



Urbanization And Sustainability: Designing For The Future – A Case Of Guwahati

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ABSTRACT

This research paper aims to provide insights into encountering the rapidly increasing density with sustainable development and how by maintaining a correlation between the same one can address the welfare, well beings of all living beings inhabiting that place. The linking of demographic factors with sustainability helps us to address the various ignored and excluded factors that in the long term hampers the livelihood of people of all age groups. It also helps in planning development considering the ecological limits of the earth. The paper also emphasizes the crucial role of architects as they help in shaping the built environment which is the fundamental component of every community. Architects and Urban Planners through their design can inculcate the concept of sustainability in the community and fulfill both the roles as responsible citizens and professionals thereby becoming sustainable members of their community. The paper aims to identify the various needs and requirements of people belonging to all age groups by conducting an online survey tool like Google Form that will be circulated among 96 people randomly chosen between the age group of 18 -70 years residing in the various parts of Guwahati City (Municipal Boundary). This study will help identify the loopholes in the system thus helping the designers and planners to create a sustainable environment. Therefore, this study's conclusion emphasizes designing spaces that promote inculcating environmentally conscious behavior among people and also creating opportunities for interactions between humans and nature. It also focuses on generating awareness among people of age groups both at the micro and macro level in discouraging any development that hampers the immediate and more distant environments.

1. Introduction

In the age of unprecedented globalization, we cannot lose sight of the fact that cities are more than just places where people live and conduct business they are emotionally charged locations

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with unique identities, cultural values, and customs. Today, preserving urban uniqueness while advancing urban development with few resources marks the greatest challenge. Urbanization and cities are closely interrelated as urbanization drives the growth and expansion of cities making cities the focal point of transformation. Urbanization is inextricably linked to processes such as modernization, industrialization, technological advancement, infrastructure, planning regulations, public health, sociology, and economics among others. Urbanization has a large-scale impact on climate, land, and transportation, but decades of debate have yet to fully quantify the benefits and drawbacks. Urbanization is a global phenomenon that transfers and redefines humans' social, cultural, and historical foundations. This paper analyzes the impact of urbanization particularly in Guwahati City (Municipal Boundary), the largest and fastest-growing city in North-East India. The city's favorable geographic location has attracted commercial and industrial activities, resulting in significant environmental degradation risks. The paper highlights the drawbacks of urbanization that have led to a trade-off between development and environmental protection thereby suggesting that opting for sustainable approaches in planning Guwahati City will help to use the resources as efficiently as possible. It emphasizes the importance of designing the city by prioritizing sustainability and thereby incorporating features such as using compostable materials, recycling, or converting waste into energy that will minimize pollution and ecological impact. It advocates for urban planning that reduces environmental degradation while meeting the needs of its residents. This includes improving infrastructure for waste management, water conservation, energy consumption, and transportation to limit their environmental footprint. By promoting a comprehensive approach, the paper aims to balance community and socio-economic needs with the imperative of environmental preservation.

2.Aim

To comprehend the broad effects and trends of urbanization in Guwahati City (Municipal Boundary) and provide long-term Sustainable solutions.

3.Objectives

- To understand the concept of urbanization and its various repercussions in Guwahati City (Municipal Boundary).
- To identify the major challenges faced by the people residing in Guwahati City (Municipal Boundary).
- To develop a strategic plan for integrating Sustainable Design Practices to address issues of urbanization of Guwahati City (Municipal Boundary).

4.Scope and Limitations

This research is restricted to urban residential settlements in Guwahati City (Municipal Boundary), including a sample of persons belonging to an age group of 18-70. The study is limited to formal urban residences and was conducted in a single instance. This is a cross-sectional study with a limited sample size.

