

SERIES-1, PLANNING
VOLUME - 5

Population Projection, Landuse Forecasting, Town Planning Norms & Standards

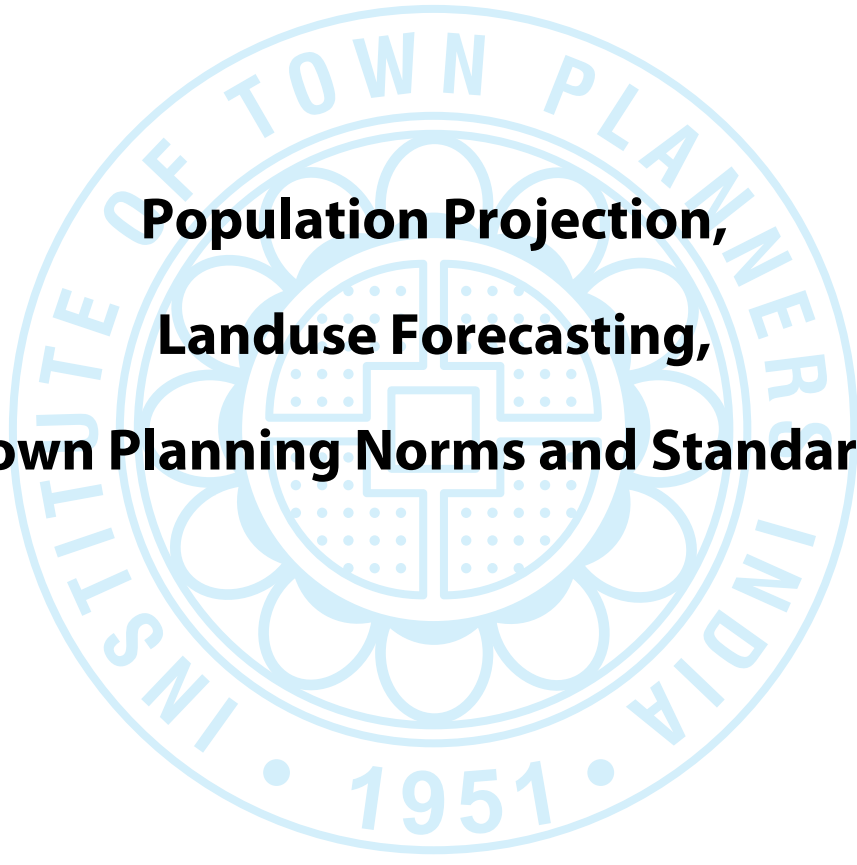


INSTITUTE OF TOWN PLANNERS INDIA
HARYANA REGIONAL CHAPTER, PANCHKULA

Population Projection,
Landuse Forecasting,
Town Planning Norms and Standards

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Preface

The organic growth of towns without any planning for the future leads to deficiency in facilities, services and utilities. As the population increases, the streets become narrower for the movement of ever increasing traffic. Therefore, there is a dire need to foresee the population growth and the resultant requirement of facilities, services and utilities so as to overcome the difficulties which are normally associated with unplanned organic growth of towns. The economic development and change of land values over a period of time results into the inter mixing of non compatible land uses which needs to be regulated by land use zoning in the development plans to achieve better habitable environment. The present study is an attempt to facilitate the town planners and practitioners to achieve a balanced and healthy urban development.

Over 100 towns have been examined in the study to arrive at suitable techniques and proposals. The study examines and proposes methods of population projection, land use forecasting and rationalization of town planning norms, their relation with each other. It has zeroed down to specific planning recommendations and suggestions for the Indian towns and can serve as a quick reference book of urban planning.

I am thankful to Sh. Raj Vir Singh for his guidance as a research guide and all the members of ITPI HRC who have made valuable contributions to this study. I am also thankful to Ms. Rajdeep Kaur and Ms. Gurpreet Kaur, Research Associates of HRC for their outstanding work.

Dated: 22.03.2018

(Nadim Akhtar)
Chairman, ITPI-HRC
Panchkula.

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CHAPTER – 1

INTRODUCTION

Since the dawn of civilization, human beings have started living a sedentary life which ultimately led to the emergence of villages and towns. These settlements started growing in size due to natural increase in population (i.e. birth minus death) and also due to immigration from other settlements. The bigger settlements called towns are like living organisms which grow with the passage of time and their growth needs to be planned. Normally, when the town grows without any plan or regulation it results into a low density unplanned urban sprawl and when the growth potential of this area increases, the population density also increases resulting into total mismatch between the services, utilities and the requirements of the population. In many cases the urban sprawl results into wastage of precious fertile agricultural land which needs to be curtailed by systematic planning for high density and high rise buildings. The availability and cost of land determines the form of development and construction of low rise or high rise buildings. The land values are usually higher along the transit routes and in the Central Business Districts (CBD) whereas the outer areas of the towns have low land values and therefore, characterized by low rise / density urban sprawl.

Therefore, in planned urban development, conscious decision needs to be taken regarding the form of urban development, planning norms/standards and the pattern of residential densities to arrive at the optimum level of vertical and horizontal expansion of town.

The growth in population of towns is reflected on the ground by spatial expansion of towns, which can be planned in the following three ways:

1.1 CONCENTRIC AND SCATTERED SPREAD

There is all round growth of the town around a settlement or nucleus as shown in the figure 1.1. This is the natural growth pattern of the towns expansion where there is no physical constraints to restrict the urban expansion. This form includes planning for the existing leapfrog and poly nucleus development also. An example of this simple out

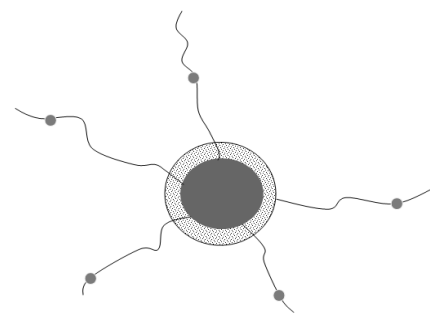


Figure 1.1: Concentric spread

ward circular form of planning is Ahmedabad and Bangalore as shown in figure 1.2 and 1.3. Such town normally suffers from improper housing, concentration of people in the heart of the town, congestion of the traffic and accidents.

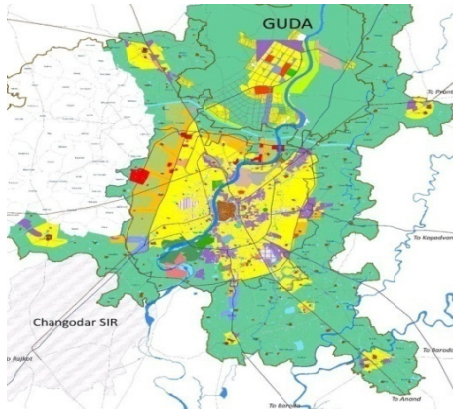


Figure 1.2: Concentric spread of Ahmedabad

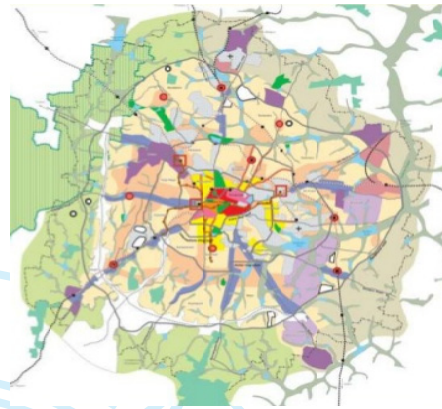


Figure 1.3: Concentric spread of Bangalore

1.2 RIBBON DEVELOPMENT

The towns can grow along the major transit route which is popularly considered as a transit oriented development because the expansion relies heavily on the transit route as indicated figure 1.4. The finger plan of Copenhagen is an example of this form of planning in which the space between the lines of linear development has also been filled up as shown in the figure 1.5. This form of planning leads to linear development when the transit routes are far apart. Normally, all types of buildings creep in at the frontage, such as schools, factories, bus stops, petrol pumps, theatres, commercial complexes etc. with no regard to zoning regulations. This kind of development is not suitable from traffic and transportation point of view.

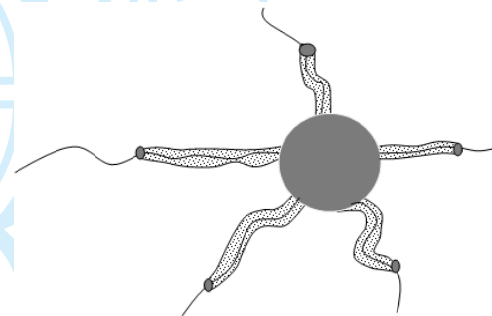


Figure 1.4: Linear Development

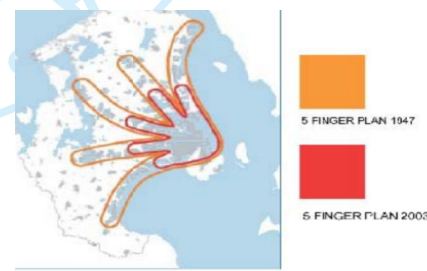


Figure 1.5: Finger plan of Copenhagen

1.3 SATELLITE TOWNS

There have been attempts to regulate the growth and expansion of towns by developing satellite cities as shown in figure 1.6. However, the population of a growing town can seldom be

diverted in this manner. A number of satellite towns have been created in India since independence, such as Marimalai near Chennai, and Navi Mumbai near Mumbai.

Another example of Delhi is shown in figure 1.7. There are urban centers performing the services of satellites, e.g., Ghaziabad, Noida and Gurugram (Gurgaon). Eventually such satellite towns get merged with the main towns.

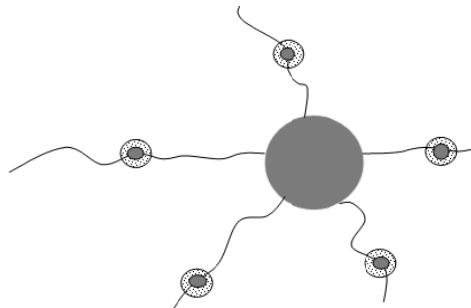


Figure 1.6: Satellite Towns

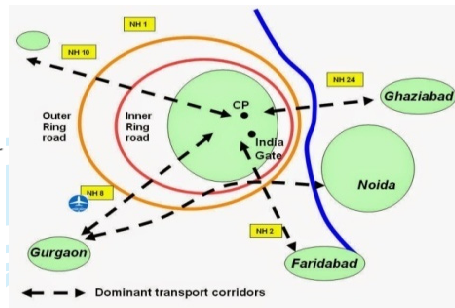


Figure 1.7: Satellite towns around Delhi

1.4 SCOPE

The study examines and proposes, methods of population projection, land use forecasting and rationalization of town planning norms, their relation with each other, with a view to arrive at greater objectivity in urban planning.

This report critically examines the town planning practices followed in India especially Haryana and arrives at suitable methods of population projections, land use forecasting and norms and standards which are handy to use and can be referred to by the town planners in practice.

CHAPTER – 2

ESTIMATING POPULATION

Planners use various methods and tools for “predicting” the future which involves data of population as they are the ones for whom planning is done. They are concerned with population projections which form the basic framework for setting targets expected to be achieved within a specified time-frame, be it for land use, services or facilities etc. Most of the important decisions about land uses and services are derived from population estimate which are detailed as following¹.

2.1 IMPORTANT USES OF POPULATION PROJECTION

1. Development planning of cities, housing, employment etc.
2. Projection of labor force for estimating the future production of goods and services.
3. Population projections by age for requirement of future school enrolments etc.
4. Population projections for estimating the future demand for food, power, water, transport etc.
5. Projections of the future age and sex composition of the population for estimating the incidence and prevalence of various diseases and planning for the number of hospitals, hospital beds and specialized facilities as well as training programmes for medical specialists.
6. Future consumption requirement of various goods and services by the population, obtained from the projection of population by age and sex, in different socio-economic strata. For example, the future demand of feeding bottle for children will depend on the projected number of children in future.

The need for population projection in India by different components like age, sex, rural-urban etc., for use by the official agencies, both at the centre and the states, was keenly felt in 1958 on the eve of the formulation of the Third Five Year Plan. Being the second most populous country in the world, the size and growth of India’s population have remained a matter of great interest not only to India but to the outside world also. Different population projections at the country

¹ Shubham (2014), Article on Population Projection, Planning Tank retrieved from <https://planningtank.com> dated 12th August, 2017

level are made by the government, national and international agencies from time to time. In addition, individual demographers make their own projections for the country as a whole, and sometimes, at the sub-national level also. The important international agencies which make population projections for the world as a whole and for the individual countries are the United Nations Population Division; the World Bank; and the United Nations Population Fund (UNFPA); etc².

2.2 TYPES

Population projections are of various types which are as following³:

2.2.1 Total Projections and Regional Projections:

Projections made for the whole country are called total projections. When projections are made for a region, state or province, district or ethnic group, they are called regional or sectoral projections. Total projections are easy to make as compared to regional projections. This is because present and past data about birth and death rates and internal migration are not easily and accurately available at the regional level.

2.2.2 Forward Projections and Backward Projections:

All projections that are based on past data are called forward projections. However, in certain exceptional cases, projections are made about the past population. These are known as backward projections. Backward projections are made where population census has not been done or to check the correctness of past population data.

2.2.3 High, Medium and Low Projections of Population:

Population projections are made on the basis of certain assumptions relating to birth rate, death rate and migration which have also been categorized as follows.

If it is assumed that the birth rate is high, death rate is low, immigration rate is high and emigration rate is low, it is high projection rate of population. Such a projection is for less developed countries that are passing through the demographic transition stage.

² Census of India (2001), "Report of the Technical Group on Population Projections constituted by the National Commission on Population", Office of the registrar general & census commissioner, India.

³ S. Divisha, "Article on Population Projections: Meaning, Type and Importance", retrieved from <http://www.sociologydiscussion.com> dated on 12/0802017.

If it is assumed that there is medium increase in birth and death rate and medium increase in immigration and emigration rate, it is known as medium rate of population projection. Such a projection shows a medium increase in the growth rate of population due to the success of family planning and health services. Projection of this type is useful in fast developing countries.

If it is assumed that both birth and death rate are high and both immigration and emigration rates are also high, it is low projection rate of population. Such a situation exists in very backward poor countries such as in Africa.

Low projection rate of population is also suitable for developed countries on the assumptions that there are low birth and death rates and both immigration and emigration rates are also low.

2.3 METHODS

In the calculation of projection, the time period and the base years are very important. There are several methods used in the calculation of projection. This section of the chapter describes the various methods and approaches involved in population projection by different organizations and scholars⁴.

2.3.1 Component

The component method of population projection basically refers to the projection type where there is the separation of the three components of population change namely, mortality, fertility and migration. These components are projected and applied to the base population in order to obtain projected population at future points in time.

This method was used by a technical group constituted by the National Commission on Population (NCP) under the Registrar General, India to work out population projections for India, States and Union Territories up to the year 2026. This method was applied for States having population of 1 crore or more during 2001 Census. The exceptions to this were Himachal Pradesh and Uttarakhand⁵.

1. Advantages

- a) The method is crucial for planning exercise since it takes future population change into account and can be designed to satisfy basic needs of certain segments of the population.

⁴ Shrivastava O.S. (1994), "Demography and Population Studies", Vikas Publishing House Pvt. Ltd.

⁵ Town and Country Planning Organization (2015), Urban and Regional Development Plan Formulation and Implementation Guidelines, Ministry of Urban Development, Government of India.

- b) It attempts to take proper accounts of the component of the population change and also of available information as to their trends in the past.

2. Disadvantages

- a) The method merely provides an estimate of what will be if the components of population change takes the course specified in the assumptions.

2.3.2 Mathematical

The basic mathematical methods, involve the charting of past and present population data for the determination of "trends" and the projection of these present population trends into the future. These are simple or direct methods of estimations based on the past population records. This model is used by different organizations such as Census of India, URDPFI (Urban and Regional Development Plans Formulation and Implementation) Guidelines, American Planning Association and International Union for the Scientific Study of Population. The mathematical models of population projection, such as arithmetic, geometric and Incremental Increase are adopted by Amritsar Master Plan- 2031 and City Development Plan for Allahabad, 2041⁶. These projections are discussed as follow.

1. Arithmetic Increase

In this method, the average increase in population per decade is calculated from the past census reports. This increase is added to the present population to find out the population of the next decade. Thus, it is assumed that the population is increasing at constant rate. Therefore,

$$\text{Population after } n\text{th decade will be } P_n = P + n.C$$

Where, P_n is the population after 'n' decades and 'P' is present population and C i.e., rate of change of population with respect to time is constant. This method can be used for short period projections if the conditions are fairly static.

2. Geometric Increase

In this method, the percentage increase in population from decade to decade is assumed to remain constant. Geometric mean of increase is used to find out the future increment in

⁶ Town and Country Planning Organization (2015), Urban and Regional Development Plan Formulation and Implementation Guidelines, Ministry of Urban Development, Government of India.

population. Since this method gives higher values and hence can be applied for a new industrial town at the beginning of development for only few decades.

The population at the end of nth decade 'Pn' can be estimated as:

$$P_n = P (1+k)^n$$

Where, k = Geometric mean P = Present population n = no. of decades.

3. Incremental Increase

In this technique, the average of the increase in the population is taken as per arithmetic method and to this, is added the average of the net incremental increase, one for every future decade whose population figure is to be estimated. In this method, a progressive increasing or decreasing rate rather than constant rate is adopted. Mathematically, the hypothesis may be expressed as:

$$p_t = p_0 + n*k + n(n+1)/2*a$$

Where, p_t = population at some time in the future, p_0 = present or initial population, k = rate of increase for each decade, a = rate of change in increase for each decade, n = period of projection in decades.

4. Graphical

In this method, the populations of last few decades are correctly plotted to a suitable scale on graph. The population curve is smoothly extended for getting future population. This extension should be done carefully and it requires proper experience and judgment. The best way of applying this method is to extend the curve by comparing with population curve of some other similar cities having the similar growth condition.

An example of the population figures for Gurugram derived from the above methods are illustrated in table 2.1.

Table 2.1: Population Projection Gurugram 2021 and 2031

Methods	2021	2031
Arithmetic Increase Method	1148400	1410280
Geometric Increase Method	2038994	4689686
Incremental Increase Method	1459746	2344318
Average	1549047	2814761

Note: The graphical method has not been applied due to wide variation in the population figures of 2001 and 2011 which could not be compared with any town having similar population structure.

It can be seen from the above table 2.1 that arithmetic increase method of population projection estimates the population at the lower side whereas the geometric increase method of population projection estimates population on the higher side. They lay down the higher and lower limits of expected population. In such cases, the average of all form of population projection can be considered after due diligence and cross-checking with the local municipal authorities.

The mathematical projections have their own limitations which are as follows:

1. The projection is done on the self-evident assumption that the demographic projection of the future is based on the growth rate of the past and that the prevailing situation will remain in the future too.
2. It ignores the past and future socio-economic changes which affect population growth significantly.

2.3.3 Employment

This method is described in the URDPFI Guidelines. This method assumes that there is a very strong inter-relationship between population and employment and indicators such as worker's population can be correlated with total population to yield extrapolated information. This method's reliability is low and should not be used for long range population forecasting.

2.3.4 Ratio

This method is described in the URDPFI Guidelines and is based on the assumption that changes in any geographical area are a function of those experienced in wider area. Thus population of a city is held to be a function of the region and region itself is a result of the function of nation.

In this method, the population of the second largest area (e.g. the region) is plotted against that of the parent area (the nation). A curve is obtained by fitting it on the two points. Thereafter, it is extrapolated, by least square/graphical/other method, to estimate the projected value for the parent area for the target year. The requirements of such projections are time-series of populations for the areas to be used in the analysis and a forecast or sets of forecast for the larger area.

These methods are weaker for longer periods and smaller areas, but are useful for quick forecasting for middle range (10-15 years) for areas not less than a whole metropolitan area or a city region.

2.3.5 Migration and Natural Increase

This method is described in the URDPFI Guidelines and adopted by the Master Plan for Delhi - 2021⁷. This method enables natural and migratory changes to be handled separately. By examining past data on net migration rates and by attempting to relate these to economic conditions, particularly to the demand for employment in the study area, it is possible to adopt varying assumptions about the pattern of future migration. A set of programs of future natural change is developed either by subjective projection of past maximum and minimum migration rates or by using migration data from projections produced nationally or regionally. The essence of the method is to begin with the starting date population, add the estimated migratory population figured to produce the next figure (A). Natural change in population is then added to the projected figure (A), thus completing one cycle of the projection giving a figure (B). The process is then repeated until the end of the projection period giving a figure (C). Cycle of projection could be any convenient period; example 5 years or 10 years or more.

This projection method uses total population, but age and sex structure is not considered. Thus changes in death and birth rates, which might result from changing age/sex structure cannot be seen and acted upon. Neither future estimates of school age population and numbers of women of working age can be made. Still migration and natural increase method does reveal the possible sequence and the main elements of change.

2.3.6 The Cohort – Survival

The Cohort – Survival projection method is proposed / described by URDPFI Guidelines, United Nations⁸ and World Bank. It is a method for forecasting what the future population will be, based upon the survival of the existing population and the births that will occur. This method can be applied for any period of time but typically it involves five year steps.

⁷ Delhi Development Authority (2007), “Master Plan for Delhi -2021”, Published by Delhi Development Authority, New Delhi.

⁸ United Nations (1955), “Manuals on Methods of Estimating Population”, Department of Economic and Social Affairs, Population Branch.

Cohort – component models are so called because they divide the population into cohorts and model on the demographic components of change such as fertility, mortality and migration – affecting each of the cohorts. Cohort indicates the generational group e.g. 0-9, 10-19 and so on.

The cohort component method is used when population projections by age and sex are needed for 5 years, 10 years or longer periods of time. This projection tool allows planners to examine the future needs of different segments of the population including the needs of children, persons in the labor force and the elderly. It also allows planners to project the total size of the population. The results can be used in all aspects of local and regional development plans.

2.3.7 Matrix

This method is described in URDPFI Guidelines⁹. The method follows the logic of the cohort-survival technique. The initial age and sex distribution is similarly represented as a column sector but the incidence of births and deaths is handled by means of a 'survivor ship matrix' which operates on the original population to age the population through successive time periods, simultaneously performing the calculations of births and deaths.

2.4 LIMITATIONS

Population projections are often incorrect. The following are the common errors, difficulty and limitations of population projections¹⁰:

1. **Wrong assumptions:** The projections are bound to be incorrect when the mathematical and growth component methods are based solely on past trends and wrong assumptions. Very often high decadal growth rate may not reflect the overall prosperity or economic development or growth potential of a town because additional adjoining area, having dense population, was added to the town.
2. **Estimation of mobility of labor.** It is not possible to estimate correctly birth rate, death rate and migration rate due to the mobility of labor, especially in a developing economy. With development and structural transformation, there is large scale mobility of labor within and outside the country which cannot be projected correctly even for a short period.

⁹ Town and Country Planning Organization (2015), Urban and Regional Development Plan Formulation and Implementation Guidelines, Ministry of Urban Development, Government of India.

¹⁰ S. Divisha, "Article on Population Projections: Meaning, Type and Importance", retrieved from <http://www.sociologydiscussion.com> dated on 12/08/2017.

3. **Fertility theories of “Comparative Statics”.** A model requires dynamic and unconditional models for population projection. Demographic literature mostly uses fertility data for “cross-sectional comparisons “where as forecasters require “longitudinal sequences”. Cross-sectional data and the comparative statics about fertility cannot be used for other times and places, certainly not for future times¹¹.
4. **Biological, socio-cultural and economic hypotheses about fertility.** A projector cannot statically know which theory to trust and more importantly does not know to what extent they will change the fertility, mortality and migration rates over different years.
5. **Age-Sex Structure:** Population projections may turn out to be wrong during the demographic transition stage because it is difficult to estimate correctly the age-sex structure of the population.
6. **Condition change:** Demographic projections are like weather forecasting. Like weather, they are based on conditions and if conditions change during the projection period, they may be incorrect. For example, failure of crops due to adverse climatic conditions, sudden burst of inflation may emerge and the projector may find it difficult to gauge their impact on various variables affecting population change.

Despite limitations population projections will continue to be made because everyone needs them. The planners need them, the governments, administrators, industrialists, and businessmen need them. Projections have failed many times but they must succeed.

¹¹ Shrivastava O.S. (1994), “Demography and Population Studies”, Vikas Publishing House Pvt. Ltd.

CHAPTER -3

LAND USE FORECASTING

After assessment of the projected population of the towns, the land use requirements for the projected population are estimated. The assessment of the land use requirements cannot be devoid of the land use policy of the state and central government on land preservation etc. The assessment need to be objective and land should be treated as a perishable resource and therefore planned with at most care and diligence. There are many techniques and methods by which future land requirement for limited purposes and area can be assessed. But, there are very few attempts on models which can be used objectively in forecasting all the land use requirements of towns. Some of the important models have been discussed as follows¹².

3.1 LAND USE CHANGE MODEL

The land use change model analyzes conditions under which land use change occurred in the past. Those conditions are projected into the future to create the development probability index, which assigns a probability of land use change for each parcel of the land. The model uses logistic regression analysis to determine which of several criteria related to land use and development had a relationship to the location of development and the strength of those relationships. The model requires the collection of land use data over many years and relates them to criteria relating to the development and location of the area. The probabilities, and the parcels selected to change, may be affected by the locations of known development projects, as well as the decisions of local authorities..

3.2 ACTIVITY WEIGHTED TECHNIQUE

This technique allocates activity growth in population to share of the particular activity which already exists in the zone. It assumes that if the present trends continue, allocated activity will grow in proportion to the present share. Therefore, the zone with highest present share will be allocated with major share in future. It is clear that existing size as a proxy for the future development potential leads biased allocation. This technique is suitable only for short term planning.

¹² Module 4 (2006), "Landuse", Department of Civil Engineering, Indian Institute of Technology, Bombay retrieved from [/www.civil.iitb.ac.in/~dHINGRA/ce751/Module4.pdf](http://www.civil.iitb.ac.in/~dHINGRA/ce751/Module4.pdf).

3.3 DENSITY SATURATION GRADIENT METHOD

The Density Saturation Gradient Method (DSGM) is based upon the axiom that there are regularities in the activity distribution about the central place. This method can be used as a tool for the analysis of existing land use structure and also for use in forecasting land use structure. The forecast is basically a trend projection of the existing land use and density structure in the region. The method is based essentially on the regularity of the decline in density with the increasing distance from the Central Business District (CBD). This method depends upon the relationship between distance and present saturation. Though the DSGM is complete in itself, this technique demands more subjective inputs and allows only for a cursory and limited consideration of policy and other planning decisions.

3.4 PROJECTIVE LAND USE MODEL

This model is another family of Lowry derivative models. Projective Land Use Model (PLUM) is designed to yield projections of the zonal level distribution of the population, employment and land use within an area based upon the distributions of these characteristics in base year. There are different versions of PLUM. Allocation incorporates auto and transit mode separately and disaggregated local serving categories; allocated by different processes. The allocation algorithms are derived from original Lowry model. This model can distinct both basic and local-serving employment. The allocation function used in the model has two components,

- a) The first component is the probability of making a trip for a given trip purpose of particular length.
- b) The second component is the measure of attractiveness of the destination.

The total PLUM model is divided into four phases: initial allocation, revised allocations of incremental employment, reallocations and increments, projections. The outputs of PLUM consist of total housing units, residential population, total number of employment of residents, and total employment.

3.5 Computer Aided Land Use Transport Analysis System

It has been developed to forecast the future location of housing, industrial and commercial activities and the land use and travel patterns, within a large metropolitan area. It is applied to Tokyo, with a huge population of some 28 million lives within an area of 15000 sq. km. In the

model, land uses are classified into the following four types according to their locational characteristics:

- a) Priority location type(e.g. large scale basic industries)
- b) Optional locational type(e.g. business areas , housing)
- c) Subsequent location type (e.g. neighborhood stores, schools)
- d) Passive location type(e.g. agricultural areas, forests)

The allocation and amount of use is determined on the basis of an existing development plan.

Allocation of optional land uses is described by these five models which are as follows:

- i. The industrial location sub model
- ii. Business location sub model
- iii. Activity within each of the zones
- iv. Local land use sub model
- v. The transport sub model

3.6 The Leeds Integrated Land-use/Transport Model

It represents the relationship between transport supply (or cost) and the spatial distribution of population, housing, employment, jobs, shopping and land utilization. It is applied to a study area divided into zones, with an external zoning system to ensure the closing of the spatial system. The main use of this model is to allocate exogenously specified totals of population, new housings and jobs to zones taking into account the existing land use pattern and the cost on travel and constraints on land use.

3.7 LAND USE DEMAND & SUPPLY ANALYSIS

1. Land use demand

The land use forecast translates projections of growth in housing units and jobs into projections of land area needed to accommodate that growth. The underlying assumption is that we can use general factors to estimate “demand” for different land uses, for specific types of jobs and units. Based on the socio-economic forecast, the land use forecast projects how new land development will be distributed among the Community Plan (CP) regions, according to the projections in the socio-economic forecast report.

The demand for land area to support different types of land use activities is called “Land Use Demand.” Land use forecast identifies land use demand for the urban land uses as shown in the table below 3.1. The table also indicates how the socio-economic projections are linked to land use demand. For example, future projections in the number of housing units needed to support a growing population would result in a demand for single-family and multi-family residential units.

Table 3.1: Land Use Demand for the Urban Land uses

Growth in	Creates Demand for Land in
	Land Use Category
Housing Units	<ul style="list-style-type: none"> • Single-Family Residential • Multi-Family Residential
Jobs	<ul style="list-style-type: none"> • Commercial (office and retail) land uses • Industrial land uses

2. Land Supply

This forecast assesses the existing supply of land available to accommodate the demand for future land uses. It consists of lands that are already planned for urban development but have not yet been developed. Lands planned for urban development are those shown on the Plans/maps, including Project Districts. Land supply numbers address the question: If no changes were made to the existing plans, how much growth could be accommodated? Another name for this is “build-out.” It should be noted that the supply consists of lands that have plan designation and that may or may not have requisite land use zoning.

3. Comparing Supply to Demand

The final step in the land use forecast is the comparison of demand to the supply of developable lands. Comparing supply to demand indicates whether urban-planned lands are sufficient to meet demand over the planning period. If demand exceeds supply, the analysis indicates how much additional land is needed in each of the general land use categories.

Some land use forecast studies automatically increase the amount of additional land needed by a factor of 20 to 25 percent, for purposes of flexibility. The intent is to allow for “market unpredictability”.

It is evident that the models are essential for the objectivity required in the projection of future land uses. But, the models also require the input of comprehensive data, sound planning principles, policies and assumptions which depend on various factors which may be of national importance or localized in nature. In India, the land use forecasting models are seldom used due to the non-availability of requisite data spreading over a period of time and due to the complexity involved in the use of such models for which the practitioners are not prepared. Moreover, every town has a unique history and position in the overall development of the area. For example, there are large chunks of under/unutilized land uses in towns such as the cantonments, residential zones in Lutyens Delhi and Nungambakkam in Chennai which fall within the towns and therefore disturb the overall gross density and natural land use pattern of the towns. No models can be derived for universal applicability.

3.8 CATEGORIZATION OF LAND USES

The spread of population and the use of land is very uneven and diverse in towns. The URDPFI Guidelines have categorized the land uses in various categories such as Residential, Commercial, Industrial, and Public/Semi-public, Recreational, Transport and Communication, Agricultural etc (refer table 1 in annexure 1) for the purpose of uniformity. However, there are variations in the categorization of the land uses across the country as can be seen from the practice followed in Haryana (refer table 2 in annexure 1) and in Delhi (refer table 3 in annexure 1) for example. This deviation of categorization can result in deviation in the application of other guide lines of URDPFI. Uniformity in land use classification is essential in the long run to arrive at the consensus for land use forecasting. However, this does not mean that the deviations prohibit the laying down of benchmarks which can be slightly varied as per the local conditions.

At the preliminary stage, there is a need to study the land use composition of various towns so as to have an idea about the composition of various land uses. Table 3.2 gives the existing land use of Indian towns.

Table 3.2: Land use Allocations in Urban Centre's of various Population Sizes

Sr. No.	City Size	Percentage of Developed land								
		Residential	Commercial	Industrial	Parks	P/SP	Roads	Vacant	Other	Total
1	10 lakhs	30	2	5	4	9	8	25	17	100
2	5 to 10 lakhs	33	3	14	3	15	10	11	10	100
3	1 to 5 lakhs	40	2	5	4	13	11	13	12	100
4	50,000 to 1 lakh	37	2	6	3	8	10	16	17	100
5	20,000 to 50,000	32	2	10	5	9	13	15	14	100
6	Below 20,000	23	3	5	2	10	11	22	25	100
	Mid-Value*	34	2	9	3	10	9	17	16	100

*Note: Mid-value = Maximum value + Minimum value/2

Source: Report of the National Commission on Urbanization, 1988

A list of existing land uses of 11 towns are given in the following table 3.3. It is for illustration purposes only so as to give a broad feel of the land use distribution.

Table 3.3: Existing Percentage of Land Use in Cities and Towns (%age)

Sr. No.	Use	Percentage of Land Use in Cities And Towns (%age)										
		Amritsar (2010)	Patiala (2009)	Surat (2004)	Pune (2001)	Chennai (2006)	Udaipur (1996)	Indore (2001)	Patna (2001)	Kanpur (1998)	Faridabad (2011)	Noida (2010)
1	Residential	50.94	40.58	57.53	42.55	54.25	47	54	47.55	62.93	41.69	36.45
2	Commercial	4.72	2.84	2.44	1.61	7.09	5	4	4.46	3.28	6.02	1.11
3	Mixed Use	-	-	-	-	-	-	-	3.37	-	0.21	-
4	Industrial	5.35	3.21	17.74	4.05	5.17	11	9	1.05	6.93	17.98	13.76
5	Pub. & Semi Public	8.86	11.23	3.40	6.84	18.48	14	11	10.18		3.78	8.83
6	Recreational	1.50	3.12	0.62	8.37	2.09	8	8	3.07	6.84	15.46	19.13
7	Transport & Communication	16.66	10.09	9.18	13.05	-	14	14	5.90	10.37	11.7	19.59
8	Agriculture, Water bodies and Special areas	0.27	28.14	9.09	22.97	12.93	-	-	24.41	0.60	1.30	1.13
9	Utilities & Services	0.33	0.65	-	0.57	-	-	-	-	6.90	1.86	-
10	Govt. Land	10.58	-	-	-	-	1	-	-	2.13	-	-
	Total	100		100	100	100	100	100	100	100	100	100

Source: Master Plans/Development Plans

The above tables are given for illustrative purpose only and in actual practice the predominant employment characteristics of the town in question should also be examined with reference to the other towns of similar characteristics.

3.9 GROSS DENSITY

Gross density reflects the overall land utilization intensity of a town. The vertical or horizontal expansion and urban form of the town has a direct bearing on the gross density. The current town planning practice starts from assessing the total urbanisable area based on the gross population density. As per the URDPFI Guidelines, the gross density of the towns is recommended to be fixed in accordance with the following table 3.4.

Table 3.4: Developed Area Population and Average Densities

Settlement Type	Persons Per Hectare (pph) in			
	Plain Areas		Hill Areas	
	Population	Density	Population	Density
Small Towns	Less than 50,000	75-125	Less than 20,00	45-75
Medium Towns	50,000 – 5lakh	100-150	20,000 – less than 80,000	60-90
Large Cities	More than 5 lakh	125-175	80,000 and more	60-90
Metropolitan Cities	-	125-175	-	100-150
Mega polis	-	More than 200	-	-

Source: URDPFI Guidelines, 2015

They have left the scope for the deviation from the above table subject to local conditions. But it has been found that there is a remarkable deviation from the recommendations of the URDPFI Guidelines as can be seen from the comparative analysis of 64 towns for which development plans have been prepared by Haryana State (refer table 1 in annexure 2). It can also be seen that there is no correlation between the population size and the gross density of towns. Moreover, the presence of vast floodable areas, forests and ridges within the census and urbanisable boundary of town can give a distorted picture of the gross density of the town. It would be desirable to start from the basic land uses and their requirement.

3.9.1 High Rise Versus Low Rise

Land is not unlimited, and time has come when planners need to consider the intensity of land use at the first instance. This brings us to the important question of planning for high rise development. There is no universally accepted definition of a high rise building. As per the

dictionary meaning a high rise building is a building having many stories. The variation in the definitions of high rise building largely arises due to the variation in the fire and safety preparedness of the concerned authorities. For example as per the Emporis standards, a building¹³ above 35 meters in height is considered as high rise building whereas as per the Indian National Building Code, a building which is above 15m is considered to be a high rise building. Apart from this there is wide variation in the definitions adopted by the local authorities in India. The Mumbai Municipal Corporation holds that any building above 32 meters is to be considered as high rise building.¹⁴ However since the structural and fire safety of a building is of utmost concern, the definition given in the National Building Code seems to be most appropriate for planning and designing purposes in Indian context.

Vertical growth is the process of increasing and maintaining the intensity of land use in established areas. It is often realized by densification, high-rise development and urban renewal.¹⁵ Increasing population, narrow roads, slums, environmental pollution, garbage accumulation, scarcity of drinking water, concentrated and unbalanced growth and poor transportation facilities have combined to create a depressing picture of life in old cities. With the passage of time, as land starts to fall short in comparison to the demands of urbanization, the vertical direction has to be given preference.¹⁶

On the other hand, horizontal development is a never-ending mass of urban development extending to the horizon. In India, with an unprecedented population growth and migration, an increased urban population is inevitable. More and more towns and cities are blooming with a change in the land use along the highways and in the immediate vicinity of the city.¹⁷ This type of development usually results in loss of agricultural land, open space, and ecologically sensitive

¹³ <https://en.wikipedia.org/wiki/Low-rise>

¹⁴ The Economic Times, (May 09,2016) "BMC proposes new norms for city's high-rise buildings" retrieved from [https://economictimes.indiatimes.com/wealth/real-estate/bmc-proposes-new-norms-for-citys-high-rise-buildings /article show/52180268.cms](https://economictimes.indiatimes.com/wealth/real-estate/bmc-proposes-new-norms-for-citys-high-rise-buildings/article show/52180268.cms)

¹⁵ "Development Strategies for Sustainable Growth" retrieved from "http://www.sage.unsw.edu.au/current_students/ug/projects/Wallace/consolidation.html"

¹⁶ Saleem Sehba (2016), "Issue Related to Vertical Growth and Development" retrieved from <https://www.omicsonline.org/open-access/issue-related-to-vertical-growth-and-development-2168-9717-1000178.pdf>

¹⁷ Barima Abel O Anarfi "Form, Structure And Morphology Of Urban Planning" retrieved from https://www.academia.edu/9468419/FORM_STRUCTURE_AND_MORPHOLOGY_OF_URBAN_PLANNING?auto=download

habitats. In simple words, as population increases in a city, the boundary of the city expands in a sprawl to accommodate the growth.

Characteristics of Vertical and Horizontal Development

1. Land use

In vertical development, mixed kind of land use, higher density and clustered activities helps in easy accessibility to the facilities thus reducing the travel time whereas in case of horizontal development homogeneous land use, low density and dispersed activities enhance the travel time and distance requiring automobile access which tends to increase pollution and road congestion.

2. Cost of Public Services

Vertical development makes more efficient use of land and resources by strengthening the existing urban infrastructure, reduction in infrastructure costs energy usage and creating greater resilience. It tends to reduce the land covered by buildings or paved for roads and parking facilities. It also improves overall accessibility, reduces public transportation costs, including the per capita costs to consumers to own and operate vehicles.

Horizontal development of the town is usually accepted as being very costly to its occupants and to society in the long run, due to its environmental and economic cost. Cities have experienced an increase in demand for the maintenance and improvement of urban infrastructures such as fire-service stations, police stations, schools, hospitals, roads, water mains, sewers and other services such as waste and recyclables collection, mail delivery and street cleaning. Maintenance cost to individuals is high in vertical development as the charges for water, removing garbage, security and transportation etc are higher when compared to low rise buildings which depend on local authorities for the same.

3. Energy Efficiency

Vertical development brings activities closer together, making them more accessible by foot or by bicycle, reduces the car dependency, energy consumption, and low emissions via a decrease in distance traveled. In the vertical cities the horizontal travel distance is less and vertical travel distance is by high speed elevators, reducing the consumption of fuel which saves time, money

energy and reduces the carbon foot print (refer figure 3.1). Moreover, the requirement of air conditioning is minimized in high rise as lesser roof area is exposed to direct sun light.

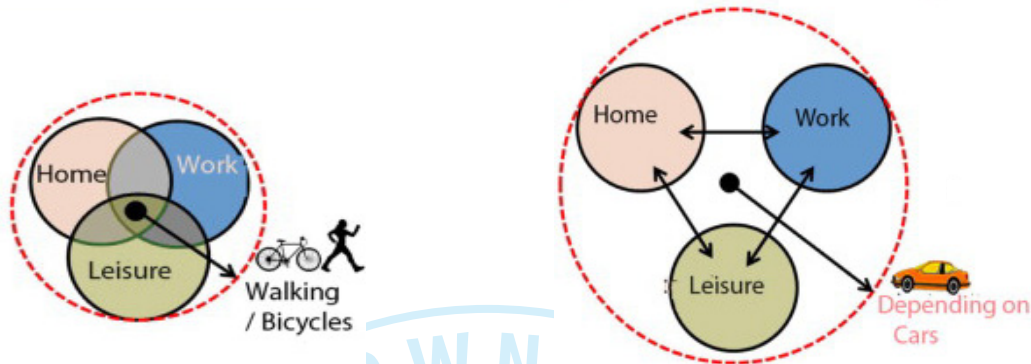


Figure 3.1: Vertical development reduces car uses and people can walk or use bicycles

Figure 3.2: Horizontal development makes people to depend on their private vehicles

Horizontal development is not energy efficient as horizontal growth of the town or a city causes more travel and thus more fuel consumption and traffic congestion (refer figure 3.2). It leads to increased driving and car dependent lifestyle and contributes to poorer air quality by encouraging more automobile use, thereby adding more air pollutants such as carbon monoxide, carbon dioxide, ground-level ozone, sulphur dioxide, nitrogen oxides, volatile organic carbons, and microscopic particles which are health hazards. Figure 3.3 shows that while urban population has increased by 50 % during 1990–2004,

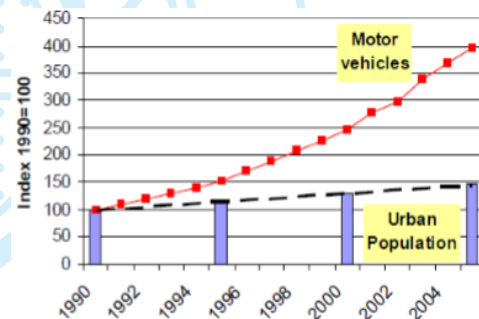


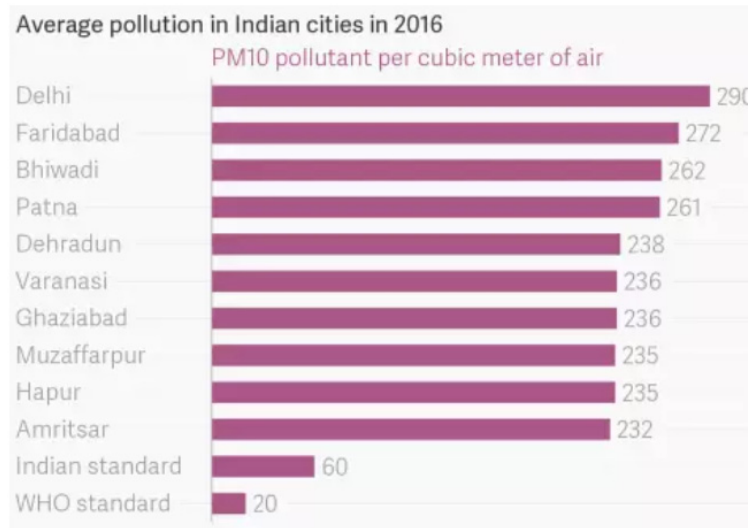
Figure 3.3: Motorization and Urbanization Trends in India

the number of Registered Motor Vehicles (RMVs) has risen by nearly 400 % in India which is alarming. India has 13 out of 20 most polluted cities in the world. India ranks 177th among 180 countries in terms of Environmental Performance Index 2018¹⁸. This poor performance is largely attributed to the ever increasing air pollution in cities caused by PM 2.5 leading to deaths. As per global burden of disease estimates for 2017, PM 2.5 deaths in India are the second highest in the world. An epidemiological study done by Central Pollution Control Board and Chittranjan National Cancer Institute of Calcutta, every third child has reduced lung function in India and as

¹⁸ Environmental Performance Index (2018) retrieved from <http://www.iasparliament.com/current-affairs/environment-biodiversity/environmental-performance-index-2018>

many as 12 lakh deaths take place every year due to air pollution in India. No Indian city passes the World Health Organization guideline value for PM10 pollution of less than 20 micrograms per cubic meter. Only 52 cities pass the Indian government's own standard of PM 10 which says that it should not exceed PM 60. The example of the highly polluting Indian towns is as follows (refer figure 3.4).

Figure 3.4: Example of Highly Polluting Indian Towns



4. Cost of Construction

Cost of construction per square feet is higher in high rise building. As per normal land values, it goes on increasing as one goes higher than 6-7 floors. This is more in seismic sensitive areas (refer table 3.5)¹⁹. Only the higher land values and scarcity of land can over shoot this cost.

Table 3.5: Cost of three Types of Building Foundations in Different Seismic Zones

Building	Foundation	Structural cost in Rupees per sqm of floor area					Percentage Increase in cost over Non-seismic (N. S) case				
		N.S	Zone II	Zone III	Zone IV	Zone V	Zone II	Zone III	Zone IV	Zone V	
8 storied	Isolated	433	443	449	507	518	2.4	3.6	15	17	
	Raft	750	773	801	819	871	3.1	6.8	9.2	16.1	
	Pile	1846		1924	1926	2134	-	4	4	16	
10 storied	Isolated	433	439	449	513	517	1	3.6	18.5	19.4	
	Raft	762	773	787	820	862	1.4	3.3	7.6	13.1	
	Pile	1872		1949	1984	2117	-	4	6	13	

¹⁹ V. Thiruvengadam, J. C. Wason and K. I. Praseeda, "Cost Modeling of Foundations of Reinforced Concrete Buildings Designed for Seismic Effects" retrieved from http://www.iitk.ac.in/nicee/wcee/article/14_S14-018.PDF

5. Spacious and privacy issues

High rise have less space and even terrace is common. The disturbance from neighbors may result in lack of privacy or less privacy as many people occupy the same building with inadequate private outdoor space, such as a garden²⁰. Horizontal development, initially, has low density and individual houses usually have internal courtyards which gives more privacy.

6. Resale value

Resale value in case of flats is lesser as compared to individual houses. The value of appreciation and resale is much higher in low rise as mostly investors look for them because of the independence it gives them. Low rise buildings can be added to and altered easily to suite the changing requirements.

7. Amenities

In vertical development one can enjoy the facilities and high living standards, due to provision of facilities and services and a variety of amenities, including laundry services, pools, convenience stores and even small grocery stores located within the building itself. On the other hand in horizontal development, facilities/ services like shops, schools, parks etc. tend to increase the travel distance.

8. Socialization

Lack of social interaction in vertical development leads to increase crime and the option of socialization is higher in low rise development. The anonymity of the high-rise block facilitates crime, whereas in low- rise buildings the inhabitants themselves, looking casually out of doors and windows, are the neighborhood's best protection.²¹

9. Impacts on wildlife and ecosystem

In vertical development more land is left open and there is lesser ecological disturbance as compared to horizontal development as more land is covered under buildings roads and pavements.

In areas where horizontal development is not controlled, the concentration of human presence in residential and industrial settings may lead to an alteration of ecosystems patterns and

²⁰ <https://www.addressreport.com/blog/low-rise-vs-high-rise-apartments/>

²¹ 1988, "Report of the National Commission on Urbanization"

processes. It may decrease the amount of forest area, farmland, and open space and breaks ecosystems in small chunks. Roads, power lines, subdivisions and pipelines often cut through natural areas, thereby fragmenting wildlife habitat and altering wildlife movement patterns.

10. Loss of agricultural land

In vertical development loss of agriculture land is less as compared to the horizontal development due less land coverage. For example the residential densities are varying according to different use forms as shown in the Figure 3.5. 1000 units can be adjusted in vertical development whereas 25 to 40 dwelling units per hectare can be adjusted in horizontal development as shown in the figure 3.6.

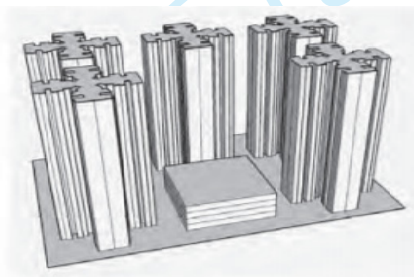


Figure 3.5: High rise apartments



Figure 3.6: Horizontal development

If dwelling units per hectare is developed vertically it will absorb 25 times more dwelling units than horizontal development.²²

Horizontal development very often contributes to loss of agricultural and forest land. For example in United States, urban growth is predicted to consume 7 million acres of farmland, 7 million acres of environmentally sensitive land, and 5 million acres of other lands during the period 2000–2025. This loss of agricultural and forest land to urban sprawl means not only the loss of food sources but also the loss of habitat and species diversity²³.

Comparison of Vertical Development and Horizontal Development

Comparison of vertical and horizontal development has been done on the basis of various parameters as shown in the table 3.6.

²² Samaratunga Thushara , Daniel O'Hare “High Density High Rise Vertical Living for Low Income People in Colombo, Sri Lanka: Learning from Pruitt-Igoe” retrieved from https://www.researchgate.net/profile/Thushara_Samaratunga/publication/269863172_High_Density_High_Rise_Vertical_Living_for_Low_Income_People_in_Colombo_Sri_Lanka_Learning_from_Pruitt-Igoe/links/56037d8808ae4accfb8af1c/High-Density-High-Rise-Vertical-Living-for-Low-Income-People-in-Colombo-Sri-Lanka-Learning-from-Pruitt-Igoe.pdf

²³ Springer-Verlag Berlin Heidelberg (2010), “Causes and Consequences of Urban Growth and Sprawl” retrieved from www.springer.com/cda/content/document/cda

Table 3.6: A Comparison Showing Vertical Development and Horizontal Development

Parameters	Vertical development	Horizontal development
Growth Pattern	Compact, Infill (Brownfield) development	Scattered, periphery (Greenfield) development
Urban Form	Cluster development, High Density High rise development	Sporadic development, Leapfrog pattern, Commercial strip, Low Density plotted development, Single Use development
Land use mix	Mixed land use is possible.	Homogeneous (single use, segregated) planned land uses.
Ground area occupied	Less area	More area
Accessibility, Transport and Connectivity	Easily accessible (within walking distances) Multimodal transport and land use patterns that support public transit, walking, and cycling Highly connected roads, sidewalks and paths.	Requires automobile access tends to increase pollution. Automobile-oriented transport and land use patterns poorly suited to walking, cycling, and use of less public transit systems. Hierarchical road network with numerous dead end streets, and unconnected paths and sidewalks
Impact on public and social health	Air pollution is minimized by shorter distances.	More air pollution due to longer vehicular travel time.
Cost of construction	Construction cost increases with the height of the building.	Construction cost is minimal.
Infrastructure cost and maintenance	Infrastructure cost and maintenance tends to be low as spatial coverage is less.	Infrastructure cost and maintenance is high as building, roads etc are widely spread.
Energy efficiency	Energy efficient as travel time is minimized.	More travel time and fuel consumption.
Choice of facilities/ Services (shops, Schools, parks)	As density is higher so choice tends to increase. Local, well distributed services.	Limited choice as threshold population is missing.
Street Design	Streets designed to accommodate a variety of activities.	Streets designed to maximize motor vehicle traffic volume and speed
Density	Higher density, Clustered activities.	Low density, dispersed activities
Public Places	Emphasis on the public realm (streets, sidewalks, swimming pools, gym and public parks etc).	Emphasis on the private realm (yards, shopping malls, gated communities, private clubs), sporadic public places, mostly unmaintained.
Impact on Wildlife and Ecosystem	More land is left open and lesser ecological disturbance.	More land is covered under buildings and roads.

It is evident from the foregoing table that high rise development has distinctive advantages over low rise development. In many countries including the developed countries like United States, poorly planned urban development is threatening the environment, health, and quality of life. In communities across the world, sprawl is taking a serious toll. China

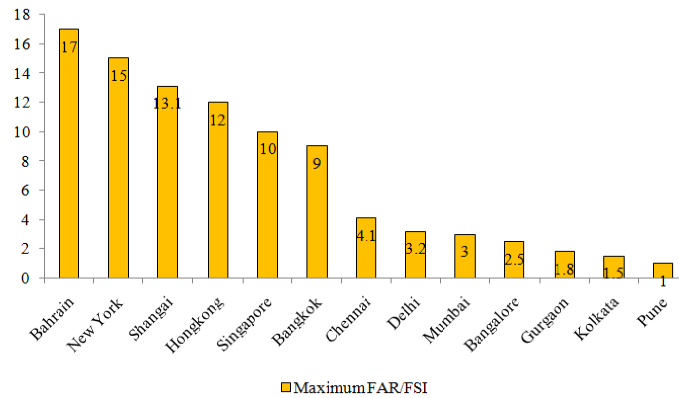


Figure 3.7: Maximum FAR/FSI

has opted to go high rise to meet the increasing demand of rural population migrating to cities which is to the tune of nearly 25 million per year. China has the largest number of tall buildings in the world. It has more than 1500 buildings above 150 meters and 26 super tall skyscrapers. Shanghai tower has a height of 632 meters and has homes, shops, offices, galleries and multiplexes²⁴. The urban land is grossly underutilized in most of the Indian cities and Indian metros have the lowest Floor Space Index (FSI) when compared to others developing countries. The FSI in Shanghai is 4 times that of Delhi and Mumbai as is evident from the graph (refer figure 3.7).

3.10 MAJOR LAND USE FORECASTING

The URDPFI Guidelines provides for forecasting of land uses as a percentage of total area as is evident from the following table 3.7:

Table 3.7: Land use Structure for Developable Area in Urban Centers

S. No.	Land use Category	Percentage of Developed Area			
		Small	Medium	Large Cities	Metropolitan Cities & Megapolis
1	Residential	45-50	43-48	36-39	36-38
2	Commercial	2-3	4-6	5-6	5-6
3	Industrial	8-10	7-9	7-8	7-8
4	Pub. & Semi Public	6-8	6-8	10-12	10-12

²⁴ Nov 21, 2016, "City Expansions and the Vertical Urbanization approach" retrieved from <https://medium.com/@SunnyKulkami/city-expansions-and-the-vertical-urbanization-approach-10280a05a01>

5	Recreational	12-14	12-14	14-16	14-16
6	Transport & Communication	10-12	10-12	12-14	12-14
7	Agriculture, Water bodies and Special areas	Balance	Balance	Balance	Balance
8	Total Developed Areas	100	100	100	100

Source: URDPFI Guidelines, 2015

The above percentage of land uses is subject to variation on account of local conditions. However, the comparative analysis of 64 planned towns of Haryana (refer table 1 in annexure 4) shows that there is remarkable variation.

The URDPFI Guidelines has established the broad parameters on which the forecasting of land uses is to be done but the guidelines do not indicates the methods and techniques adopted to arrive at the planning parameters. Moreover, it is seen from above analysis that there is a remarkable deviation from the recommendations of the URDPFI Guidelines and the actual practice being adopted in the planning of towns.

Therefore, the best way to forecast land use requirement is to understand its components. The components that make up the forecast also reflect the “steps” that are essential to arrive at the forecast results²⁵. Broad planning principles, components and considerations for the same are as following:

3.10.1 Residential

Residential land use is the major component of any city and accounts for majority of the total land in urbanisable area. It shapes and defines the overall structure of the city. The gross residential area required can vary depending upon the desired density of residential development planned for. The higher intensity of land use will require high rise development resulting in less residential area on the ground. Therefore, a balance need to be arrived between the population of residential development and the thresh hold population of the services and utilities. This balance should not only confirm to the planning standards and norms but also reflect the ease of availability of the services and facilities. It is essential to minimize

²⁵ Plan Pacific, Inc. (2006), ‘Technical Resource Study on Land Use Forecast – Island of Maui’, Maui Country General Plan 2030, Published in the US by Maui County Planning Department

travelling distance and bring the majority of services and facilities within walking and cycling distance²⁶.

The space standards of public utilities, services and facilities have evolved in India over a period of long time. The National Building Code (NBC) has recommended the space standards of public utilities, services and facilities which were recommended to be followed by the state governments. Prior to the recommendations of NBC the planning authorities were following diverse planning standards and norms. However, even after the recommendations of NBC (updated up to the year 2016) the recommended space standards are not being followed by many of the agencies perhaps because of the compelling local conditions. The space standards recommended/followed over a period of time by important agencies is indicated in the annexure 4 which shows the variation in recommendations/adoption.

Most of these space standards do not provide for the convenient travelling distance required to avail the services and facilities. This may lead to serious lapse in the provision of the services and facilities on the ground at convenient distances. It should be endeavor of the planning authorities to locate these facilities and services so as to minimize the use of motorized vehicles. Therefore, there is a need to re examine and rationalize the space standards keeping in view the latest requirement and planning practices. The following table 3.8 indicates the norms and standards which have been proposed/rationalized for adoption.

Table 3.8: Recommended Population Threshold, Plot Area and Accessibility for Public Services/Facilities

Sr. No	Category		Sub- Category	Population/unit	Plot Area (Sqm/ha)	Accessibility (in kms)
1	Health	a.	Dispensary, Polyclinic	15000	800 sqm	1
		b.	Nursing Home, Child welfare and Maternity Centre	15000	3000 sqm	1.5
		c.	Family Welfare Centre, Health Centre	30,000	4000 sqm	1
		d.	General Hospital including Speciality and Super-Speciality Hospital, Medical and Training Institutes, Nursing and Paramedical Institutes	1 General Hospital in district headquarters/5 lakh	5 ha
		e.	Dispensary for Pet animals and birds	2.5 lakh	500 sqm	3

²⁶ Haryana Regional Chapter, Panchkula (2017), "Study on Planning for Pedestrian and Cycle Movement", Institute of Town Planners India.

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		f.	Veterinary Hospital	5 lakh	2000 sqm	6
2	Education	a.	Creche, Anganwadi	10000	800 sqm	0.5
		b.	Nursery cum Primary School	5000	5000 sqm	0.5
		c.	Integrated High School (including primary school)	15000	2 ha	1
		d.	Integrated High School (including primary school) with hostel facility	15000	3 ha	1
		e.	School for Physically and Mentally challenged	1-2 lakhs	1.5 ha	5
		f.	Vocational Training Centre: ITI, Polytechnic, Vocational Training Institute, Management Institute, Teacher Training Institute etc.	5 lakh	3 ha	8
		g.	General College	1.25 lakhs	3 ha	8
		h.	Professional (Engineering College)	7.5 lakh	5 ha	8
		i.	University	10 lakh	20 ha	
3	Sports Facilities	a.	Community Sports Centre, Multipurpose Ground	1 lakh	2 ha	2
		b.	District Sports Centre	5 lakh	10 ha	8
4	Communication facilities	a.	Head post office with delivery Sub post office	1 in each town	2000 sqm	1
		b.	Delivery sub post office	25000	80 sqm	
		c.	Telephone Exchange	1 in each town/as per technical requirement	5000 sqm	...
		d.	TV, Radio Station	As per technical requirement	2000 sqm	
5	Security Facilities	a.	Police booth, Traffic and Police Control room	At major road intersections	10-12 sqm	...
		b.	Police Post	20,000	2000 sqm	1
		c.	Police Station	1 in each town and one on every 80,000	1 ha	8
6	Electrical and Safety Facilities	a.	Electrical Sub-Station (11 kv)	1 for 15000	500 sqm	...
		b.	Electrical Sub-Station (66 kv)	1 for 100000	6000 sqm	...
		c.	Electrical Sub-Station (220 kv)	1 for 500000	4 ha	...
		d.	Grid Sub-station	1 in each town /as per technical requirement	0.5 ha	...
		e.	Fire Station	5 to 7 km radius	0.5 ha	...
		f.	Disaster Management Centre	1 in each town	As per requirement	...
7	Distributive Services	a.	Milk booth, Fruit and Vegetable booth	10000	50 sqm	...
		b.	LPG, Gas Godown with booking office	30000	500 sqm	...
		c.	Filling station	15000	500 sqm	...

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8	Socio Cultural Facilities	a.	Multipurpose Community Hall which may include provision for marriages, small public gathering, function, eating joint, and library etc	25000	8000 sqm	1
		b.	Recreational Club	5 lakh	5000 sqm	8
		c.	Socio-cultural activities such as auditorium, music, dance & drama centre, meditation & spiritual centre etc.	6 lakh	2 ha	8
		d.	International Convention Centre and Exhibition hall	1 in city with population of 10 lakh and above	10 ha	...
		e.	Public Library	1 in city with population of 10 lakh and above	8000 sqm	...
		f.	Auditorium	1 in each town with population of 5 lakh and above	2 ha	...
		g.	Open Air Theatre	1 in each town with population of 10 lakh and above	2 ha	...
9	Other Community facilities	a.	Old Age Home	5 lakh	3 ha	8
			Care Centre for Physically-Mentally challenged			
			Working women- men hostel			
			Adult Education Centre			
			Orphanage, Children's centre			
		b.	Night Shelter	1 lakh	1000 sqm	3
		c.	Religious site	10000	1000 sqm	1
		d.	Dharamshala	1 lakh	5000 sqm	2
		e.	Taxi Stand	30000	2000 sqm	...
		f.	Dhobi Ghat	2 lakh	4000 sqm
		g.	Public Conveniences	...	50 sqm	1 km
h.	Garbage Collection Centre	...	100 sqm	2 km		
i.	Garbage treatment, processing plant	5 lakh	2 ha	...		
10	Cremation, Burial Ground and Cemetry	a.	Cremation ground, Electric Crematorium	5 lakh	6000 sqm	6
		b.	Burial Ground and Cemetry	5 lakh	2 ha	6
11	Open Spaces	a.	Neighbourhood Park, Playground, Children Park, Tot-Lot	5000	2000 sqm	0.25
		b.	Sector Park	30000	1.5 ha	0.5 km
		c.	District Park, Open Air Gym	3 lakh	5 ha	4
		d.	Town park	1 in each town having population more than 5 lakh	20 ha	...

Note-

- i. The above bench marks are subject to 5% variation.
- ii. Compatible items have been clubbed together and the total of their land requirements has been indicated. No separate land is recommended to be allotted for the individual item which has been clubbed together.

Based on the above threshold population and maximum accessible distance, the composition of typical sector of 100 hectares (247 acres approx.) is indicated in the table 3.9 given below for illustration purposes.

Table 3.9: Recommended Typical Sector Planning

Sr. No	Category		Sub- Category	No. of units	Area (Sqm)
1	Health	a.	Dispensary, Polyclinic	2	1600
		b.	Nursing Home, Child welfare and Maternity Centre	2	6000
		c.	Family Welfare Centre, Health Centre	1	4000
2	Education	a.	Creche, Anganwadi	3	2400
		b.	Nursery cum Primary School	4	20000
		c.	Integrated High School (including primary school)	1	20000
		d.	Integrated High School (including primary school) with hostel facility	1	30000
3	Security Facilities	a.	Police Post	1	2000
4	Electrical and Safety Facilities	a.	Electrical Sub-Station (11 kv)	2	1000
5	Distributive Services	a.	Milk booth, Fruit and Vegetable booth	3	150
		b.	Filling station	2	1000
6	Other Community Facilities	a.	Religious site	3	3000
		b.	Taxi Stand	1	2000
7	Parks and Open Spaces	a.	Neighborhood Park, Playground, Children Park, Tot-Lot	6	12000
		b.	Sector Park	1	15000

The sector is planned for 30,000 persons at the gross density of 300 pph which is the minimum standard recommended to be adopted for future planning. Therefore, the details of areas in a sector shall be in accordance with the percentages indicated in the table 3.10 given below.

Table 3.10: Details of Areas – Residential Sector Planning

Sr.no	Land use	Percentage of Area under use
1	Residential	49
2	Convenient shopping	1
3	Public services, facilities and utilities	12
4	Roads, Pedestrian and cycle tracks	35
5	Exigency/Planning Considerations	3
Total		100

It may be noted from the above table that 49% of the land is utilized for residential purposes. 3% of the land is reserved for exigency/planning considerations as the areas can seldom match the above percentages and there is a need to maintain flexibility in planning.

However, care has to be taken to accommodate and integrate both existing residential areas and the area proposed to be added for a future population for the purpose of overcoming the existing deficiencies in facilities, services and utilities. Similarly, affordability issue needs to be addressed at the first instance to determine high rise and low rise mix of residential development.²⁷

3.10.2 Commercial

Commercial growth is also an important part of the city's overall economic development strategy. It is planned to provide adequate, organized, retail and wholesale trading activity for the city residents. Only the commercial centers such as town centers, district centers and places of wholesale trade need to be reflected on the development plans. Local commercial activity required for day to day functioning of the major land uses is not be reflected on the development plan drawings as they fall in the sub-category of the major land use indicated on the development plans.

It is recommended that only 2-4% of the total urbanisable area should be reserved for town centers, district commercial centers and for wholesale trading activities.

3.10.3 Industrial Land

It is important to provide ample land for expansion or relocation of existing industrial uses in the city apart from land demand for new industries. The need for industrial land is not town centric only. All the product of industries does not get consumed within the town itself. On the contrary, the demand for industrial land depends upon the demand of the surrounding region and other towns. Therefore, a judicious decision needs to be taken in this regard and experience has shown that under normal circumstances 7-10% of the urbanisable land should be reserved for industrial purposes.

²⁷ Haryana Regional Chapter, Panchkula (2017), "Study on Affordable Housing – Challenges and Solutions", Institute of Town Planners India.

3.10.4 Public/ Semi-Public

The public and semi-public land uses are not utilized by the different age groups of the population and in most of the cases they are not under utilization for all days and night. Therefore, there is a strong justification to restrict the land under this use so that the demand is met by going high rise. It is recommended that not more than 6-9% of the urbanisable land should be utilized for this purpose.

3.10.5 Parks and Open Spaces

Provision of such spaces shall be made integral part of the planning as these are the lungs of the city. A town park, District Park and other open spaces except those provided in the residential sectors should not be less than 5-8% of the total urbanisable area.

It is clear that URDPFI Guidelines cannot be applied in totality for each and every town because every town is unique and requiring separate planning approach and considerations. Since, no correlation was found between the land under various uses and the population size of towns, it would be unrealistic to fix the percentage of areas under various uses with mathematical precision. The broad percentages of the land under major land uses as discussed above are given in the following table 3.11.

Table 3.11: Broad Percentage of Land Under Various Uses

Sr.no	Land use	Percentage of area under uses
1.	Residential	47-49
2.	Commercial	2-4
3.	Industrial	7-10
4.	Public/Semi-Public	6-9
5.	Parks and Open Spaces	5-8

Since every town is unique, minor deviations, keeping in view the local conditions can be considered from the above benchmarks.

CHAPTER 4

CONCLUSION

Accurate population projection is the back bone of any planning process. It is also evident that population projections may not tally with the actual population achieved but they can certainly be close to the reality. It is generally felt that the mathematical methods are no longer acceptable. Perhaps the best uses to which the mathematical methods may be put are as checks on analytical methods. The advantage in using mathematical methods is that they are easy to compute, and that they sometimes have "worked." The methods are easy because the technique is to assume a population increase without asking why this increase should take place, and to assume that population trend lines will be static . The fact that these methods have sometimes been successful when used for very short periods of projection is perhaps, due to the fact that this country has enjoyed a fairly stable rate of population increase. Finally, the accuracy depends on the knowledge and experience of the person projecting the population as many subjective decisions are required to be taken. There cannot be unified assumptions for all the towns as every town is unique, but certain broad principles, precautions and practical methods can be laid down, which are as follows.

1. Town is not an island. It has a definite position, both spatially and functionally with reference to other settlements. Therefore, very often it forms a part of a Regional Plan or urbanization policy which assigns the projected population. This does not require any projection of population.
2. Data on birth death and migration should be critically studied to find out the trend. This trend should then be used to project population with accuracy. If the data at town level is not available, data of higher level can be used with caution and diligence.
3. A statistical examination of co relation between population size and growth rates of 101 towns of Haryana has shown that there is no significant co relation between them (annexure 5). Therefore, it is not necessary that as the town grows in size it will increase its growth rate.
4. Similarly, the towns at the lowest ring of population may not show high growth rate because new towns also come into existence having similar employment and economic opportunities.

5. Urban growth dynamism has shown that each big town has its influence area in which smaller towns may not show a higher growth rate. These smaller towns will grow rapidly only when there is spill over of employment and economic activities from the adjoining big size town.
6. The past trend should be studied keeping in mind the external factors such as change in the census boundary of the town which may have affected the growth rate. Sudden change in growth rates need be examined in detail for the causes. The following table 4.1 of Gurugram shows the during 2001 – 2011 the growth rate of the town was high at 283%, partly because the area of the census town had increased by 1674% in this period. The change in the census boundaries when not considered can give a misleading growth rate.

Table 4.1: Growth Rate of Gurugram Town (2001-2011)

	2001*	2011@	Growth Rate (%age)
Population	228820	876,969	283
Area (in Sq.kms)	41.64	738.82	1674

Source:

* Census of India 2001, "General Population Tables Haryana", Directorate of Census Operations Haryana
@ Statistical Abstract of Haryana (2011-12), "Department of Economic and Statistical Analysis Haryana, 2013

7. However, in the absence of ready availability of localized data on births, deaths and migration the growth rate of past decades will continue to be used for quite some time in projecting population.
8. Since, the land surrounding majority of the towns is fertile judicious planning of land use is a must. As a matter of principle all the million plus cities which are the engines of economic growth should opt for high rise development as the land values are also high in these cities. It is clear that high rise development is the call of the day yet we cannot ignore the poor economic status of majority of the migrants to the towns which is not favorable for high rise residential development.

9. The high rise residential development is beyond the affordable limits of majority of migrants. According to the report of "The National Commission on Urbanization", for the vast majority of Urban India, only 7% of our urban population could afford anything taller. Therefore, the main residential land use should be further detailed and phased out.
10. Affordable plotted development can be provided immigrants from villages while all the other residential, institutional, commercial and recreational land use must go for high rise development.
11. The small size towns can adopt low rise development as the land values in these towns are low and most of the immigrants to such towns are from the villages having no experience of living and utilizing the high rise buildings. Therefore, the recommended gross density of the towns should be arrived by the combination of high rise and low rise development. Low-rise and plotted development should be gradually replaced by high rise flatted development. The million plus cities should have only 20% of its residential area under plots measuring less than 100 sqm or low-rise flatted development measuring less than 50 sqm. In general, the hangover of colonial era should be over by now and the government housing should invariably be in the high rise development.
12. It may also be noted that the land uses should be in conformity with the natural growth of the town and in accordance with the economic trends. A review of the town centers of Chandigarh, Gurugram, Panchkula and Faridabad indicates that the commercial activity does not match the area and size of the town centers. Sector 17 of Chandigarh was planned as a town centre, but it is yet to achieve its full potential as a large part of this sector lacks active commercial activity. Similarly, the land for town centers of Gurugram, Panchkula and Faridabad stands acquired for more than three decades yet there is hardly any commercial activity worth its name and stand out as monuments of faulty planning and execution. It is so because excessive commercial land use is provided in sectors, district commercial centers and along the major artery roads.

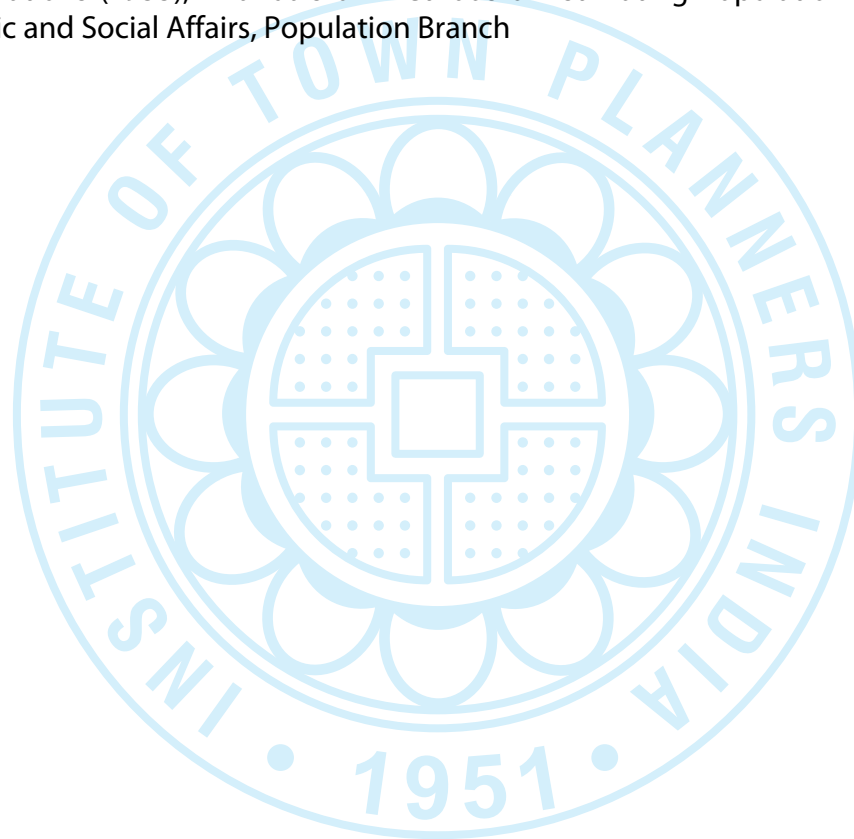
13. Higher density/utilization of land should invariably be proposed in and around the central business districts and major transit routes. The intensity of land utility should thereafter gradually decrease as one goes away from the CBD, and the transit routes. Much will depend upon the professional capability and experience of the professionals in arriving at the most suitable distribution of projected land uses.
14. Normally the plans are prepared for a 20 year period and most of the plans do not contain a provision of interim review. With the result, the land uses are changed very often for no tangible reasons. Every development plan should be reviewed for its population & land uses and phasing only after 10 years and suitable correction done, if required.
15. Under ideal conditions, for accuracy, it would be desirable to start the estimation of land for all the land uses separately. This would ensure that the intensity of land use and other details of floor area ratio etc are taken care of in arriving at the total urbanisable area but this requires the data on the existing land uses with their changing characteristics over a period of time which is not available. Therefore, it is recommended that the local authorities should record the land use of each of the property floor wise and update/verify the same every five years.

References

- Barima Abel O Anarfi "Form, Structure and Morphology of Urban Planning" retrieved from https://www.academia.edu/9468419/FORM_STRUCTURE_AND_MORPHOLOGY_OF_URBAN_PLANNING?auto=download
- Census of India (2001), "Report of the Technical Group on Population Projections constituted by the National Commission on Population", Office of the registrar general & census commissioner, India.
- Delhi Development Authority (2007), "Master Plan for Delhi -2021", Published by Delhi Development Authority, New Delhi.
- "Development Strategies for Sustainable Growth" retrieved from http://www.sage.unsw.edu.au/current_students/ug/projects/Wallace/consolidation.html.
- Environmental Performance Index (2018) retrieved from <http://www.iasparliament.com/current-affairs/environment-biodiversity/environmental-performance-index-2018>.
- Haryana Regional Chapter, Panchkula (2017), "Study on Planning for Pedestrian and Cycle Movement", Institute of Town Planners India.
- Haryana Regional Chapter, Panchkula (2017), "Study on Affordable Housing – Challenges and Solutions", Institute of Town Planners India.
- Module 4 (2006), "Land use", Department of Civil Engineering, Indian Institute of Technology, Bombay retrieved from www.civil.iitb.ac.in/~dhingra/ce751/Module4.pdf.
- Nov 21, 2016,"City Expansions and the Vertical Urbanization approach" retrieved from <https://medium.com/@SunnyKulkarni/city-expansions-and-the-vertical-urbanization-approach-10280a05a01>.
- Plan Pacific, Inc. (2006), 'Technical Resource Study on Land Use Forecast – Island of Maui', Maui County General Plan 2030, Published in the US by Maui County Planning Department .
- S. Divisha, "Article on Population Projections: Meaning, Type and Importance", retrieved from <http://www.sociologydiscussion.com> dated on 12/08/2017.
- Shrivastava O.S. (1994), "Demography and Population Studies", Vikas Publishing House Pvt. Ltd.
- Saleem Sehba (2016), "Issue Related to Vertical Growth and Development" retrieved from <https://www.omicsonline.org/open-access/issue-related-to-vertical-growth-and-development-2168-9717-1000178.pdf>
- Shubham (2014), Article on Population Projection, Planning Tank retrieved from <https://planningtank.com> dated on 12th August, 2017.
- Samaratunga Thushara , Daniel O'Hare "High Density High Rise Vertical Living for Low Income People in Colombo, Sri Lanka: Learning from Pruitt-Igoe" retrieved from https://www.researchgate.net/profile/ThusharaSamaratunga/publication/269863172_High_Density_High_Rise_Vertical_Living_for_Low_Income_People_in_Colombo_Sri_Lanka_Learning_from_Pruitt-Igoe/links/56037d8808ae4accfb8af1c/High-Density-High-Rise-

Vertical-Living-for-Low-Income-People-in-Colombo-Sri-Lanka-Learning-from-Pruitt-Igoe.pdf.

- Springer-Verlag Berlin Heidelberg (2010), "Causes and Consequences of Urban Growth and Sprawl" retrieved from www.springer.com/cda/content/document/cda.
- Town and Country Planning Organization (2015), Urban and Regional Development Plan Formulation and Implementation Guidelines, Ministry of Urban Development, Government of India.
- The Economic Times, (May 09, 2016) "BMC proposes new norms for city's high-rise buildings" retrieved from <https://economictimes.indiatimes.com/wealth/real-estate/bmc-proposes-new-norms-for-citys-high-rise-buildings/article-show/52180268.cms>.
- United Nations (1955), "Manuals on Methods of Estimating Population", Department of Economic and Social Affairs, Population Branch



ANNEXURE- 1

Classification of Use Zones

1. Classification of Use Zones (URDPFI Guidelines)

Sr. No.	Use Zone	Types of Use Zones
1	Residential	Primary Residential Zone Unplanned/Informal Residential Zone
2	Commercial	Retail Shopping Zone General Business and Commercial District Centre Wholesale, Godowns, Warehousing/Regulated Markets Service Sector Regulated/Informal/Weekly Markets
3	Mixed Use	Mixed Industrial Use Zone Mixed Residential Zone Mixed Commercial Zone
4	Manufacturing/ Industry	Service and Light Industry Extensive and Heavy Industry Special Industrial Zone Hazaroudous, Noxious and Chemical
5	Public and Semi Public	Govt. Land Use(Use undetermined) Police Headquarter/Station, Police Line Education and Research Medical and Health Socio Cultural and Religious (including cremation and burial grounds) Utilities and Services
6	Recreational	Playground/Stadium/Sports Complex Parks and Gardens-Public Open Space Multi-open Space (Maidan)
7	Transportation and Communication	Roads/BRTS Railways/MRTS Airport Seaports/Dockyards Bus Depot/Truck Terminals and Freight Complexes Transmission and Communication
8	Agricultural and Water Bodies	Agriculture Forest and Horticulture Poultry and Dairy Farming Rural Settlements Brick Kiln and Extractive Areas
9	Special Area	Old Built up (Core Area) Heritage and Conservation Area Scenic Value Area Government Restricted Area (such as defence) Other Uses/spot zone
10	Protective and Undevelopable Use Zone	Water Bodies Special Recreation Zone/Protective Areas such as sanctuaries/reserve forests and Ecosensitivte Zone Undevelopable Use Zone

Source: URDPFI Guidelines, 2015

2. Classification of Use Zones (Development Plan Haryana)

Sr. No.	Use Zone	Types of Use Zones
1	Residential	Residential Sector on neighborhood pattern
2	Commercial	Retail Trade Wholesale Trade Warehousing and Storage Office and Banks including Government Office Restaurants, Hotels and Transient Boarding Houses including public assistance institutions providing residential accommodation like Dharamshala, Tourist House etc. Cinema and other places of public assembly on a commercial basis. Professional Establishments
3	Industry	Service and Light Industry Extensive and Heavy Industry
4	Transportation and Communication	Railway Yards, Railway Station and Sidings. Roads, Road Transport Depots and Parking Areas Dockyards, Jetties Airport/Air Stations Telephone Exchanges Broadcasting Station Television Station Logistic Parks/Dry Ports including Inland Container Depots and Warehouses
5	Public Utilities	Water Supply installation including treatment plants Drainage and Sanitary installation including Sewage Treatment Plant and disposal works Electric power plants, substation etc. Gas Installation and Gas work. Solid Waste Management Site Cattle Pond, Transfer Station for Solid Waste Management, Slaughter house with meat market, Dairy/Piggery zone, Dog Kennel. Dead carcass
5	Public and Semi Public	Government Administrative Central Secretariat, District Offices, Law Courts, Jails, Police Stations, Governors and President's Residence. Education, Cultural and Religious Institutions Medical and Health Institutions Cultural institution like Theatres, Opera Houses etc. of a predominantly non commercial nature Land belonging to defence
6	Open Spaces	Sports Grounds, Stadium and Play Grounds Parks Green Belts, Garden/Golf Courses and other Recreational Uses. Cemeteries, crematories etc Fuel filling stations and Bus Queue shelters Water bodies/lakes/water recharge zones Mela Ground, multipurpose ground
8	Agricultural Land	Market Garden, Orchards and Nurseries Land under agriculture operation, where no change of land use/license shall be granted. Land Under staple crops Grazing and Land pastures Forest Land.

		Marshy Land Barren Land Land under water Dairy Farming
9	Special Zone - 1 Special Zone - 2	Institutions, offices, recreational building and areas with residential, commercial and other uses ancillary to the main uses mentioned above. Residential & Commercial
10	Natural Conservation Zone	Agriculture and Horticulture, Pisciculture, Social forestry/plantation including afforestation, and Regional recreational activities with no construction exceeding 0.5% of the area with the permission of the competent authority.
11	Mixed Land Use	Residential, Commercial and Industrial

Source: Development Plan of Faridabad (2014)

3. Classification of Use Zones (Delhi Development Authority)

Sr. No.	Use Zone	Types of Use Zones
1	Residential	Residential area Foreign Mission
2	Commercial	Retail Shopping General Business and Commerce District Centre Community Centre Non Hierarchical Commercial Centre Wholesale, Warehousing, Cold Storage and Oil Depot Hotels
3	Industrial	Manufacturing, Service and Repair Industry
4	Recreational	Regional Park City Park, District Park, Community Park Historical Monuments
5	Transportation	Airport Terminal / Depot - Rail / MRTS / Bus / Truck Circulation - Rail / MRTS / Road
6	Utility	Water (Treatment Plant etc.), Sewerage (Treatment Plant etc.), Electricity (Power House, Sub-Station etc.) Solid Waste (Sanitary landfill etc.) Drain
7	Government	President Estate and Parliament House Government Office / Courts Government Land (use undetermined)
8	Public and Semi Public Facilities	Hospital, Education and Research University / University centre, College, Social - Cultural, Socio Cultural Complex / