Assessing Location Preferences for Housing in Bhopal City

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Abstract— **Housing attributes at building level have been suggested in literature and also used as variables in different statistical housing demand models. Location choice also plays an important role in housing demand. Significance of location in housing choice has been highlighted in literature. Aspirations of housing attributes as well as location are different for different households. Study of location preferences might be useful to develop a housing development strategy for a city. During last four decades, the housing attributes has been widely used to estimate the housing demand. Location preference itself has its own importance. Proximity to physical and social infrastructure, work place, recreational area etc. influences location choice for housing demand. The objective of the study is to categorize Bhopal city into unit cell with potential of housing development. It identifies different location factors from literature. Considering proximity as measuring tool of factors' influences Bhopal city has been categorized to five categories of importance grid. The foremost contribution of the study is to support city development plans for allocation of residential development.**

Keywords— Housing; Location; Neighbourhood;Proximity; Category

I. INTRODUCTION

The population of the country was 1.21 billion in 2011 as per census of India which includes 31.1% urban population. Urban population is increasing rapidly in India. It has increased from 290 million to 377 million and parallel cities and towns has increased from 5,161 to 7,935 during 2001 to 2011 [1]. These growing populations in urban area have generated land dearth and housing shortage [2]. Housing deficiency has reached to 18.78 million units in India [3]. Housing gap has been identified with the figure of housing stock stood at 78.48 million for 78.86 million urban households in urban India. These issues extenuated the housing problem, causing a housing shortage of 51 million in 2011 [4]. According to the Planning Commission, urban India is going to be home to 600 million people by 2031; an increase of 59% from 2011 [5]. Issues of housing in India are synonymous with ignorance of housing in active government involvement at the policy and program formulation levels. They are also due to the problems that unplanned urbanization, income disparity, poverty, illiteracy, and unemployment brought.

Accurate prediction of future demand for residences is challenging as the demand is governed by a number of social and economic factors [6]. Owning house considers spending a large proportion of income as well as location, choices of neighborhood, and environmental characteristics affecting the household's living conditions and quality of life [7]. High property values effectively price out the less prosperous families from access to quality housing colony and neighborhoods [8]. There are many factors which are responsible for the housing demand.

Housing demand studies have been changing from neo-classic economical approaches to behavioural approaches in the historical process [9]. Location preference was included in scope of the study since 1979. It also covered household size, density and some social-economical characteristics. Rosen and Magbolugbe [10] [11] adopted the hedonic model locational environment and socio-economic characteristics. National housing bank of India has developed 'Residex' which is the housing price index. Index also assess change in house price of a city in different zones or location. Developing countries are scrupulously working for housing scarcity. A housing demand model attempts to estimate the demand for housing units, with specified attributes, by households in Mumbai. The model is expected to be used by housing developers, engaged in construction of a wide range of products, to assess the attitude, willingness and the ability to pay of the potential buyers for their products. Models mathematically express the demand of a housing unit function with explanatory variables affordability, tastes and preferences [12]. The housing demand models estimates the number and type of housing while house price index measure the change in house price. The research and study is being made to fill housing gap. The housing gap figure is increasing day by day with the truth of large number of vacant unoccupied houses. This is due to improper delivery of houses. The mismatch in the demand preference and supply quality is responsible for the fact.

II. STUDY OBJECIVE AND METHODOLOGY

With approximately two-thirds of the country's population living in rural areas, India is urbanizing, albeit with reluctance, as evidenced by policies toward urban areas [4]. According to the Ministry of Housing and Urban Poverty Alleviation (MHUPA) in 2012 there were 18.78 million units housing units short in urban India. India's urbanization lies in the fact that it has barely paid attention to urban transformation so far. Urbanization has taken place in a largely unplanned fashion. Life in metropolitan cities means wading through congested roads and heavy traffic, suffering from pollution and compromising on living standards. Studies conducted so far on urbanization in India reveal alarming facts; evidences which exemplify the truth that India must now wake up and take measured steps towards sustainable urban development

[5]. One of the biggest pitfalls of India's unplanned urbanization is the under-supply of housing units. The irony of Indian economic growth establishes itself in several ways. Urban India is suffering from housing shortage; but it is also true that there is a huge and speedily growing stock of vacant houses [13]. Housing shortage is not a big issue if collation between the people for whom the houses are being built and those who need them, is tried to be made.