5. Literature Review

Urbanization is the process of population migration from rural areas to urban areas, leading to increased population density and growth in cities. Urbanization provides better healthcare facilities, education, employment opportunities, innovation, and improved living standards. However, uncontrolled urban population growth leads to environmental degradation, such as increased slum

areas, and pollution (air, water, and noise). Rapid urban growth hampers infrastructure development, resulting in inadequate housing, healthcare, and education facilities. Health implications of urban environments include pollution, noise, and overcrowding, which can lead to respiratory and cardiovascular diseases. Urban air pollution is a leading cause of respiratory and cardiovascular diseases, while urban heat islands affect vulnerable populations, increasing heat-related illnesses. In order, to cater to this rapid urbanization problem, sustainable development practices should be adopted in city planning. Sustainable development entails striking a balance between environmental conservation and economic development. at the same time, catering to future needs and demands. It refers to equitable development and sectoral initiatives across place and time. It needs a combination of economic, social, and environmental approaches to development. With the increasing expansion of urban populations around the world, there is concern about reducing the environmental consequences of urbanization. Cities have recently become locations of urban environmental degradation and inefficient use of resources, which is proving to be costly for present and future generations. Guwahati, a rapidly growing city in North-East India, is a prime example of this issue. The city's rapid urbanization has resulted in socio-economic and environmental issues. Therefore, to address the situation, we must reduce the depletion of non-renewable resources and pursue environmentally friendly economic development which must be done in ways that are socially, economically, and politically acceptable. Sustainable cities require a holistic strategy, involving grassroots efforts from local governments and citizens as they cater to both socio-economic and environmental issues. Sustainable transportation systems, like public transportation, cycling, and walking, can significantly lower urban carbon footprints. Investments in transit infrastructure and policies encouraging electric and hybrid vehicles can contribute to more sustainable urban mobility. Green infrastructure, like parks, green roofs, and urban forests, can help manage stormwater, reduce urban heat islands, and improve air quality. In conclusion, urbanization presents both opportunities and challenges with significant implications for the environment, society, and public health. Sustainable development strategies offer promising solutions to mitigate these impacts. By incorporating green infrastructure, sustainable transportation, energy efficiency, effective waste management, and community engagement, cities like Guwahati can work towards more sustainable and resilient urban futures.

6.Methodology

6.1 Study Area

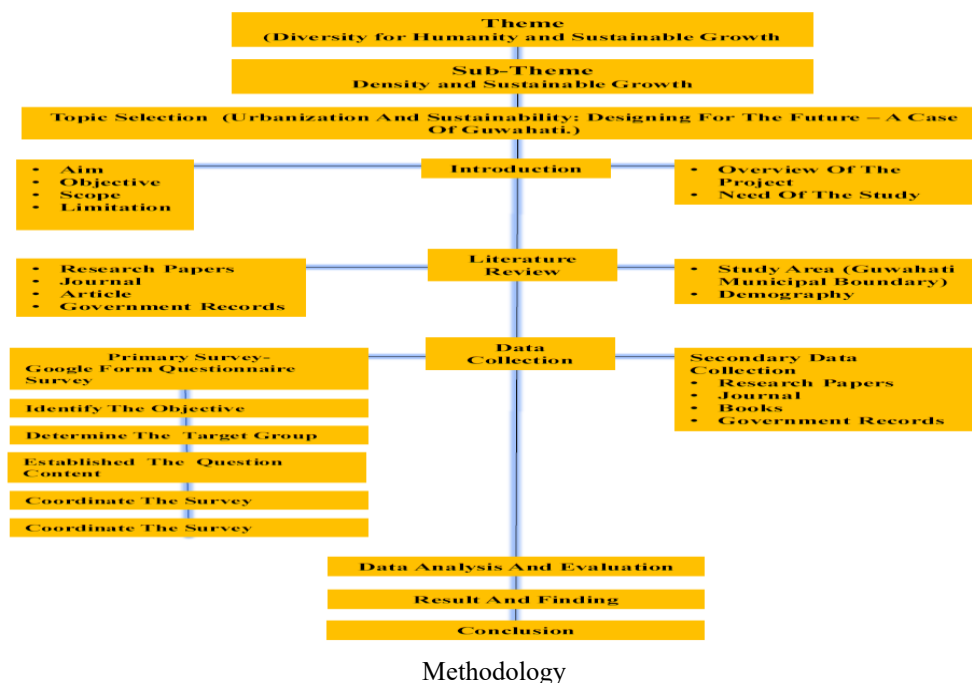
The study was carried out in Guwahati City (Municipal Boundary), which is situated on the southern bank of the Brahmaputra River of Assam. It is located between latitudes 26°5' N and 26°12' N and longitudes 91°34' E and 91°51'E .With the town of Narengi to the east and LGBI International Airport to the west, Guwahati is situated between the banks of the Brahmaputra River and the slopes of the Shillong plateau. The planning and development organization for the larger Guwahati Metropolitan Area is the Guwahati Metropolitan Development Authority (GMDA). Guwahati stands as the biggest city with a 963,429 people living in the Guwahati municipal area as per the 2011 census. The Guwahati Municipal Corporation (GMC), which oversees the municipal territory, last expanded its boundaries to include 216.79 square kilometers in 1991.

