



Land Use Suitability Analysis for Zone K-1 (Urban Extension), New Delhi

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ABSTRACT: The purpose of this paper is to study urban extension area of Delhi national capital territory (NCT) which is proposed to develop as sub city of NCT by Delhi development authority to absorb future growth in population. An attempt has been made in this paper to suggest land suitability analysis strategies for urban extension area of Zone K-1 in West Delhi assimilating the new Land assembly policy and Master Plan of Delhi, 2021. The study area is reclassified into manageable sectors depending upon the level of development and size of population. A multi criteria decision making analysis (MCDA) approach is carried out for the ranking purpose of land parcels within the zone which helps in the preparation of probable land use allocation plan for pilot area within study area. The major findings of the study suggest that there was a strong correlated relationship between the ranking scores and level of urban development. Subsequently the land suitability analysis map is prepared for finalizing the land use to be allocation to different sub-sectors within the large sector. The paper presents an original research of the study area through various surveys conducted by the author, and an operation research method is used to do ranking of sub sectors to formulate land use plan.

Keywords: Peri Urban Area; Sub City; Urban Area; Multi criteria decision making; Land acquisition Policy; National capital region; master plan

I. INTRODUCTION

In the last four decades national capital territory of Delhi has developed into a massive and vibrant urban area. Due to unprecedented in-migration the surrounding peri-urban area around Delhi had witness tremendous growth in population which resulted in unplanned and haphazard growth. Consequently large areas have grown outside the framework of the master plan. This resulted in shortage of housing for majority of population and around fifty per cent of the population of Delhi is forced to live in slums, unplanned urban villages and other unplanned areas. To regulate this chaotic growth the Master plan has provisions to formulate urban extension areas which can be developed as sub-city to the parent city. Moreover urban expansion in the two previous plans, which was based on large scale acquisition policy and disposal of land by DDA failed to provide affordable housing to the ever increasing population due to which large number of unauthorized colonies and J.J. clusters have come up. The substantial time gap between acquisition, development and disposal of land resulted in encroachment of these supposedly new urban extension areas.

To meet the future demand of housing, five mega sub-cities (urban extensions) have been proposed in MPD 2021 and Zone K-1 is one of them, located in west Delhi. As the name suggest this paper provides the strategies and guidelines for the development of this zone in consensus with MPD 2021 and newly proposed land acquisition and assembly policy for NCT Delhi. But these planning interventions fall behind the actual need of the hour and due to the time lag in formalization of zonal plans for these urban extension there was need felt, to do prepare a land suitability analysis map for assisting land use planning for the zone to incorporate already built up area and the people living in the area in the mainstream planning process. The zone K-1 was chosen as the study area and the purpose of this paper aims to prepare land suitability analysis for Zone K-1, West Delhi-II and to come up with land use plan for study area incorporating Master Plan of Delhi 2021 and new land use land acquisition Policy. The result of land suitability analysis can help in making decisions for allocation of proper and justified land use map at zonal level which in turn facilitate preparation of sector development plans. It may also help in choosing the best possible location for particular land use.

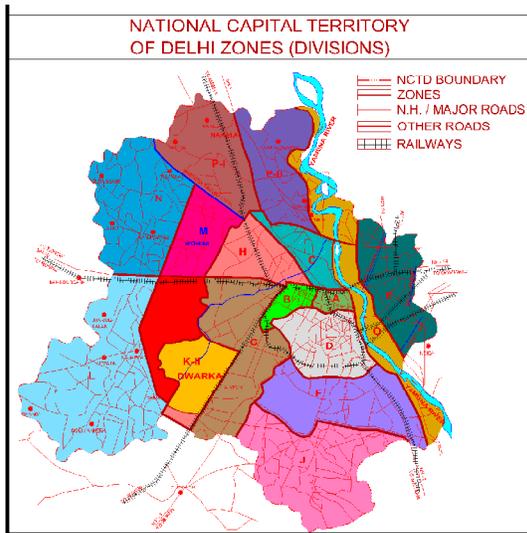


Fig. 1. Planning Zones of NCT.
(Source: DDA Dwarka Project office)