Housing is the subject area of the study which seeks to discuss the location consideration required during supply of housing. It is assumed that living environment is made up of a collection of location features. People have different preferences for these features to which they ascribe larger value; simply, people have preferences [14]. Therefore location choice for a house is one of the important factors for housing demand and selection. The objective of the study is "to assess importance of location for different neighborhood attributes for the case of Bhopal".

After understanding the significance of location, present study explores the preferred location features (Neighborhood Attributes) from literature. Benefit of neighborhood attributes has its' is range of proximity. URDPFI guidelines as well as Bhopal Development Plan suggest the access distance of neighborhood attributes. Based on defined proximity of neighborhood attributes, Bhopal city has been categorized into five importance of 'Least', 'Less', 'Moderate', 'High' and 'Extreme'. Thus study identifies neighborhood attributes from literature and with the measure of their respective access, it find location importance of each neighborhood attributes for the case of Bhopal.

III. LITERATURE PERSPECTIVE TOWARD LOCATION CHOICE FOR HOUSING

People's preferences of housing demands are intended to show diversity with the variation of life prosperity and individual value judgments. The perceptions of living environment are important factors for the determination and diversity of housing demand. Fact and figures of housing shortage support for housing research. Literature from last four decades presents enormous research scope in this direction. Importance of location for housing is associated with nearness to workplace and facilities. A detail literature review has been performed to find neighborhood attributes responsible for location importance.

Kain & Quigley suggests median schooling, block face, miles from CBD, nearby crime rate, school quality as location importance and other housing attributes factors. Other classifications of preferred attributes were dwelling quality, neighborhood characteristics, structure type and tenancy terms [15]. Trost states that housing is a heterogeneous good with a bundle of several commodities such as location, size of house, type of structure, neighbors and other humanities [16]. Arnott and others in a research report discusses demand and supply side factors. It states that alike households select location, housing quality and quantity, and other goods [17]. Amerigo & Aragones in their study presented the relations between people and their living environment [18]. Gabriel & Rosenthal studied the influences of demographic characteristics on profits in relation to location [19].

Arifin & Dale details the determination of the main factors that impressed the perception of housing needs [20]. Montgomery & Curtis also presents critical factors in three class of household, housing and location characteristics [21]. Jim and Chen counts exposure to traffic noise, distance to the town centre, proximity to green, proximity to water bodies as housing demand variables [22]. Onsekiz worked for the case of industrial city Kayser. Area preferences for housing of industrial employees were explored. Physical and infrastructure characteristics, security, transportation, environment, culture, health, sports, infrastructure were considered as determinants of housing of industrial employees [9]. Ionnides worked on neighborhood effects more generally social interactions, via their location decisions for number of approaches that economists have used in studying neighborhood effects in housing markets [23]. He and others in a study lists number of bus lines, distance between many pairs like trading with the downtown area, central business district, nearest hospital, nearest park, nearest road, railway station, nearest school. It also considers the existence of facilities near the trading housing, park near as demand variables. Housing demand factors are different for different age groups [24]. Bertrand and others classifies housing demand variables for young households, middle-age households and retirees. It recommends that young households are massively attracted by the urban pole of the area for several reasons: proximity to employment centre, urban amenities and public services, middle-aged households prefer periurban and rural zones, but in proximity of urban centers. Proximity to employment, urban services (education and social and health facilities) and natural amenities are also considered by middle-aged. Location is the most priority element for retirees [25]. Bayer and others have worked on the dynamic model of houses demand and neighborhoods [26].