6.2 Sample

The study is limited to urban residential settlements in Guwahati City (Municipal Boundary) and includes a sample of people between the ages of 18 and 70. The investigation was done using an online Survey Tool like Google Form circulated among 50 – 100 people along with Secondary sources such as government records, books, articles, and online journals were used to collect the data.

6.3 Methods and Tools

A set of 19 questions was circulated through Google Forms. The questionnaire was divided into 3 Sections seeking information about (a) Demographic Data (b) Urbanization and (c) Sustainability. The rating of the various questions are on a scale of 1 -3. Rate 1 being the most preferable and rate 3 being the least preferable.

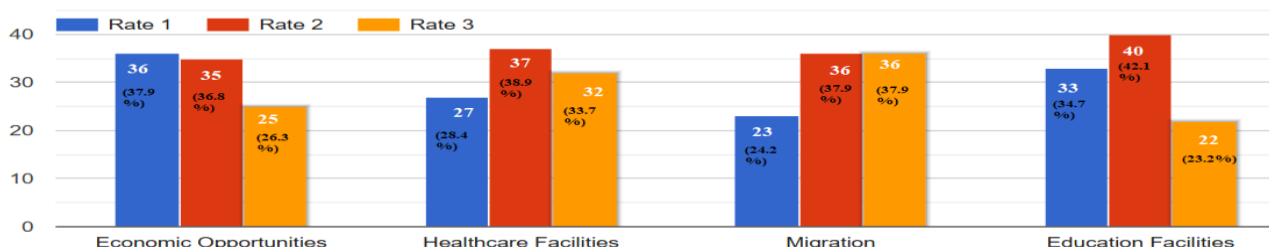


7. Guwahati’s Urban Boom: Understanding the Major Contributing Factors

Guwahati has always been the center of attraction for all the North–Eastern states. People have always been attracted to the city ranging from rural areas, neighboring states, and countries. The findings of the study are from various sources such as online surveys through Google Forms, Secondary Sources, government records, books, articles, and online journals suggesting that the primary reasons for Guwahati Cities (Municipal Boundary) rapid Urbanisation are its economic opportunities, healthcare facilities, education facilities and migration. Economic Opportunities were ranked as a priority by 36% of respondents in Google Forms, and numerous government records indicate that Guwahati is a significant hub for commerce and business. The majority of people coming are in quest of employment for working in industries and related fields.. The range of employment options is extremely constrained in rural locations, which leads to more people migrating to Guwahati. The growth of the industries is also another factor for increased Urbanization. In addition to creating job opportunities, industrialization has altered people’s lifestyles, contributing towards a better standard of living. The city's employment-generating factor has also caused migration from the neighbouring states and countries. The government of Assam conducted the National Register of Citizens to identify the migrants and immigrants which showed Inter-state migration in Assam has increased significantly from 1991 to 2011, with the highest percentage of migrants coming from Bihar, West Bengal, Meghalaya, Rajasthan, Tripura, and Uttar Pradesh. 24.2% of the respondent in the Online Survey showed concerns regarding Migration in Guwahati City. Immigration to Assam is always a major issue with some people moving legally and others illegally, causing socio-economic problems. The majority of immigrants came from Bangladesh, Nepal, and Pakistan leading to a severe increase in population in the Guwahati City. Immigrants have put tremendous strain on the land and caused

