

Study of Transformation of a Sustainable Neighbourhood in Urban Area Through Infrastructure Analysis for Future Smart Cities, Case Study Nagpur.

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Abstract:-- The central premise of this study is that the infrastructure facilities at the neighborhood level can affect its neighborhood sustainability and can it affect city development. It is now widely accepted that a relationship exists between the shape, size, density and land use distribution of a neighborhood and its sustainability. The relative sustainability of, for example, high and low urban densities, or centralized and decentralized settlements is still disputed. Certain forms of neighborhood appear to be sustainable in some respects, for example in reducing travel, social and recreational facilities are nearby. Consequently, if any advances in neighborhood sustainability are to be made, then connections between the neighborhood form and a range of infrastructure, recreational and social facilities at neighborhood level need to be established.

A possible solution offered for achieving sustainable neighborhood form through infrastructure is that of "a high density mixed use development within a restrictive geographical area with enhanced public transport and infrastructure facilities for making smart city".

This study attempts to answer three key questions:

- ◆ what is the existing form of selected neighbourhoods for the study purpose, to identify whether present neighbourhood form is based on sustainable neighbourhood concept if not then.....
- ◆ how can it be achieved?
- ◆ how it will help for making future smart cities?

Index Terms— Community life, environmental benefits, infrastructure parameters, Social Aspect of Sustainability.

I. INTRODUCTION

Industrial revolution led to a development pattern with economic growth as a priority while degrading the environment. In 1970's, the conflict between environment and development was first acknowledged and the term sustainable development (SD) was coined and defined as "the development which meets the needs of the present generation without compromising the ability of the future generation to meet their own needs" (Brundtland Commission, 1987). The three pillars of sustainability i.e. social, economical and environmental, together contribute to a healthy and productive present and future community. Sustainability is related to creating and maintaining the quality of the life in a community.

A community cannot exist without people and their interaction. The inhabitants influence development when they choose where to live, work and play. Social aspect has major capacities to enable immediate and positive change for sustainability but then also the social

dimension of sustainability has traditionally received less attention than the environment and economic dimensions because of the difficulty in defining and measuring social sustainability (Richmond, 2012).

Mixed landuse development plays a crucial role in enhancing social aspect. Thus, this study focuses on the aspect of social sustainability its significance to understand the notion of mixed landuse and support the literature study with the case study of three neighbourhoods with varying landuse mix in the urban context of Nagpur, India.

II. PURPOSE OF THE STUDY :

India's rapid urbanizations has few unique characteristics. First, the scale of urbanization is vast, not only in terms of number but also in terms of having multiple models of urbanization in different regions. Second, Indian cities, especially the metropolitan, are characterized by high densities, and third, is the vast of growth of existing cities, rather than accommodating growth in new planned cities. In India, large cities are

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experiencing rapid population and spatial growths. The rising land costs are making the construction of reasonably priced. Local and Planning Authorities are encouraging to transition to commercial retail establishments or higher-density residential uses that supports the need to supply housing apartments by designating streets and areas.

From the available statistics, it may be inferred that the urbanization in India will definitely have an impact on global sustainability as India's share in global ecological footprint will increase in near future. The rapid growth of Indian cities driven by growing economy needs to be discussed in relation to the quality of life in cities, resource consumption and environmental impacts. Thus, building sustainable cities will be a key to hold India's economic growth in future.

Nagpur, centre of India, located in Maharashtra state, has been going through rapid urbanization for last several decades. It is the primate city for Vidarbha region as well as the second capital of Maharashtra. Nagpur Metropolitan area is among the 13th largest urban conglomerations in India. The present pattern of accommodating this fast growing population is creating a stress on the limited available resources. Agricultural lands are being encroached and to meet the growing demand for land. This pattern also has direct and indirect effects on the environment of the city and quality of life of its citizens. Nagpur, which is amongst the greenest city in the country, needs to find some alternative ways to define its growth pattern.

The purpose of this study is to first understand and identify the spatial pattern of neighbourhood's of the city to evaluate the possibility of adopting the new concept of sustainable neighbourhood's as a growth option for city like Nagpur in context of developing country. Aim : To propose policies and strategies to develop an approach towards sustainable neighborhood development through Infrastructure analysis : a case of Nagpur city

III. OBJECTIVES

- ◆ The study involves understanding the concept of sustainability and neighborhood
- ◆ Study the Sustainability aspects of selected neighbourhoods from Nagpur city.
- ◆ To study the various methods and techniques for deriving a set of indicators for measuring the neighborhood sustainability and Infrastructure facilities.
- ◆ To analyze the inter relationship of neighborhood , Infrastructure and sustainability.