II. BRIEF ABOUT STUDY AREA

A. Jurisdiction and Planning Zones of Delhi Development Authority (DDA)

The whole area of NCT of Delhi which is 1483 Sq. Km. in area comes under the jurisdiction of DDA having population of over 16.75 million (Census 2011) and around 22 million in CNCR . For planning purposes Delhi had been divided into 15 Planning Zones by DDA. Out of these zones, 8 zones are Urban, 6 Zones are rural and one Zone is under flood bed of River Yamuna. The red zone in the map (Fig.1) denotes the Location of Zone K-1 (West Delhi II). It is located in the south west of New Delhi

Zone K (west of Delhi airport and Cantonment) is divided into two parts namely K-I and K-II. Zone K-I is located on the Western side of the Zone K-II which is Dwarka. It is accessible from Najafgarh road and a small bridge from Dwarka. The zone demarked in red colour is Zone K-1.

This zone has many villages, unauthorized colonies and settlements having a population of over 0.4 million according to 2001 census and nearly 1.0 million lakhs today. According to the master plan the area is designated for predominantly residential facility and facility corridors.

With decrease in habitable area in Delhi NCT, development of Dwarka as a Sub-city and expansion of IGI airport and had tremendous effect on the surrounding areas, especially at immediate periphery of zone K-1 and along the corridors connecting it with Najafgarh and airport. The consequence of this will be an extensive variety of impacts over the area of influence, ranging from negative to positive aspects.

This has started to trigger commercial and institutional activity on an unprecedented scale thereby changing the land use.

Introduction of a Metro Corridor to Najafgarh and MRT transport corridor in the zone has automatically resulted in increased demand for commercial and residential properties along the transportation linkages, thereby boosting the land values and triggering off real-estate activity. It would therefore be relevant to look for ways of appropriate land use and planning to exploit the increased property demand over such a large area.

III. METHODOLOGY FOR GENERATION OF LAND USE SUITABILITY PLAN

MCDA for the study area along with Delhi master plan 2021, new land acquisition policy is used to create land use suitability analysis map. The methodology used to create land use suitability map is presented in fig.2. Multiple-criteria decision-making MCDM or MCDA is a sub-discipline of operations research that explicitly evaluates multiple conflicting criteria in decision making. Joerin, F. *et al* (2001) gave emphasis on MCAD approach for comparing the set of identified alternatives. Mokarram, M. and Aminzadeh, F (2010) have used GIS-based multi-criteria land suitability evaluation approach for effectively solving this problem. Ali Reza AFSHARI, et al. (2016) has concluded that MCDM approaches and techniques are appropriate for the urban planning problems such as urban land use planning urban site selection.

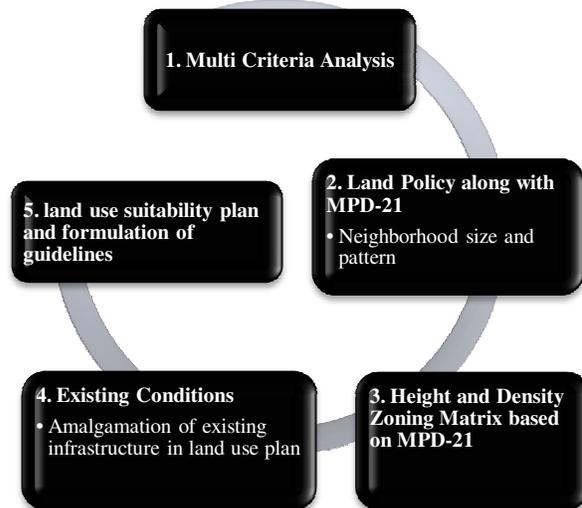


Fig. 2. Methodology Chart.

Further as per policies in MPD 2021, the zonal plans shall detail out the policies of the Master Plan and act as link between the Layout plan and Master Plan.

The effective use of new land acquisition policy can only be done if proper prior work related to zonal plan is done otherwise it again lead to hap hazard development with respect to zonal level.

Key parameters or attribute taken in this study for discrete multi criteria analysis are Accessibility, Land use, Land value, Density, Noise and Height restriction. Factors such as land use/cover, accessibility, economic are highlighted in URDFFI guidelines for land suitability analysis. The preferability scale of 1 to 5 was taken to access each parameter in which 1 means least preferable and 5 being the most favourable.

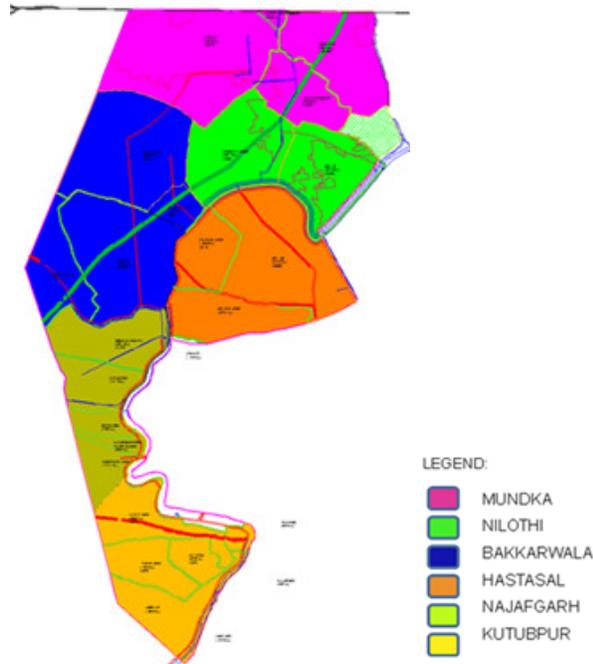


Fig. 3. Delineation of sub zones (Source: author)

Delineation of sub zones (Fig. 3) is done according to the percentage of built up area and the boundary of sub zone coincides with the revenue boundary of villages.

IV. SPATIAL ANALYSIS OF STUDY AREA

A. Multi-criteria Decision Analysis:

For MCDA, Firstly we get a Spatial Assessment of the Impacts caused by individual Parameters (Fig.1-9), then by further assigning weights to various parameters we get the sector ranking map (Fig.10) and final Probable land use map (Fig.11), Which would also provide a broad base for future land use proposals. Here density, height restriction and noise level are treated as negative variables.

281 Sectorial cells have been analysed and the sum total of attributes of each cell has been calculated and categorised based on the mean and standard deviation.

Resultant value of each cell (0.5x0.5km) = (Attribute1 value X Sub attribute x value) + (Attribute2 value X Sub attribute x value) + ___ + (Attribute n value X Sub attribute x value).

Table.1 gives the result of the MCDA applied for study area.

Table 1: category wise distribution of cells.

Cate-gory	Range	Preferable land use	Colour coding
1.	< 1.864	No development	Red
2.	1.864 to 12.056	Commercial development	Yellow
3.	12.056 to 22.255	Mixed land use	Green
4.	> 22.255	Residential land use	Blue

The four categories based on the cumulative scores includes category 1 where further development is not possible as some of areas are already developed or is coming under reserve area. Category 2 is suitable for commercial use due to highly built up areas and high land value due to higher accessibility. Category 3 has cumulative attribute value range between 12.05 and 22.25 is area medium density but it still have some vacant space for development which is suitable for mixed land use development. Category 4 is suitable for new residential development as these areas are mainly devoid of built-up spaces and have least density.

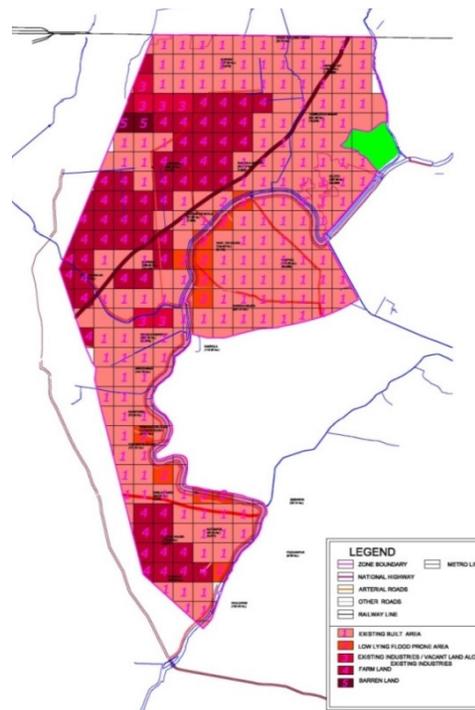


Fig. 4. Existing Land Use map (sector wise).

B. Delhi Master Plan 2021 and land acquisition policy

The master plan roads proposed for the zone are taken into account and mixed land use allocation was given preference in final land use zoning map. New land acquisition policy and its implication is also considered while preparing land use plan and it can help in planned and monitored development.

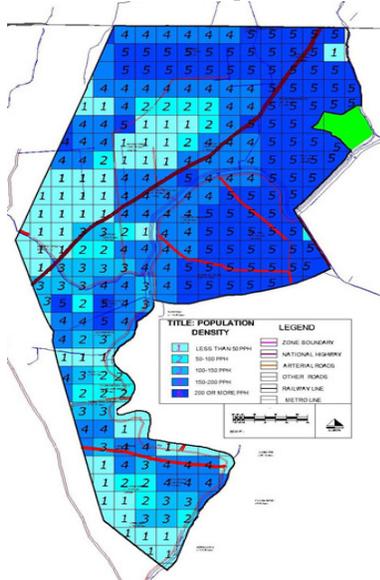


Fig. 5. Population Density Map.

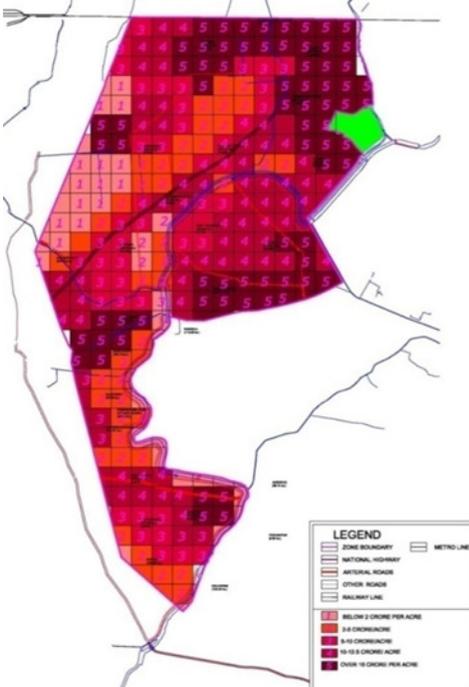


Fig. 7. Land Price Ranking Map.

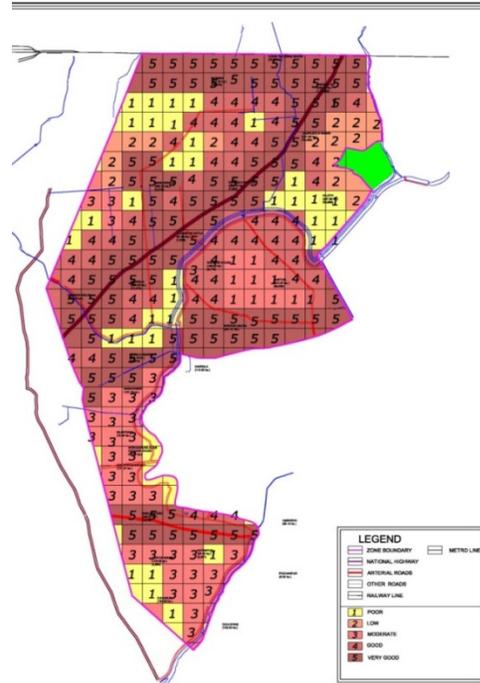


Fig. 6. Accessibility map.

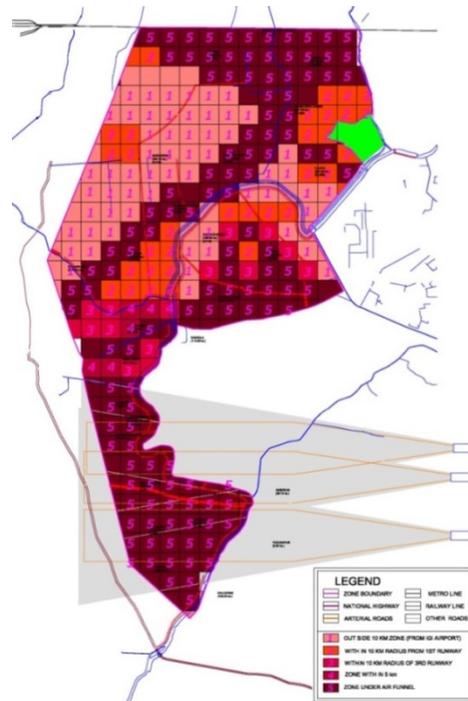


Fig. 8. Height Restriction Map.

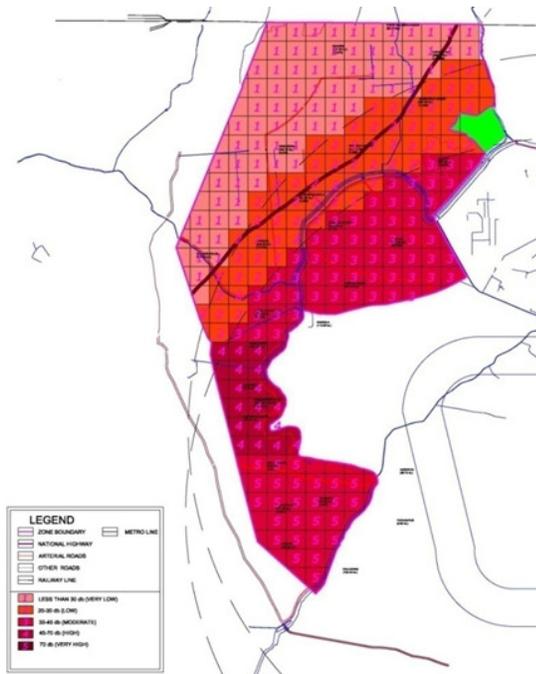


Fig. 9. Noise Pollution level Map due to airport.

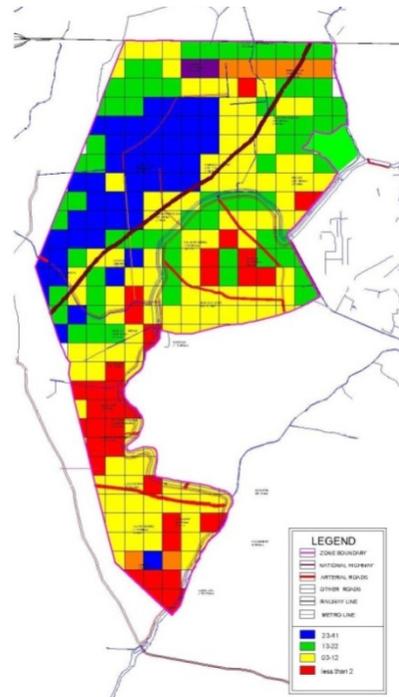


Fig. 10. Sector ranking map obtained by combining six maps.

V. DENSITY AND HEIGHT ZONING MATRIX

Methodology behind density and height zoning suitability table

This matrix gives the tentative results regarding built-up area and density level that we want to achieve in sub zones as per following constrains taken up.

Constraints: (1) maximum density to be achieved i.e.250 PPH. (2) Maximum area allocated for residential land use i.e. 54%.

Suitability if function of availability of land, existing density, existing building and road foot print, After multi-criteria analysis of study area is done it is further estimated which area is suitable for residential, commercial industrial activity, after that the more suitable option is taken into account

Table 2: Density and Height Zoning suitability table for zone K-1.

Density level	Gross Residential Density (PPH)	Accepted for Mundka	Accepted for Kutubpur	Accepted for Bakkarwala	Accepted for Nilothi	Accepted for Najafgarh	Accepted for Hastasal
Low rise low density	105		Suitable #				
	120						
	135	Suitable #			Suitable #		Suitable #
Low rise high density	150						
	165				Suitable	Suitable *	
	180			Suitable#		Suitable #	
Mid-rise low density	525		Suitable *	Suitable *			Suitable *
	630						
Mid-rise high density	735	Suitable *			Suitable *		
	840						

* For non-urbanised part, # for urbanised part (Source: author)

Constraints: objectives related to density and height zoning we want to achieve. Little deviation is possible subjected to the overall planning concept for the sub Zone of Zone or at city level.

For non-urbanised part:

The population density of mundka have already reached the half of the prescribed limit in MPD-21 and covers most of its sub zone area, so more emphasis is given in mid-rise high density development and same is for Nilothi. Bakkarwala is mostly rural and have potential for mid-rise low density and can easily achieve 250 PPH. Kutubpur is located in air funnel zone so most probable is low rise low density, while Nazafgarh is assigned low rise high density (Table 2).

For already urbanised part:

Low rise low density model is preferred except Nilothi and Mundka and Hastasal. The decisions for development densities are summarized in table No. 2

VI. PROPOSALS

Proposals for the development of Zone-K-1 are as under:

Zone K-1 may be developed rationally by increasing the regional accessibility and connectivity to the proposed sub-city, concentrating on mixed land use development along facility corridor, emphasis on neighborhood units, proper enforcement of Master Plan, timely preparation and enforcement of Zonal Development Plan and encouraging developer entities to develop land parcel as per new land assembly policy. Looking at the future perspective and existing physical/socio-economical parameters of area the architects/planners must work to reduce the building footprint, increase green spaces and emphasis should be given on high density medium rise construction specifically in areas under air funnel zone.

Further, proper demarcation and preservation of Najafgarh dain is necessary and it can also act as open space for the existing build up area of the Zone. The 100m wide Master Plan road crossing the Zone can be developed as facility corridor which can incorporate business and office area as per master plan guidelines. Further exercise can be done to decongest the already overcrowded urban villages like Nangloi Jat and Mundka and other urban villages by redevelopment and other relevant planning processes. The new Land assembly policy must be implemented in coherence with other building bylaws for timely land acquisition and development. MNC/IT sector should come up along Facility corridor as this area is located in proximity of the IGI Airport. This will automatically

improve the traffic condition on Delhi Gurgaon expressway and segregate the traffic to east west corridor within the city. Proposed land use map (Fig. 11) is prepared incorporating masterplan roads and other essential arterial and subarterial roads to facilitate and regularized urban growth and it will encourage private entities to take part in planning process.

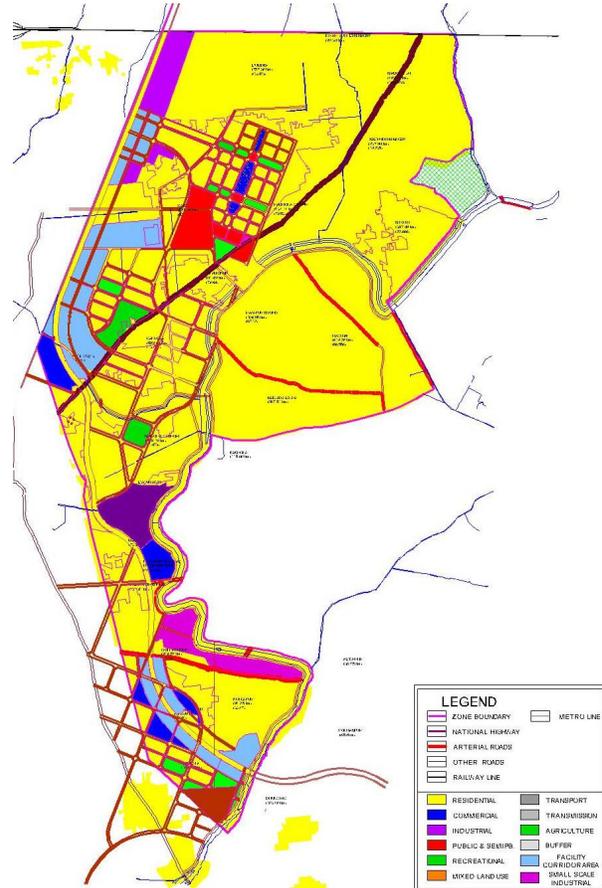


Fig.11. Proposed land use map.

VII. CONCLUSION

Urban extensions are one of the solutions for the growing housing demand for metropolis of Delhi. Out of five sub-cities proposed for Delhi, urban development in zone k-1 is of most importance owing to its proximity to IGI airport, coming up of Dwarka Gurgaon expressway and high density residential areas in Najafgarh. This area has been a shadow area in the past due to poor connectivity to other part of the city. The present infrastructure and accessibility are not up to the mark, Most of the Development is taking place along the NH-10 and the State highway, thus the land prices are assuming alarming proportions along the main road network resulting in under-developed, high density development.

Further, due to large number of villages have converted into unplanned urban villages, the land acquisitions has been a problem for the local government.

A comprehensive approach of land use suitability analysis was taken, intertwining the multi criteria ranking matrix and height and density zoning matrix. The land ranking matrix thus formed can be used as reference material for preparing up of detail land use plan and can be a yardstick for other types of strategy used for land use allocation at zone level. The data for the analysis was taken from primary and secondary sources and attempt has been made to validate it through primary survey. For better accuracy in land use planning at zonal level, other parameters related to urban planning can be explored and incorporated. Further, the study has also tried to analyse applicability of new land acquisition and Land assembly policy and future impacts on the land use and other attributes of land development.

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