socio-political and environmental issues that have a negative indirect impact on the economy because they hardly contribute to government revenue and the government must spend a substantial amount to maintain this large fraction of the population. Higher Education is also among the other elements that have contributed to the current urbanization scenario in Guwahati City (Metropolitan Boundary) which came into light through various government records , journals, and also through the online survey conducted where 34.7% drew light on it. The higher education system is more advanced in Guwahati which is a reason that individuals are moving to the city for better educational facilities and quality for a better future. The tremendous growth in the healthcare industry has transformed the city into a hub of medical excellence, attracting patients from neighboring cities, states, and countries. Our nation's rural areas lack medical facilities compared to cities. People therefore choose to live in urban regions in order to have access to better and more modern health services. About 28.4% people in the online survey emphasized the availability of Healthcare Facilities has also contributed to urbanization. The city now boasts several critical care, multi-specialty, and super-specialty hospitals, making it a hub of medical care. The rise in the medical sector has accelerated the development of low-cost quality treatment, modern infrastructure, and the availability of highly skilled professionals. Assam has become a hub for medical tourism among neighboring states and countries, that has contributed with the increase in density of population in Guwahati City. Guwahati's urbanization has been greatly hastened by the dynamic interaction of its economic potential, improvements in healthcare, educational advancements, and migration trends. An increasing number of people seeking a better quality of life, employment opportunities to the city as it becomes a regional economic center with enhanced healthcare system and educational offerings. The promise of improved possibilities has fueled this migration, which has accelerated urban expansion and infrastructural development. As a result, Guwahati is developing into a thriving metropolis that reflects the intricate relationship between population changes and economic growth.

According to your opinion rate the main reasons behind Guwahati's Urbanization on a scale of 1-3?

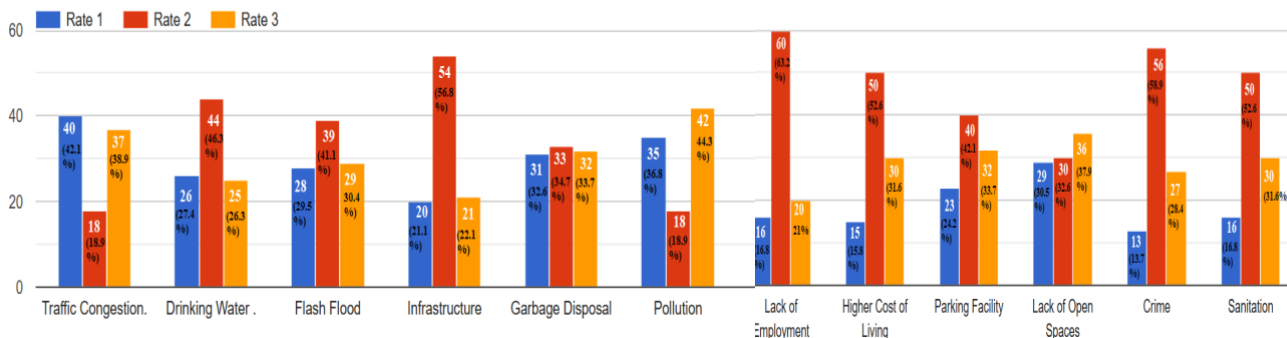


Source – Survey By Authors

8. Challenges and Impacts of Guwahati City's Rapid Expansion

The various challenges identified through the online google survey along with the data obtained from secondary sources like government records, books, articles, and online journals are listed below:-
 Source– Survey By Authors

1) According to your opinion rate the issues that have you faced due to the rapidly growing Guwahati City on a scale of 1-3?



8.1 Socio-Economic Impact

Urbanization impacts housing, infrastructure, and transportation networks, which are key to spatial connectivity and economic inclusion. It provides access to new technologies and technological know-how, ensuring income growth and individual development. Urbanization facilitates people's access to the job market, allowing them to pursue specializations in their professions and earn enough money to meet their basic necessities. However, urbanization in Guwahati is facing various negative impacts on socio-economic lives. Guwahati lack access to basic infrastructure, including marketplaces, roads, power, communication technologies, and institutions for skill development. In the absence of meaningful reforms, there is urban- rural migration. As a result of underinvestment in rural areas and competition for dwindling arable land infrastructure facilities in Guwahati rapid growth pose a bottleneck, leading to a shortage of housing and substandard accommodation. The high population density creates overcrowding issues, while unplanned expansion of town areas leads to issues with water supply, drainage, sewage, and sanitation. An increasing number of people are becoming squatters and residents of slums as a result of population growth. The poor and unsanitary living conditions in slums are caused by these deficiencies. Another problem due to Urbanization is increased in crime rate . Individuals' demands for improved lifestyles are rising as urbanization increases. People frequently look for ways to increase their income levels, and some of them resort to taking shortcuts for a better life, which leads them down the path of crime. Crime rates in modern societies are positively correlated with urbanization people's desire for a better lifestyle has driven them to take the wrong paths. Along with that poverty, peer pressure, unemployment, and politics are also factors for increasing crime rates. Additionally, inadequate traffic and transport arrangements also pose problems. Road transportation is crucial for socio-economic development and better livelihoods. However, slow development in this sector can hinder economic progress due to issues faced by users and stakeholders. Traffic congestion is a significant issue, affecting the city's infrastructure and overall development. This study aims to identify road transportation problems in Guwahati city and propose alternative solutions for better traffic management. In Guwahati, the city's rapid motorization and urbanization have had a negative impact on pedestrian mobility and safety. The existing state of affairs for automobiles and pedestrians has gotten worse due to factors such as constrained road space, unplanned vehicle movement, unregulated traffic management, and quick changes in land use. Many parking-