- ◆ To propose restructuring strategies for achieving sustainable neighborhoods.

II. METHODOLOGY :

Literature review

Selecting indicators for sustainable neighbourhood Data collection (primary and secondary surveys) selection of pockets , Site surveys , Preparation of maps and graphs (on the basis of primary and secondary data collected) Achieving sustainable neighbourhood concept through restructuring strategies & policies. Derived indicators for neighbourhood sustainability (data analysis & interpretation) Identify issues and areas of intervention.

Concept Of Sustainability Neighbourhood :

A sustainable neighbourhood is place where people want to live & work now & in future it's a mixed used area with a feeling of belonging for community which provides an environment with high quality of life includes safe and inclusive, well planned, built and run, and offer equality of opportunity and good services to all. The component of sustainable neighbourhood may vary according to the need of the particular society but the whole concept of sustainable neighbourhood aims to accomplish long term socially, environmentally feasible community by focusing on various sustainability indicators

Neighbourhood Sustainability Framework An outcome of a sustainable neighbourhood built environment. The built environment maximises neighbourhood satisfaction through housing quality, durability and low levels of dilapidation, street safety, low noise disturbance, opportunities for casual social interaction, and opportunities for enclave living. It minimises the direct and indirect costs for households and cities associated with travel, land and dwellings, maintenance and repair, infrastructure, and facilities & encourages resource efficiency, conservation and sustainable resource use in dwelling performance, land consumption, transport, energy sources, water consumption and life cycle impacts. It also protects and enhances the environment by reducing negative impacts on air quality, aquatic health, biodiversity and soil quality.

Toward Sustainable Neighbourhoods : The Need To Consider

Infrastructure Interactions :-

- ◆ The role of infrastructure in promoting sustainability at the neighbourhood scale. A sustainable neighbourhood design process is outlined and the importance of adopting a systems perspective and

considering infrastructure interconnections is emphasized. The performance of local infrastructure systems (e.g., buildings and local transportation network) is influenced by interactions with the greater urban region and with other local infrastructure.

- ◆ It is difficult to achieve neighbourhood sustainability objectives without infrastructure systems at the urban scale that support these micro-scale goals.
- ◆ Furthermore, interactions between local infrastructure systems can have a positive or negative impact on infrastructure performance and environmental impacts. The incorporation of sustainability principles in neighbourhood design is important because many of the problems encountered at the macro-city scale are in fact cumulative consequences of poor planning at the micro-neighbourhood level.

Infrastructure is the basic requirement of urban life and its adequacy and accessibility are two important ingredients and key contributors in the up gradation and enrichment of quality of urban life which is the primary objective of any planned development effort. Social amenities and infrastructure fall under the social welfare objectives of the urban development programme.

Study Area And Data Identification :- Study Area Nagpur Nagpur city is located in Nagpur district in the state of Maharashtra. Nagpur is the administrative headquarters of Nagpur district and Nagpur division. The city falls in the Deccan plateau of Indian peninsula. Nagpur is the largest city in central India and the third largest city in the western state of Maharashtra after Mumbai and Pune.

Being the geographical center of India, the zero mile marker of the country is located here. Spread across 220 sq.km. With a population of 2,388,558 (2011 census), Nagpur was the nation's 13th largest urban conglomeration in 2001 and the foremost city in Maharashtra's eastern Vidarbha region. On a global scale, Nagpur is estimated to be The 114th largest city and 143rd largest urban area in the world in 2006 in terms of population.

