EVALUATING THE FEASIBILITY OF SELF-SUSTAINING SETTLEMENT IN CENTRAL INDIA CONCERNING SUSTAINABLE DEVELOPMENT: CASE STUDY OF NAGPUR

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ABSTRACT

The majority of the developing world saw tremendous industrial expansion and progressive wealth creation throughout the second half of the 20th century. In developing cities compared to developed ones, this recurrent urbanization resulted in an unstable population explosion. This study intends to determine and analyze various aspects of self-sustaining settlements and also derive relevant indicators to find out whether the current self-sustaining communities of the selected region are favorable for achieving sustainability. The goal of this article is to gather information and discuss issues associated with unauthorized settlements thereby implementing sustainable development strategies so that resource consumption is reduced.

Keywords: sustainability, self-sustaining, community, population

INTRODUCTION

The concept of a self-sufficient community is seen as a solution for protecting the environment and ecological systems in the future[1]. As the human population rises, consumption and demand for natural resources will inevitably increase. Population growth and sociocultural issues coexist. Due to cultural conflicts and diverse customs, social cohesion tends to decline. Besides being self-sufficient, a community should also be unified. By addressing the community's wellness, a more desirable living environment can be established [2]. Finding viable sustainable initiatives that promote communal living could become a daily ritual for a community. This will develop a sense of belonging while promoting the notion that environmental protection is a common goal.

Collective Living and Self-Sufficient Communities

Self-sufficiency is the capacity to fulfill one's requirements without outside assistance. Community refers to people residing in a particular location, such as a city or neighborhood, and considered as a whole [3]. Total independence is difficult to obtain due to the limited land available for agriculture, particularly in urban districts compared to rural ones. Yet, it is an appropriate step towards an interest in the environment and a desire to maintain its sustainability. For instance, a self-sufficient urban home could establish a small-scale self-sufficient community.

Today, we confront the challenge of creating a self-sufficient dwelling, which is a living entity that interacts with its surroundings, have exchange of resources, and functions totally on its own, like a tree in a field. To balance the excess and insufficient connection, a self-sufficient dwelling project should be linked to surrounding structures [4]. Research studies have highlighted that any part of a city is self-sufficient when it comprises a diversity of activities and that its design should prioritize the density, collective, and complexity of activities. This study examines the characteristics of self-sufficient housing as an independent entity that promotes communal life while also relating to the surroundings and the city as a whole.

Issues

Our predecessors used self-sufficiency to live sustainably. The culture has long maintained a back-to-the-land philosophy in which "you harvest what you sow" from the earth. Regarding the environment, the land was utilized for cultivation as needed. This style of life emphasizes the importance of communal living. The kampung or village model served as the foundation for the political structure of the society[5]. Collectively, the people grew their crops, reared their livestock, and developed their food supply by utilizing basic but effective ways and engaging in hands-on everyday activities.

Future societies should achieve self-sufficiency via communal life, as did our ancestors. Through community-oriented projects and activities centered on green initiatives, the cohesiveness of a community increases when people live together. Creating a "space collective" from a design perspective enables the achievement of communal living through the use of a spatial approach. "Space collective" refers to common spaces inside housing complexes that aim to revive the neighborhood by implementing innovative architectural and urban interventions that are beneficial to the community. For a wide range of activities, communal spaces are built within the community. Human-centered activities might reestablish community spirit as a means to enhance society from a sociocultural perspective.

Scope

This paper discusses a community's environmental sustainability. Components and case studies are thus defined following resource management and its impact on the environment. Only settlements are discussed in the research with major emphasis on communities in rural or semi-urban areas. Consideration is given to communities that aim to become self-sufficient. It is the purpose of this study to establish the scope of sustainable communities.

Community's Contribution to the Sustainability of Community-Based Projects

Sustainable community development at the local level requires that local economic growth supports community life by using the local community's resources and abilities. It also imposes additional pressure to make sure that the advantages of development are distributed more fairly and transparently. The majority of the communities where community-based projects are implemented are affected by societal issues including poverty, unemployment, and other forms of social injustice. Individuals living in these communities have few alternatives for their development needs as a result of the predominance of socioeconomic issues and geophysical characteristics. As a consequence, these people continue to live in a backward state, which has negative social and physical effects on the wider population. This has caused them to adapt their behavior to the present circumstances.

Researchers have developed a variety of indicators on community settlement, including tools for identifying urban sprawl. Understanding the impact of urban slums on transportation behavior and environmental, social, and economic factors would be a major goal of the study. Those indicators include:

(i) Density distribution of commercial and recreational activities, services, jobs, etc. within the city in relation to the site of residence; measured by diversity, mixed use; accessibility, composition, size, and form determines the resident population distribution across the urban area.

(ii) The characteristics of the transportation network and the modes through which people travel.

(iii) The built environment's design quality either encourages or discourages certain behaviours. Settlements may thus be researched and evaluated using data analysis related to the identified aspects.

Case Study: Nagpur, Maharashtra, India

Since Nagpur is an example of a typical mid-level growing urban Center in India, it was selected as the research region. The city is the third biggest in the state of Maharashtra and the thirteenth largest urban agglomeration in the whole nation. It has a 2.4 million inhabitants and a land area of 217.65 square kilometres (as of the 2011 census). The city has a tropical savannah climate with 1161.54 mm of annual rainfall on average, hot, dry, and tropical weather that reaches 48 degrees Celsius in the summer and 10 to 12 degrees Celsius in the winter. Administrative borders are expanding geographically as a result of recent socioeconomic developments, population expansion, and urbanization of the city, and the natural environment that formerly marked the city's perimeter is now within the municipal limits. The natural and maintained public UGS, including lakes, the Nag and Pili River's drainage basins, urban forests, institutional green spaces, parks, playgrounds, and gardens, are under extreme pressure to be destroyed or degraded in this fast urban transformation scenario that Nagpur is experiencing. Urban inhabitants are experiencing worsening air and water pollution, dwindling green space, more flash floods as a result of expanded build-up areas, and the creation of urban heat islands as a result of urban sprawl and consequent land use changes.

Population

The current projection for Nagpur's population in 2020 is 2,893,455. There were 472,859 people living in Nagpur in 1950. Since 2015, Nagpur has expanded by 216,735 people, or 1.57% annually. These population predictions and estimates are based on the most recent UN World Urbanization Prospects report. These figures refer to Nagpur's urban agglomeration, which often includes the city's population as well as those living in nearby suburban regions. It is the 13th most populous city in the nation and the third biggest in the state. Estimates put the population of metro region at 3.6 million. The precise figures, however, will come from the next census. One of the cleanest cities in India is this one, according to legend. Due to its excellence in public transit, healthcare, and green areas, it is also one of the most livable cities. This results in a population density of 30,000 persons per square mile for Nagpur, which is dispersed over a total surface area of slightly over 84 miles. A deeper examination of Nagpur's population statistics reveals that there are more men than women living there. Children make up a large portion of the city's population—more than 10%. More than 859,000 people, or more than 35% of the population, live in slums. Nearly 92% of people are literate, with men being more literate than women.

Solid Waste

The average amount of waste produced daily in Nagpur is between 1150 and 1200 tonnes (TPD), with a per-person average of 4.46 kg. Only 150 to 200 TPD of this waste gets treated. NMC has started biomining at garbage sites. Although segregation procedures have been started, they are not being used at the household level. To control solid waste, residents' awareness must be raised. At disposal sites, buffer zones are essential.

Problems and Present Scenario

The over population is exerting an ill impact on the growth of the society and nation with an increasing trend of unemployment, overcrowding and depletion of the natural and manmade resources. There is a need for social awareness in the country. Population is rising at an alarming rate in unauthorized settlements near railway tracks an urgent and important issue.

A slum study was carried out in Nagpur in 2018 and the results were released as Slum Atlas for Nagpur. The survey estimates that 8.58 124 lakh (0,86 million) people, or around 36% of the whole population, live in slums in the city. As of right now, there are 446 slums distributed around the city area, both notified and unnotified. In addition, 13 additional slum areas have just been discovered but have not yet been mapped. An investigation of spatial inequality revealed that Nagpur's low-lying regions experienced the maximum spatial expansion, raising environmental concerns. The periphery of the railways, on the other hand, was observed to have the most unapproved or unlawful layout developments and the least access to infrastructure. These unapproved or unlawful schemes provide enough homes for the growing number of homeless people in the neighborhood, despite being seen as an unavoidable part of the development process.

Strategies: Self-Sustaining Settlements

Active Design Strategies Catering Both Physical and Social Infrastructures:

Water Management: In order to secure the long-term usage and availability of the resources in the field of basic needs like water resources, energy, foods, construction materials, and other essentials, etc., energy-saving and recycling technologies must be used. The idea encourages people to live independently while also having the least negative influence on the environment.

1. **Economy:** Utilizing local resources, a vibrant and diverse local economy, use of information technology to transportation management, energy, and water consumption, among other things are important things to be considered. Connecting a settlement to the global communications networks is necessary.

2. **Water, Sewage Treatment, Waste:** Utilize natural rainwater drainage, including infiltration over surfaces, basins, and hollows, to maintain the equilibrium of the water cycle. Water should be provided with multiple purposes in mind, with rainwater or grey water contributing to partially replacing drinking water. Use water as a sensory element of city greening to improve the quality of public spaces and promote comfort and wellbeing. Utilize wastewater sewage wetland treatment systems to clean black and grey water. Reduce the amount of garbage produced in settlements and provide ideal circumstances for recycling and resource reuse. Favor consumption patterns that generate less waste, helping to advance efforts to reduce and reuse materials across the manufacturing and supply chain (less wrappings and packs, refillable containers, etc.) Encourage the idea that garbage is a precious resource that can be recycled and used again to create local employment. Minimize the adverse affects of waste on the welfare, comfort, and health of users. Make an effort to meet everyone's demands for potable water. Strive towards closed production cycles in terms of technology.

3. **Energy:** Efficient energy use (low energy buildings, solar architecture, equipment), long-term usage of renewable energy sources, reduced energy consumption and the energy cycle's negative environmental effect while maintaining or improving comfort levels compared to industry standards are important to be considered. In order to improve energy efficiency, it is better to take into consideration building layout, street orientation, and density. Prefer compact structure designs with minimal roof and outside wall space. Building layouts that make use of passive cooling/heating and natural daylighting reduce the energy consumption of buildings and therefore shall be considered. Use renewable energy wherever feasible (solar, wind, biomass). Favour centralized, effective energy supply systems, assemble the necessary infrastructure, even in the settlements' farthest regions. Utilize information technology to control energy.

CONCLUSION

With worse urban-core densities and a widespread urban sprawl situation, Indian cities lead in unauthorized settlement. In this case, UGS are acknowledged as important components in sustaining and generating ecosystem services for these areas. As per Government Notification of the new Land Acquisition Act (Dist Nagpur Case No.12/A-65/2021-2022) they have provided the land for rehabilitation for these encroach

settlements. Few important and vital strategies for the community include water management, in the field of energy, sustainable building practices, economical rejuvenation etc. Retrofitting sustainable practices in existing unauthorized areas along with the identified strategies of self-sustaining community shall be adopted for ultimately making the selected community self-reliable.

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