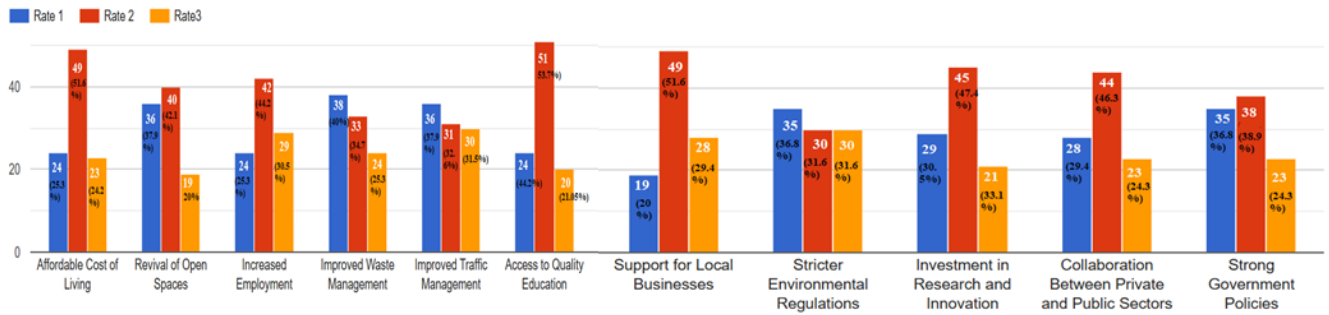
related issues have been brought about in Guwahati by dense pedestrian traffic, disorganized on-street parking, a lack of suitable street infrastructure, and designated parking spaces. Along with that urban green areas are essential, yet they face an increasing number of difficulties as a result of numerous anthropogenic activities. The changing urban landscape in Metropolitan Guwahati is a serious problem due to increased demand for land and rapid population expansion. Guwahati's general urbanization pattern is complicated, varied, and fragmented, which modifies the natural land cover of the city. The land surface characteristics have changed as a result of this intricate urbanization process. Therefore, it is necessary to address these socio-economic issues and ensure sustainable development in Guwahati .

8.2 Environmental Impact

Rapid urbanization has negative environmental implications, causing severe ecological crises due to the loss of green fields and changes in traditional agricultural practices for mass production. Air pollution, primarily from industrial and vehicle emissions, poses serious health risks to urban residents. The urban areas are the primary sources of anthropogenic carbon dioxide emissions from the burning of fossil fuels for industrial operations. The primary producers of greenhouse gases in urban settings are motor vehicles and industries. The air quality in metropolitan areas has declined because of the increase in automobiles and industries. Guwahati has experienced a significant rise in air pollution as a result of excessive industrial and automobile emissions. People are now suffering from a wide range of illnesses and disorders as a result of airborne contaminants . Along with air pollution Urban regions are renowned for their abundance of automobiles on the road, noise-producing enterprises, and various social events and festivities. Numerous psychological and physical illnesses are brought on by noise pollution in metropolitan areas, which is caused by the noise made by these cars, trucks, social gatherings, industries. Urbanization is increasing waste production specifically, large amounts of wastewater are entering rivers and canals, overwhelming their capacity for natural recycling. Over time, urbanization in Guwahati has resulted in increased sedimentation, which in turn has increased runoff pollution leading to poor water quality and shortage. Along with water shortage Guwahati is experiencing recurrent flood inundation and severe waterlogging during storms. The flooding has submerged homes and fields, causing traffic jams and stranding vehicles on major roads. Flooding leads to loss of life, property damage, and destruction of crops and livestock. Floods can also increase the transmission of communicable diseases like water-borne diseases like typhoid, fever, cholera, leptospirosis, hepatitis A, and vector-borne diseases. Flooding drives out residents and contaminates vital supplies, aggravating Guwahati's already serious sanitary problems. Since more than 1.2 million Assamese homes lack access to toilets, the flooding exacerbates the sanitation system's shortcomings and causes a large-scale leakage of human waste into water sources. This exacerbates the 80% pollution already present in Indian rivers due to excreta, severely contaminating ponds, rivers, and groundwater. The city's public health results are deteriorated when floodwaters combine with untreated sewage, degrading drinking water quality and raising the risk of waterborne illnesses.

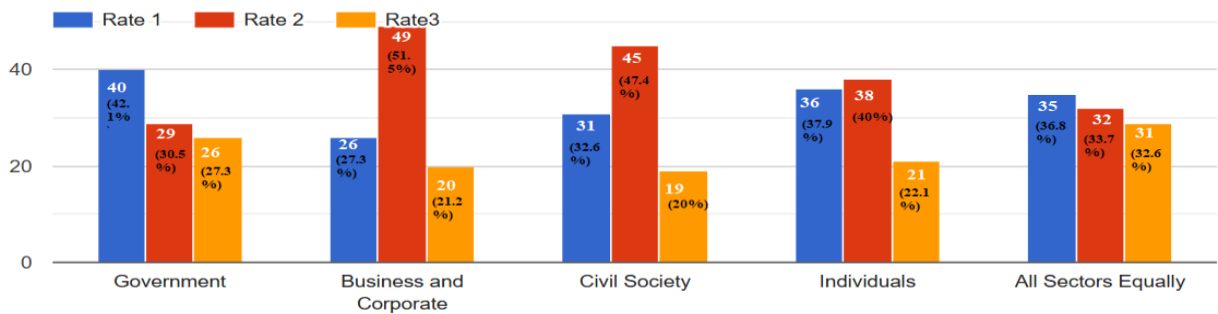
9.Strategies

According to your opinion rate the key factors for achieving Sustainable Development in Guwahati City on a scale of 1 - 3



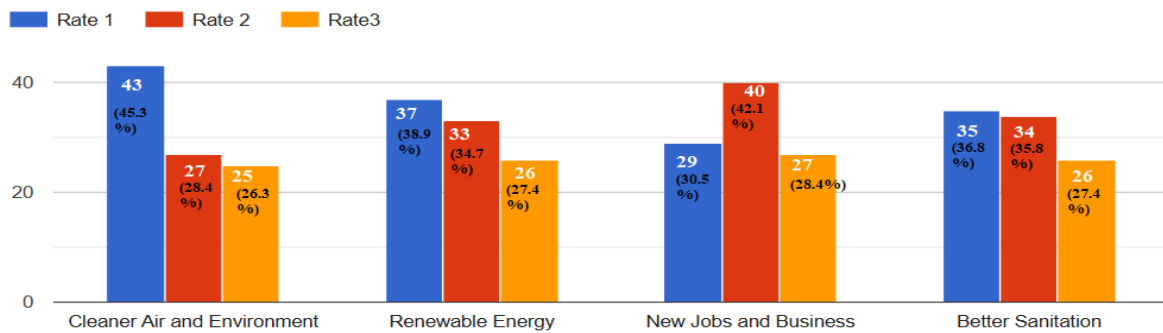
Source – Survey By Authors

According to your opinion rate the acting force that should prioritize Sustainable Development Efforts in Guwahati City on a scale of 1 - 3?



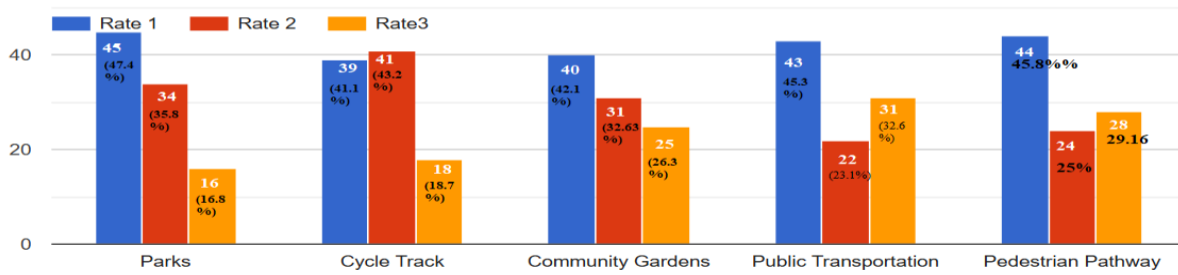
Source – Survey By Authors

According to your opinion rate the benefits of a Sustainable Environment on a scale of 1 -3?



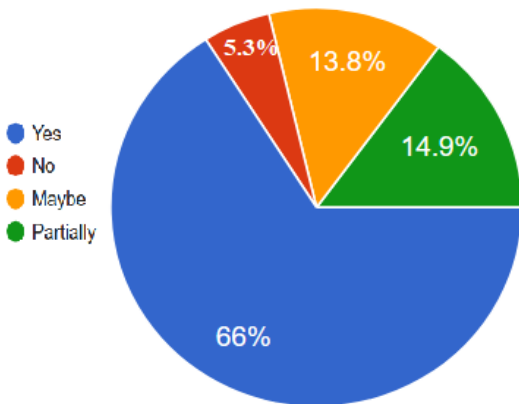
Source – Survey By Authors

According to your opinion what are the Amenities you think are important for a Sustainable City on a scale of 1 - 3

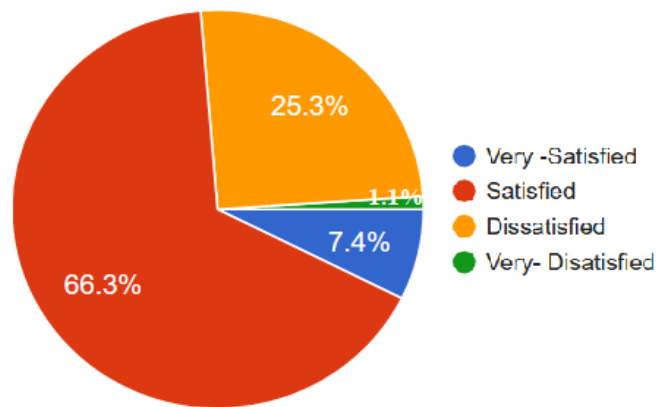


Source – Survey By Authors

* How willina will you adapt to sustainable practices in your Day – To – Day Life



* How satisfied are you being part of your community ?



Source – Survey By Authors

According to our online assessment, Guwahati city is facing serious environmental problems. The three most important daily issues that people face are pollution (35%), waste disposal (37%), and flash floods (35%), all of which have a significant negative influence on the standard of living for locals. In addition, the lack of parking places (30%) and open spaces (32%) is becoming a bigger issue, adding to the overall stress on the infrastructure and liveability of the city. All of these problems highlight how critical it is to implement efficient management techniques and sustainable urban planning in order to enhance the environment and general well-being of city dwellers. The following are the strategies that can be adopted for catering the rapid urbanization growth in a sustainable manner considering the data received from the Online Survey and secondary sources. 42.1% of the population from the online survey conducted and also from data derieved through various secondary sources believed that the government ought to be at the forefront of Guwahati City's sustainable development. To assure the city's sustainable future, however, this effort needs to be collaborative and involve all relevant parties corporates, civic society, and every individual working together. The government should be raising awareness about global warming energy-saving technologies through school projects, lectures, and exhibitions meanwhile promoting energy-efficient behavior and practices among the general population. According to 42.1% of respondents in the survey showed concern about the lack of awareness being a major obstacle to sustainable growth in the city. Additionally, the city's efforts to become more sustainable are being hampered by insufficient infrastructure and policy. The

availability of housing and the city's physical and social infrastructure are always under strain. The government should prioritize providing decent housing, access to amenities that contribute to a healthy environment, and sufficient mobility options. These factors all work together to support residents' personal independence and participation in civic and social life. The ULB should strive to maintain and improve housing conditions. In the online survey, 45.3% of respondents said that sustainable development will improve the city's environment by guaranteeing clean air, while 38.9% said switching to renewable forms of energy will lead to a better, greener future. Green Building certification should be made compulsory for new structures also homeowners who want to build greenhouses can get loans with low interest rates. The government should offer financial incentives for energy-efficient construction along with design and renovation of pre-existing structures. The city should adopt the installation of a tracking device for smart and efficient electricity use. Also organizing various programmes to integrate and coordinate sustainable energy activities, with a focus on fuel cells, alternative fuels, and solar PV technology. The government should also establish funds for Innovation in New Energy Technology to test-bench clean innovations. The government should work towards a compact development approach by concentrating new development at activity centers near current infrastructure and at strategic redevelopment sites. They should also encourage mixed-use development by making CBD's 24-hour active by encouraging building reuse. Various planning interventions need to be formulated to control sprawl. Outer-city growth should be located close to transport corridors and an urban growth boundary is envisaged to manage outward expansion. The government should take measures to protect the green wedges from inappropriate development along with that steps should be taken to create an excellent living environment, focusing on creating a well-protected cultural identity, attractive and walkable neighborhoods with a fair distribution of social infrastructure, enhanced community safety and good urban design. A green tax and preferential treatment for fixed asset taxes in specific green zones can help produce the revenue needed to preserve green spaces. Planning should be done to create an open leisure spaces that can act as the city's green lung or as a greenbelt around the Guwahati City's perimeter along with giving equal weightage on green roof. More than 40% of respondents think a city that is truly sustainable might be imagined to have features like parks, effective public transportation, and pedestrian-friendly streets. Furthermore, amenities like bike lanes and community gardens contribute significantly to improving the sustainability of the city. The government should emphasize raising public awareness of environmental issues and encourage residents' active participation in supporting the 3Rs (reduce, reuse, and recycle) program. Such measures would lead to waste reduction and moreover, recycling creates revenue. It decreases landfill space, creates jobs, and is less expensive than landfilling. Urban congestion and road problems are common issues in urban areas. Road issues require expertise from various fields, including law, engineering, economics, social sciences, ethics, and management. The Assam government should study long-term road safety programs to resolve road issues and stimulate regional development and planning. Transport planning is crucial for economic development, especially in developing countries with high urbanization trends. To improve public mobility, the government should strongly support the urban local body to work toward an effective traffic management system. Various campaigns should be organized to raise awareness of road safety. Design strategies like adopting a catchment management strategy, sponge city, improving drains alongside roads, and adopting community water resources should be adopted to improve resilience to floods. Guwahati City now relies primarily on the natural drainage system, and the city lacks a suitable drainage plan to meet its needs. The current natural drainage channels must be kept clean and free of debris to allow stormwater to flow through them during the monsoon season. Any garbage dumping should be avoided in the channels, and any drains that fall into them should be moved. Since these natural drains are interconnected, they can be useful in quickly moving floodwater out of the city, and for these reasons, encroachments over the drain channels should be eliminated. In addition, the other infrastructure services should be planned with a systematic stormwater. Our Online Survey highlights that restoring open spaces (37.9%), improving waste management (40%), traffic management (37.9%), stricter

environmental legislation (36.8%), and strong government policies (36.8%). are crucial steps toward the city's sustainable development. Hence, by implementing and adopting these strategies one can tackle the rapid urbanization in Guwahati and design the city in a sustainable manner.

10. Conclusion

Urbanization poses a significant environmental threat, causing global warming, water, noise, and air quality degradation. In Guwahati, urbanization has led to reduced forest cover, increased slum population, solid waste generation, pollution of air, water soil urban flood, and many more. To maintain a balance between development and the environment, a sustainable development approach should be followed. Effective planning and strategies should be developed by the government, policymakers, and regulating agencies to protect the city from potential damage from urban development. Improving standards and administrative procedures in Guwahati could significantly alleviate urban issues. Proper waste management, water treatment water conservation can also help reduce water pollution. Adequate social amenities, such as housing, drinking water, and sewage, should be provided to urban dwellers for a healthy and dignified life. Controlling vehicular pollution in the city should be a key focus as it causes traffic congestion along with air pollution. Mandatory guidelines must be implemented to decrease solid waste generation at its source. To effectively manage solid waste, improved garbage collection, treatment, and disposal technologies are necessary. The study found that maintaining a high quality of life in Guwahati city requires both innovative economic growth and a healthy urban population. Hence addressing population growth in Guwahati City requires a reasonable approach with Comprehensive land use planning and updating of plans in a sustainable manner thereby making the city more liveable. According to our study findings, 66% of Guwahati residents are keen to adapt to the changes required for sustainable development of the city .Thus, successful government and corporate awareness policies and campaigns we would surely open the door for a future Guwahati that is more sustainable and liveable.

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