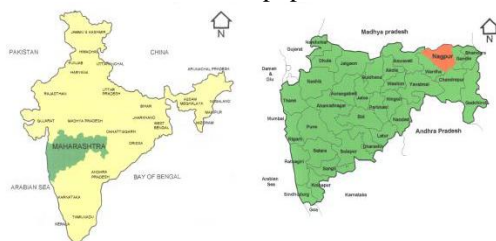


Fig.1: Location Map of Nagpur City in India and in the State of Maharashtra

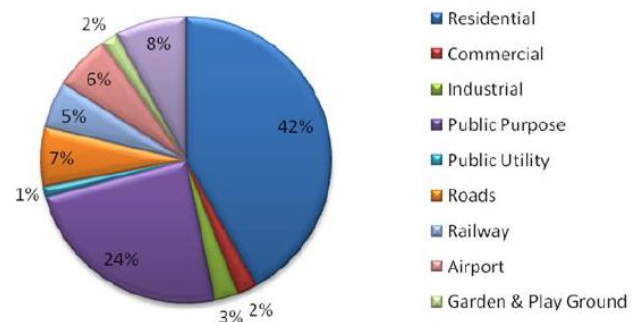
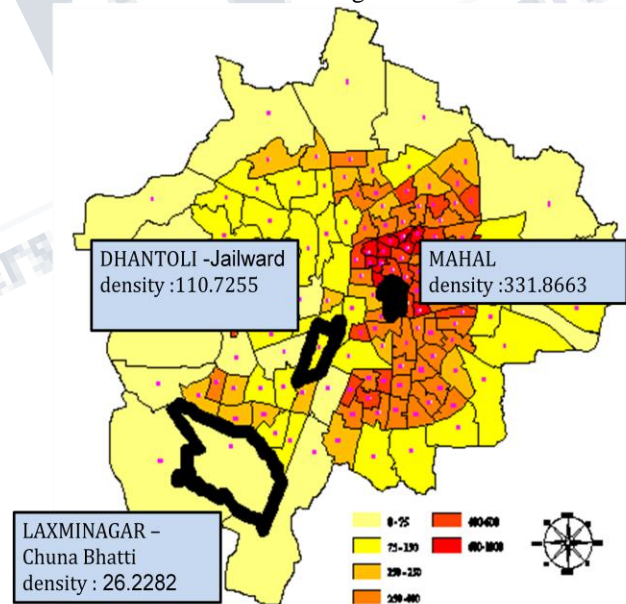


Fig.2: Existing Land Use Pattern Of Developed Area Ward Selection:

Three wards in the city have been selected for the study purpose:

Criteria For Ward Selection:

City area like – core , in-between and fringe
 Dominant density range in the city Type of development – mixed use
 Increasing pressure for commercialization thriving for becoming dominant sub centres
 Pressure on infrastructure facilities
 Increasing land cost.



Measuring The Neighborhood At The Ward Level

MAHAL

Total Population and density existing in the ward as per 2011 Census : Population-14498 , Area-43.686273 , Density- 331.8663. Mahal i.e. ward no.70 located in east Nagpur at a distance of approximately 3-4 km from the

centre of the city. This ward spreads over an area of 43.686273 Ha and falls under the high density range (250-400pph) - 331.8663pph. Mahal area is the place where the city of Nagpur begun. For the same reason, there is a great variety of buildings here. From Bhosle Raj Ghat to NMC office, Mahal has buildings of age over 300 yrs. Many of the buildings were renewed due to obsolete in function and structural stability. The age and typology of the buildings in Mahal is of significance as it gives the identity and evolution of the city. It is often an argument what is to be preserved and what is becoming obsolete in the Mahal. Mahal has buildings in two extreme conditions- deteriorating and new. The occupancy of this part of the city for the last 300 yrs is the reason why old and deteriorating structures exist. The central location and amenities in close proximity discourage the population living in Mahal to move out of the region. These houses come in the category of pucca houses, the risk of failure is very high. Poverty is the main reason why individuals are not improving their dwellings. Lack of spacing between buildings also poses threat in case of a fire breakdown, earthquakes etc.

DHANTOLI

Total Population and density existing in the ward as per 2011 Census: Population-14293, Area-129.084938 ,Density-110.7255 . Dhantoli i.e.ward n0.88- jailward located in West Nagpur at a distance of approximately 1-2.0 km from the centre of the city. This ward spreads over an area of 129.084938 Ha and falls under the medium density range(75-150pph)-110.7255pph.

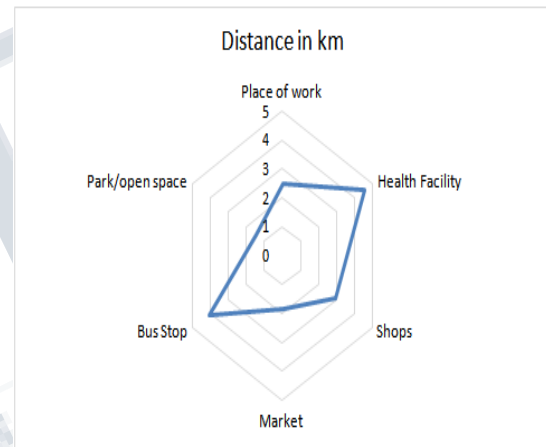
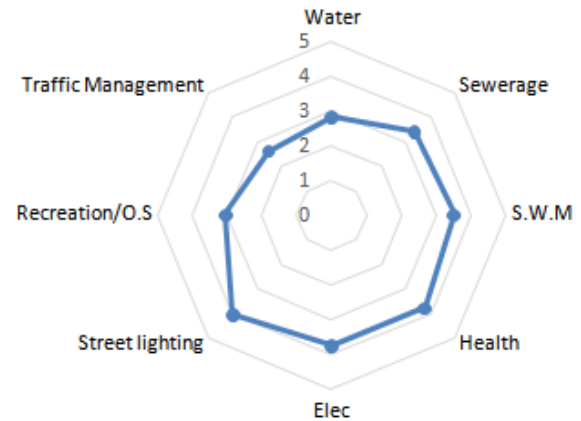
It is mainly a planned development. Initially it was predominantly residential but now is moving towards mixed use. There is an increasing pressure for commercialization as well as residential development, owing to its prime location in the city. It is also an identified sub centre within the city. Open space including park constitute almost 2.5% of the total ward area. NIT park and nearby park is the parks available. Absence of vacant plots for future development.

LAXMINAGAR

Laxminagar i.e. Ward n0.116 – chuna bhatti located in south-west nagpur at a distance of approximately 9-10 km from the centre of the city. This ward spreads over an area of 770.73669 ha and falls under the low density range(0-75pph)-26.2282pph. It is mainly a planned development. It was predominantly residential but now is moving towards mixed use. It is also an identified sub centre because of AIRPORT and MIHAN adjoining to it.

INFRASTRUCTURE & SERVICES

Infrastructure Ratings



PROPOSAL :

Citizen and community involvement :

Engage residents, neighbors, civic leaders, politicians, bureaucrats, developers, and local institutions throughout the process of designing change for neighbourhoods. Organised workshops, from which we can gain information and insights into the long standing problems of the area, and another from which we can find out alternative design concepts, included large scale models and three-dimensional drawings.

Diversity

Provide a broad range of housing types and price levels to bring people of diverse ages, races, and incomes into daily interaction — strengthening the personal and civic bonds essential to an authentic community.

Infill development :

Reclaim and repair blighted and abandoned areas within existing neighborhoods. By using infill development strategically to conserve economic investment and Social fabric.

Mixed-use :

Promote the creation of mixed use neighborhoods that support the functions of daily life: employment, recreation, retail, and civic and educational institutions.

Streets :

The primary task of all urban architecture and landscape design is the physical definition of streets and public spaces as places of shared use. Neighborhoods should have an interconnected network of streets and public open space.

Public open space :

The interconnected network of streets and public open space should provide opportunities for recreation and appropriate settings for civic buildings.

Safety and civic engagement :

The relationship of buildings and streets should enable neighbours to create a safe and stable neighborhood by providing “eyes on the street” and should encourage interaction and community identity. Provide a clear definition of public and private realm through block and street design that responds to local traditions.

POLICIES AND STRATEGIES
LAND USE :

- ◆ Enforcement of strict regulations to discourage dominance of any particular single land use / building use , such owners will be levied with heavier taxes :- to reduce polarity and other related problems like traffic congestion , parking problems , increasing pressure on existing infrastructure , etc.
- ◆ Incentives for mix use planning in identified areas in terms of FSI , fees or funding.
- ◆ Amalgamation of small , narrow and decaying building ,plots only for planning cluster development. Incentives will be given to owners/developers for such an initiative in the form of lower taxes , higher FSI or other funds.
- ◆ Makes provision for open spaces , wider roads , better infrastructure etc.

DENSITY

- ◆ Heavier taxes on low density area residents to encourage cluster planning.
- ◆ Tax benefits on land and property will be given for residents in high density areas to discourage migration into sprawl areas.

FSI

- ◆ Incentives in the form of more FSI in selected areas will be given for promoting cluster planning instead of plotted development.

- ◆ Provision of higher FSI along with higher building heights in the identified growth areas . Enforcement of strict regulations to ensure careful spatial planning of land use in the growing areas.

IV. INFRASTRUCTURE IMPROVEMENT

- ◆ Infrastructure improvement will play a key role in holding high densities and built a sustainable urban development.
- ◆ Participation of the people in the planning process should be ensured as sensitivity to social and economic needs of the people is essential in the process of making a sustainable neighborhood.

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