Boumeester present housing preference in four classes of dwelling feature, environmental features, demographic features and socio-economic feature [14]. Tan finds different buyers have different perception towards housing attributes. It evaluates the first time buyers' housing needs and preferences in greater Kuala Lumpur. Five location housing attributes were considered in this study: distance to the workplace, schools, place of commerce, recreational facilities and public transportation centers. Neighborhood attributes considered in the study were the neighborhood crime rate, neighborhood pollution level, cleanliness and gated neighborhood [27]. Jun finds buying or renting a house involves not only spending a large proportion of family income, but also choices of neighborhood, location, and environmental characteristics affecting the household's living conditions and quality of life [7]. SGS understands the property and economic drivers of housing with demand and supply side factors. Employment growth, amenity, urban environments, knowledge communities, cultural and educational opportunity affect demand for housing [28]. A very recent study of Contreras and others explores risk and house price of emerging market. Proximity of the transaction, index representing the risk of invasions and expropriations, measured as the number of these incidents occurring in a certain municipality divided by the number of transactions in that municipality [29]. Location and

neighborhood are included to capture all the factors that may significantly affect the amount of the asset.

Literature review of last four decade finds that earlier studies intended to find the housing gap. These studies facilitated to find the quantum of housing gap and projected the housing demand. Late 1980's focus of these studies moved towards economical aspect of housing which discuss about the housing financing mechanism and willingness to pay for housing. Large numbers of studies have been made which suggest location as the preferable concern during housing selection and intend to find relative factors of location. Beside location, housing attributes were also discussed for dwelling quality, size, neighborhood characteristic, structure type, tenancy terms, housing physical characteristics, internal infrastructure, external infrastructure characteristics, security, transportation services, local environment, culture, health facility, sports facility, housing price, financing opportunity etc.. There are some attributes which are expected in a house as a building and some are location attributes which are expected in its neighborhood. Thus housing attributes might be classified into building attributes and neighborhood attributes. From literature review ten neighborhood attributes has been identified which have its spatial influence in its proximity. These attributes were coded for further processing. Preferable proximity for each neighborhood attributes were taken from URDPFI Guideline 2015 and Bhopal Development Plan 2005. Bhopal Development Plan 2005, Page 108-109, Table 4-T-14 gives access standard for public facilities. It recommends maximum distance for neighborhood amenities and facilities. The minimum distance suggested was 0.30 km for crache, nursery school, tot lot and neighborhood park while 1.50 km was the maximum distance suggested for higher school. Thus the range of distance for preferable amenities and facilities were from 0.30 km to 1.50 as per Bhopal Development plan. URDPFI Guidelines 2015 suggests 400m for lower order while 800m for higher order amenities and facilities. Based on these two guidelines applicable for Bhopal city, proximity for identified 10 neighborhood attributes were defined and prepared for further processing in GIS.

TABLE I. NEIGHBOURHOOD ATTRIBUTES FOR LOCATION PREFERENCES

Neighbourhood Attributes	Attribute Code	Preferred Proximity (meter)
Distance to Central Business District	NA_Pr_01	1500 m
Distance to Workplace	NA_Pr_02	1500 m
Distance to Market	NA_Pr_03	1000 m
Distance to Public Bus Stops	NA_Pr_04	500 m
Distance to Hospital	NA_Pr_05	1500 m
Distance to Police Station	NA_Pr_06	1500 m
Distance to Bus Stands	NA_Pr_07	1500 m
Distance to Education Centers	NA_Pr_08	1000 m
Distance to Railway Station	NA_Pr_09	1500 m
Distance to Recreation	NA_Pr_10	1000 m

Source: Prepared by author from literature

IV. SPATIAL ASSESSMENT FOR LOCATION PREFERENCES

To assess and present location preference, Bhopal city base map has been prepared in GIS platform. To prepare GIS map shape files of major roads, railway line, water bodies, planning area boundary, Bhopal municipal boundary, zone

boundary and ward boundary was collected from directorate of Town and Country Planning and Bhopal Municipal Corporation. Planning boundary regulates the growth of the city. The activities within planning area are regulated by proposed landuse map of planning area. Thus following the regulatory provision a base grid has been prepared having size of 400mX400m considering the permissible area for neighbourhood development. Spatial analysis has been made in GIS software ArcMap 10.1. Initially satellite images of Bhopal have been collected from Google Earth at 500m elevation for data rectification. These images have been geo-referenced with following attributes (Table 2).

TABLE II. GIS BASED MAPPING FEATURES

Projected Coordinate System	WGS_1984_UTM_Zone_43N
Projection	Transverse_Mercator
Geographic Coordinate System	GCS_WGS_1984
Datum	D_WGS_1984
Prime Meridian	Greenwich
Angular Unit	Degree

With above specification mapping exercise was performed in GIS platform.
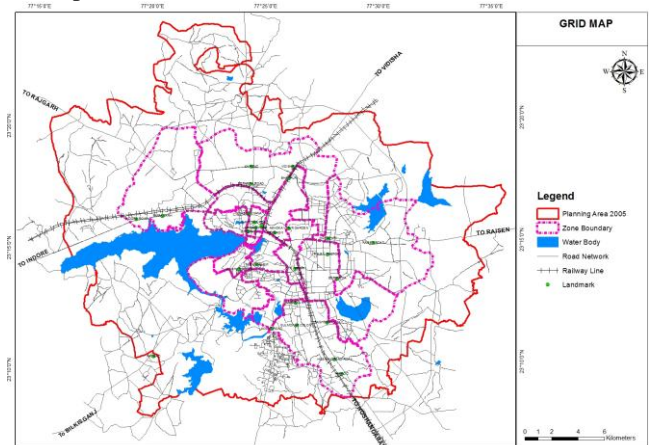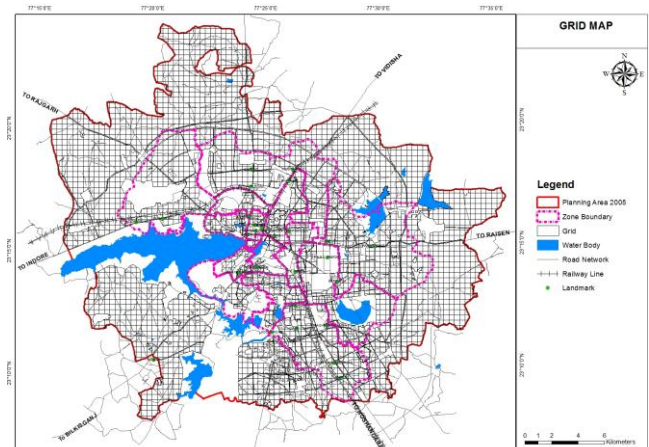

Fig. 1. Base Map Bhopal

Fig. 2. Grid Cell (400m X 400m) Map

V. GIS PROCESSING AND ITS PRESENTATION

After preparation of Bhopal city base map, thematic maps of Central Business District, Workplace, Market Area, Public Bus Stop, Hospitals, Police Station, Bus Stands, Educational Centers, Railway Stations and Recreational Area has been prepared. Point shape file of each neighbourhood attributes were prepared at city scale of 1:1,50,000. Using 'near'

command within proximity tool of GIS, distance of each grid cell from its near point of each mneighbourhood was calculated. Thus after processing near command ten times for ten neighbourood variables, ten new columns were added in attribute table of grid shape file. The new distance columns give distance of each grid cell in meter to the nearest point of the respective neighbourhood attribute. These distance column of neighbourhood attributes were categorized for its preferred proximity (Table 1). Proximity for public bus stops was less than 500m while for market place, education center, recreational area was less than 1000m. Preferred proximity for other seven attributes was taken less than 1500m. Taking preferred proximity distance of each neighbourhood attribute as class size, distance column was classified into equal class of maximum number of possible classes. Each class was ranked for inversely with increase in distance class. Therefore lower rank was given to maximum distance class while maximum rank was given to the lowest distance class. For the case of public bus stop, maximum distance of any grid was 7600m from its nearest bus stop. Thus the distance column of bus stop was classified into 15 classes of '0 to less than 500m', '500m to less than 1000m', '1000m to less than 1500m', '1500m to less than 2000m', '2000m to less than 2500m', '2500m to less than 3000m', '3000m to less than 3500m', '3500m to less than 4000m', '4000m to less than 4500m', '4500m to less than 5000m', '5000m to less than 5500m', '5500m to less than 6000m', '6000m to less than 6500m', '6500m to less than 7000m', '7000m to less than 7500', and 'more than 7500m'. Each class size for public bus stop was 500m. '0 to less than 500m' was given weight of 16 and in ascending order of class weight was given inversely to each class. Therefore the weight of class 'more than 7500m' was '1'. Based on this weight value for preferred proximity of each neighbourhood attributes GRID importance map was generated. Thus 10 grid importance maps were generated for 10 neighbourhood attributes (Figure 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12).

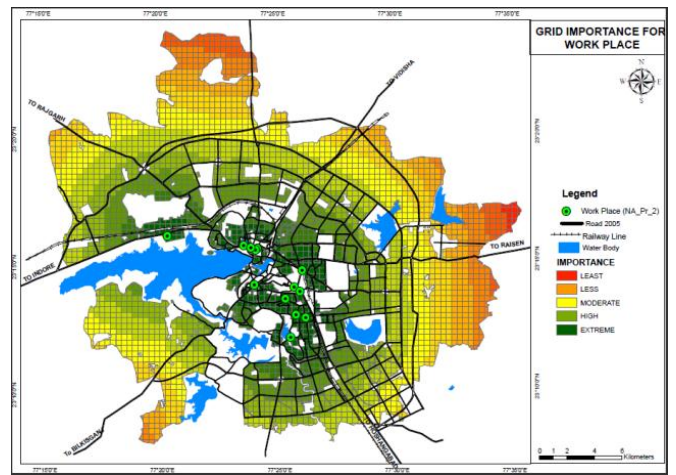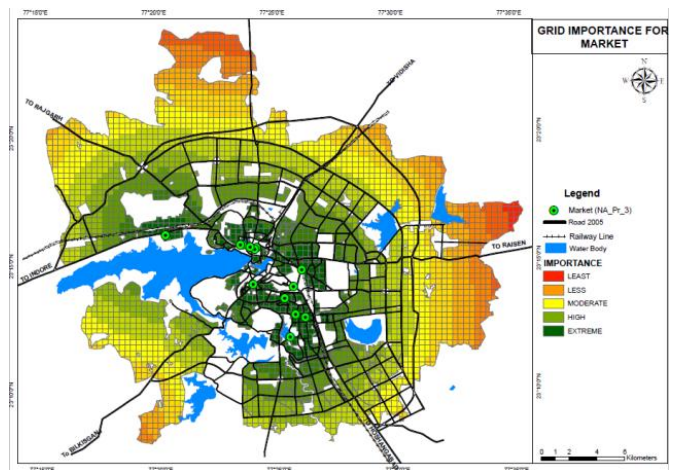Fig. 3.   Grid Importance for CBD
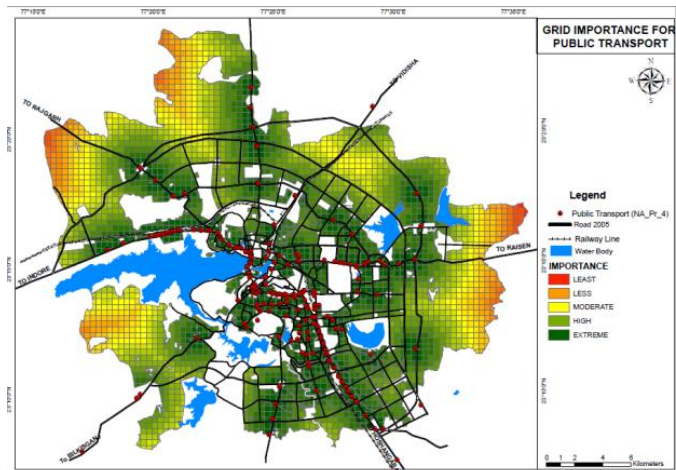

