rain so that goes back to sea which makes harder to recharge the groundwater so during summer season Chennai is facing huge challenges relating to water scarcity every year which results in drought. As in case of *Bangalore*, the city has high fresh water usage, they over rely on far away rainfall sources of water resources as Bangalore draws most of the fresh water from Kaveri river which is located 100 km away and water needs to be further pumped up for a height of 300 meters to supply water to the city which requires a huge energy supply. Also, they take water from groundwater but fail to recharge it as Bangalore receives less rainfall as groundwater is limited resources and if not recharged then it will run out which results in drought. *Bhubaneshwar*, *Indore* and *Jodhpur* highly suffer from heatwaves and drought due to high levels of concrete structures built which increases the heat level in the cities. In many cities Poor building designs mainly through cutting trees for construction additionally causes overheating

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due to lack of adequate ventilation. This increases the needs for air conditioners and increases greenhouse gasses emission. Some cities lack green cover by urbanization planning. There is a high level of air pollution as there is nothing to keep air pollution in balance and this leads to various problems.

GOVERNMENT INITIATIVES FOR COMBATING CLIMATE ISSUES IN URBAN PLACES:

Government policies and schemes help to shape climate resilience in urban planning. These governments develop a climate resilient urban city with help of strategic planning and guidance from the global climate changes reports, creating legal framework, allocating resources and funds and making community engagement and awareness. They make plans by integrating with the global climate agenda.

Climate change became a global issue and increased around the world, the government made the *Jawaharlal Nehru National Urban Renewal Mission (JNNURM)* in 2005 aimed to renovates the urban infrastructure and enhance resilience and to bring improvements in already existing services through this initiative the cities already established are given opportunity to improve their basic infrastructure to be climate resilience[4]. The *National Action Plans on Climate Change (NAPCC)* outlines 8 national missions, one of the missions in that 8 mission is National Mission on Sustainable Habitat which was approved by the Prime Minister's Council for Climate Change in June (2010) where the urban cities should formulate a development plan which focuses on mitigation and adaptation strategies for climate change[5]. Initiatives like the National *Smart Cities Mission (2015)* aim to merge the technology and to provide a sustainable climate resilient urban planning, reflecting a paradigm shift toward climate resilience like environmentally friendly public[6] transport as the smart city helps in waste management which helps to protect the environment. The *Environmental Impact Assessment* (EIA) Made a rule that each project proposed should have an environmental impact assessment. The *Disaster Management Act, 2005* focuses on the mitigation and preparedness for urban planning to make urban cities climate

[4] Parikh J., Jindal P. and Sandal G. Climate Resilient Urban Development: Vulnerability Profile of 20 Indian Cities (IRADe, 2013)
[5] Ministry of Environment, Forest and Climate Change, National Action Plan on Climate Change (NAPCC), (01 December 2012)<https://static.pib.gov.in/WriteReadData/specificdocs/documents/2021/dec/doc202112101.pdf> Accessed 03 December 2023
[6] Bajpai, Nirupam; Biberman, John (2021) : India's Smart City Program: Challenges and Opportunities, ICT India Working Paper, No. 62, Columbia University, Earth Institute, Center for Sustainable Development (CSD), New York, NY

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resilient.

CURRENT TRENDS ACROSS INDIAN CITIES:

The Global Climate Risk Ranking Index of 2021 said that India is also one of the risk prone Country for climate hazards in upcoming years due to extreme weather events[7]. So, whether Indian cities have made any policies or steps towards climate consciousness for urban planning and development? Currently, India is dealing with the impact of climate changes in several cities all over the country and to reduce that, various cities made some policies for urban development on consciousness of climate change to overcome climate change impacts. *Delhi* electric vehicle policy reflects the major trends to reduce carbon emission and air pollution as this policy as this government gives ₹5,000 per kWh of battery capacity till 31st December 2023[8]. The Sabarmati Riverfront Development Project in *Ahmedabad* helps in the sustainable development by reducing the flood and erosion and safeguard the city and also focuses on the sustainable development and also acts as a sewage diversion system which carries untreated sewage to the sewage treatment plant[9]. *Mumbai's* Coastal Road Project helps the city from erosion of coastal seawalls and also protects the city against the floods and storms surges which signifies a holistic approach to urban resilience[10]. *Chennai* grappling with water scarcity and flooding, exemplifies a city incorporating climate-conscious planning, The Chennai River Restoration Trust focuses on reclaiming water bodies and improving water management[11] to combat the northwest monsoon which happens around October to December each year which brings cyclones to the city as the city is surrounded by lots of lakes and rivers. *Surat* has highest sewage water treatment facilities (100%) followed by *Haridwar* (79%) and *Mumbai* (78%) in India[12]. These projects in Indian cities showcase the integrated climate conscious solution in urban development and have embraced climate-resilient strategies. Cities such as *Pune* are exploring innovative solutions like urban forests and green belts to mitigate the urban heat island effect.

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[7] International environmental think tank 'Germanwatch, The global climate risk index 2021, <https://www.germanwatch.org/sites/default/files/Global%20Climate%20Risk%20Index%202021_2.pdf> accessed 05 december 2023

[8] Alok K N Mishra, Delhi govt extends EV policy till December 31, <https://www.hindustantimes.com/cities/delhi-news/delhi-govt-extends-ev-policy-till-december-31-101697910912316.html> accessed on 07 December 2023

[9] Sabarmati River Front Development Corporation Limited, <https://sabarmatiriverfront.com/environmental-improvement/> accessed on 08 december 2023

[10] Municipal Corporation of Greater Mumbai, Coastal Road Project, <https://www.mchi.net/pdf/MCGM-Presentation-21-July-2017.pdf> Accessed on 06 December 2023.

[11] Chennai Rivers Restoration Trust, Government of Tamilnadu. <https://www.chennairivers.gov.in/> Accessed on 07 December 2023.

[12] Parikh J., Jindal P. and Sandal G. Climate Resilient Urban Development: Vulnerability Profile of 20 Indian Cities (IRADe, 2013)

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COMPARISONS WITH OTHER NATION:

Globally, cities account for 70% of carbon emission as buildings and transportation are the 2 largest contributors for Co2 emissions[13]. Cities around the world are adopting various methods in their urban planning with climate resilience under different names

1. *Paris, France,* Prof.Carlos Moreno, an urban planner and Professor at Sorbonne University in Paris came up with the concept of the 15-minute city in 2016. Global warming is the core problem for the emergence of this concept. In this plan there is a physical separation between motor vehicles and cycles by relocation of road space to pedestrians and cyclists to encourage people to use cycles and investing in nature-based solutions is a must.
2. *Green Roofs in Singapore* focus on nature-based solutions to provide heat resistance as this country is situated near the Equator (as the climate will be hot). They have made many green spaces in walls, roofs, roadside, etc.[14]
3. *Tokyo, Japan's* Flood Water System consists of massive tunnels where the storm waters are stored and protects the city from flooding as the city is flood prone. Similarly, Roskilde, Denmark also has made a stormwater storage solution as these tanks serve as both storage purposes and later this stored water is used for other usage.

From this we came to know that investing in the nature based solution will help urban cities and future planning urban cities to come up. We could also incorporate some of the best methods like Japan's Flood water storage tank system in India's flood prone area which later used for other needs like gardening, cleaning,etc,.

METHODOLOGY

The research method followed here is Doctrinal Research. It deals with secondary sources of data and various secondary sources are collected from books, journals, articles and case laws from Indian courts.

FINDINGS FROM THE CASE STUDIES

The Indian cities are facing challenges like rising population and demand for infrastructure which fails them to meet climate changes. The urban cities in coastal areas are affected by extreme

[13] United Nations Framework Convention on Climate Change <https://unfccc.int/news/urban-climate-action-is-crucial-to-bend-the-emissions-curve > accessed on 09 December 2023

[14] Discover how sweltering urban heat islands are being cooled down (19 August 2022)<https://www.weforum.org/agenda/2022/08/ways-to-cool-cities-and-avoid-urban-heat-islands/>

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cyclonic winds causing several damages economically and environmentally. Hilly Urban cities like *Dehradun*, *Srinagar* etc. are exposed to landslides the most. For the last 10 years unpredictable floods due to extreme weather have happened in *Chennai*, *Visakhapatnam*, *Mumbai* and other coastal regions. This also gives a clear view that despite the government's efforts to make urban cities climate resilient, not all cities have 100% coverage on the basic infrastructure like drainage system, stormwater drainage and storage and solid waste management as we could clearly see that they have floods during rainy seasons and water scarcity during summer season.

Each Government should give importance to the climate resilience agenda for urban development. Cities need to study their geography and should identify the vulnerabilities and build the cities climate resilience but mostly they fail to do so. The government should bring policies to all the urban cities to regulate the energy consumption, wastewater/stormwater management, and pollution control of the cities. But from this research, it is found that the government, while planning an urban development, only focuses on the population and industrialization in that place but completely or partially ignores the concept of climate resilience which should be adopted in urban planning and development. This could be clearly seen in the case of *Chennai*.

Urban planning without climate change consciousness in many cities is leading to climate hazards in urban cities like heat islands, reduction of green covers and forestation, flash floods, depletion of groundwater, drought, landslides, etc. which is also mentioned in the IPCC Report. Government mainly focuses on population and industrialization where they mostly ignore building a climate resilient city. Due to this, during any natural disaster (like flood, drought, heatwaves, heat island, etc.) occurs and creates economic and life loss which impacts the growth of the country.

From this research, it is also found that the indigenous knowledge of the people who resides in that place is mostly ignored in urban planning and development, this could be clearly seen in the case of *Himachal Pradesh* where they face flash floods and landslides in mountain ranges.

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SUGGESTION

- My suggestion is to have climate resilience infrastructure like a Stormwater/ drainage system or green covers across cities which could withstand the impact of changing climate in-build as the urban planning for cities by the government could make policies to allow sustainable development.
- Most urban growth takes place in less developed regions where urbanization is mostly unplanned and increases in poor informal settlements. So before making an urbanization plan for an area we first must focus on the climatic aspect and geological factors of that place for better living of the people of that area.
- The 74th Constitutional Amendment Act 1992 allows governments at local level to perform town planning so they could also have the local communities' ideas in planning to make the area climate resilient by identifying the issues faced by the area. Localized climate actions by government through the governments at the local level as the cities across India should question themself that they are prepared for the climate issues coming around the year.
- The indigenous knowledge should be used in urban planning and usage of local indigenous resources for building infrastructure should be encouraged. For example, Traditional structures are super durable in earthquake prone zones in Himalayan regions which are built by interlocking and load bearing walls which use stone and wood (Kath-Khuni).
- Increase the level of tree shade like including tree canopy where urban areas heat related problems would reduce which would also decrease greenhouse gas emission. Greenies also help in recharging groundwater by providing permeable surface that allows rainwater to seep into the ground.
- Rejuvenating the water bodies where surface water bodies like rivers and lakes act as natural flood buffers and potential sources of fresh water while water scarcity. This also helps to recharge the groundwater and reduces the chance of flooding.
- Improving solid waste management makes sure that the water bodies are not clogged, which will go a long way in restoring our waterway and ensures water doesn't sweep out.
- The Stormwater can be stored with effective planning and used for gardening or flushing toilets which could reduce the usage of groundwater by doing this the less wastewater is directed to rivers or lakes ensures minimal risk of floods and maximum usage of rainwater this can also be used when the city faces water scarcity.

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- Increasing permeable roads and pavement can help in increase in absorption in rainwater and recharge of ground water. Also need to have better managed pipelines and storm water drains so that the city does not floods every-time it rains
- Exposure to vulnerable climate changes differs each region as the geographic, demographic, environmental factors differ from each region so the government should conduct examinations on that particular place to make them climate resilient like in Chennai we need different drainage systems for different places inside Chennai itself as some places will be lower compared with nearby areas.

CONCLUSION

Urban planning with Climate resilience will see less risk by climate changes like flooding during heavy rains. Government Investing in properly designed urban planning with climate resilience is the best way to adapt to climate change. It will reduce economic losses and enhance community safety. This also creates long term sustainability and environmental conservation. If we want to fight against climate change, we have to transform our cities accordingly with urban planning which should be climate resistant in nature. As urban planning and urban governance both plays a major role in urban development, they also have to apply the indigenous knowledge in urban planning.

This study concludes that the Indian cities do not provide 100% of climate resilience and the expansion of urban population and increase of industries in the geographical areas which are often affected by the natural calamity and also increases the vulnerability of populations and infrastructure in those areas. Besides, lack of climate resilience infrastructure causes flash floods and water scarcity as rainwater couldn't enter the ground. So, by combination of policy makers, Urban planners and the local community, we could achieve a climate resilient urban landscape. So each developing/under-planning cities needed to be studied independently as India has different types of land so that they could forecast the climate changes and safeguard themselves.