Fig. 4.   Grid Importance for Workplace

Fig. 5.   Grid importance for Market

Fig. 6.   Grid importance for Public Bus Stops

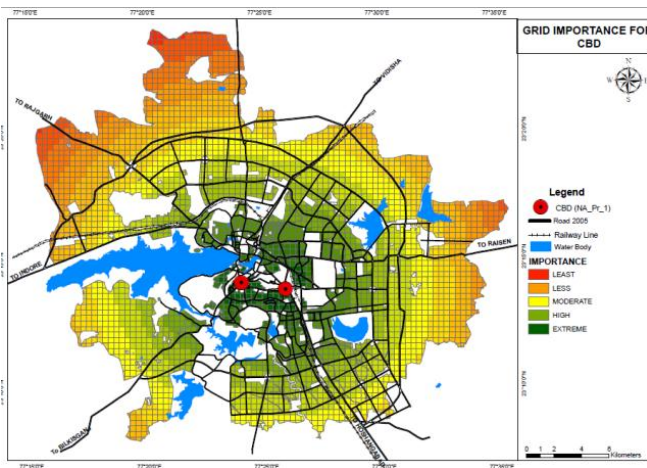IJERTV5IS080104

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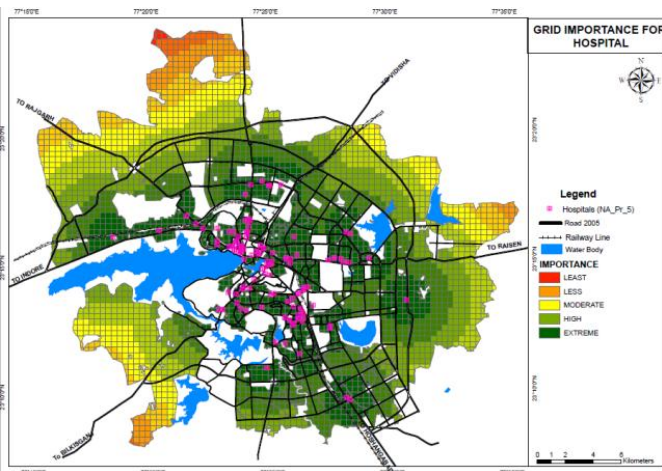
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Fig. 7.   Grid importance for Hospital
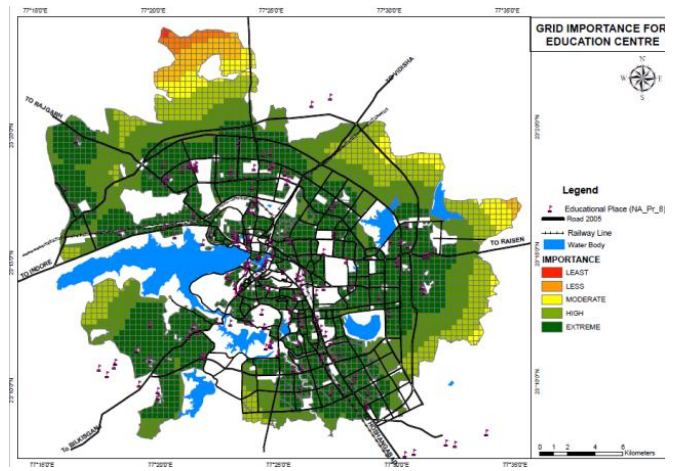

Fig. 10.   Grid importance for Education Centre
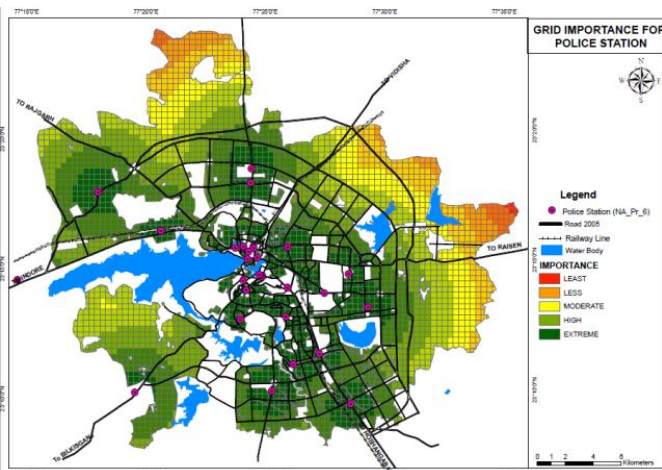

Fig. 8.   Grid Importance for Police Station
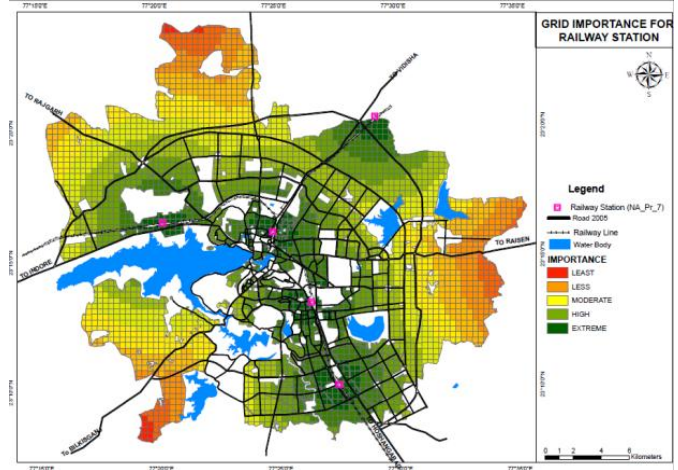

Fig. 11.   Grid importance for Railway Station
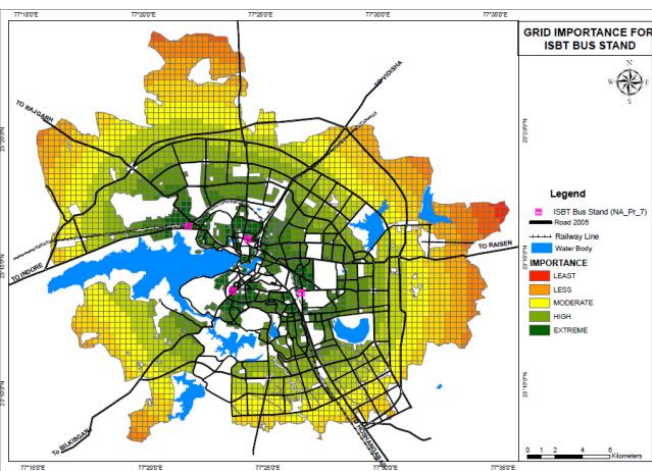

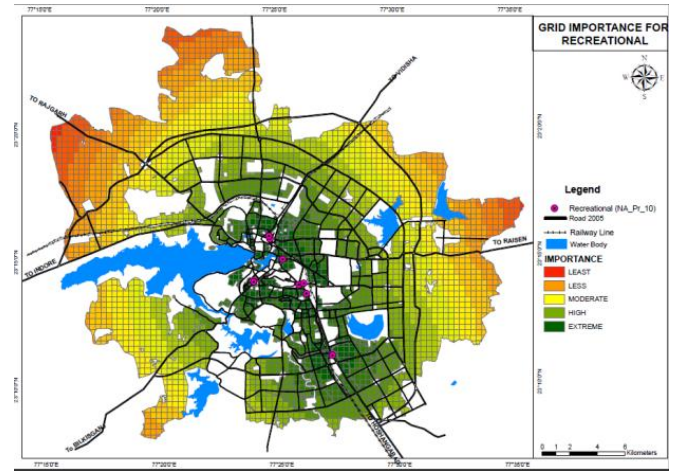Fig. 9.   Grid importance for Bus Stands

Fig. 12.   Grid importance for Recreational Area

VI.   RESULTS AND DISCUSSION

It is clear from the above maps that the weights for location preferred in terms of different neighborhoods attributes are different. Based on attributes at neighborhood level, ten maps could be prepared. Each map presents its own grid cell importance. No doubt for any facility or amenity (neighborhood attribute) if the quantum and quality is good, the nearby location would be preferred. Within scope and limitations of the study ten neighborhood attributes could be identified from the literature. Literature suggests many other housing attributes preferred at building unit level and city level. These attributes were not considered in present study as these were not included within the scope of the study. Only those neighborhood attributes were selected from the literature which might be measured with the proximity preferred.

As discussed in last section Bhopal Development Plan was taken and a grid map covering existing residential, proposed residential, and agriculture use was developed. The grid size was taken 1600sqm (400m X 400m) which is the acceptable size for neighborhood development within maximum permissible density. With the help of preferred proximity suggested by Bhopal Development Plan and URDPFI 2015, Grid importance map for each neighborhood attributes could be prepared. The resulted grid importance map has been presented in colour stretch code from green to red. Darkest green of grid cell in any map suggest most preferable gird for the respective neighborhood attributes while opposite to this darkest red suggests least preferred grid cell. Orange, yellow and parrot green lies in midway which suggests least to most preferred grid cell respectively. The five colour codes have been marked for its importance of least, less, moderate, high and extreme.

Maximum preferred grid cell location is there in 'education centers'. This is due to large number of education center in Bhopal. These are also spread to suburban areas also. Thus more number of education centers as well as spatial sprawl of these education centers presented Bhopal as an education hub for its region. In last decade many national importance higher secondary school like DPS, Shanskar Valley etc. and colleges like SPA Bhopal, NIFT, IISER etc. came in suburban areas. These work as magnet which attracts people towards itself. Public bus stop importance gird has second highest importance cell. Bhopal city is well known for its different mode of public transport in roadways. City offers from 15 sitter magic to 55 sitter BRTS to its public. Large number of mode of transport, routine frequency, bus stops at regular interval gives strength to public transport system in Bhopal. BRTS brought revolution in this. It connects suburban area to city center. New Market area and MP Nagar area are two place having city level importance. Thus both of these two were considered as CBD area for Bhopal. These areas are mostly preferred but due to preferred proximity for convenient shopping area in 1500m it has minimum importance gird within planning area. It similar was all other importance gird file might be critically analyzed.

VII.   CONCLUSION

Housing demand at national and state level is discussed for the quantity of house needed to accommodate all Household independently. When survey was made to find number of existing house, data suggests that there are household living in semi kaccha, kaccha or even doesn't have house. Parallel a figure of vacant new constructed houses also came. This figure of vacant house is in government as well as private housing. Resent housing schemes IHSDP constructed more than 60 housing projects but only 5% of this could be accommodated successfully. Other 95% projects were avoided by beneficiaries. The case of private vacant housing is little different. The constructed private housing doesn't have market demand. There are many reasons behind this scenario. The private housing is sold in open market. There are many buyers available in open market looking for housing. Due to mismatch in the demand of housing which is a bundle of attributes of shelter facility & luxury and the supply of housing with attributes specification we have figure of surplus in housing. There is an urgent need to balance this mismatch scenario of housing market.

The study explores housing attributes from literature. It finds house as a building unit, has many attributes which are preferred by buyers. There attributes might be qualitative and quantitative. Besides building level attributes of building specification, location of a house is very important. At higher scale of location, people select city to have a new house within that. Most of these are young age group who are carries seeker for its academic and professional development. Few research also find senior citizen who looks for a city wee he can spend his rest of life after retirement from job with peace. At lower scale location preference for a house is very significant. A location has its social, economic, environmental, security etc. importance. House buyers wish to get benefit of these. Different people have different perception to get benefit of these facilities and amenities. It also depends on the HH characteristics and their affordability. Past urban study classifies facilities into higher to lower order as per its range and threshold. Rang is the proximity of a facility to which its benefit could be provided and threshold is the number of people to which facility is capable to benefit. Range of neighborhood facilities has been suggested in Bhopal Development Plan as well as recently republished URDPFI Guidelines 2015. Based on these two guidelines, Bhopal city could be presented for its location importance for ten identified neighborhood. The resulted spatial presentation of importance would help housing buyers for selection of location.

The study is completely based on secondary data source and regulatory provision. It assesses spatial importance of selected ten neighborhood attributes. Study might be improved with addition of new neighborhood attributes. Number and type of neighborhood attributes might very city to city. Therefore selection and addition of neighborhood attributes might be validated from local experts before processing. The importance grid might be further improved with the addition of public preference weight. Composite weight might be calculated for each attributes and an integrated map might be developed which present the combined weight of attribute for a grid. The result would be useful for housing buyers, sellers, policy makers, urban planners, development authority and other stakeholders who are engaged in housing sectors. There are tremendous opportunities of research in this direction.

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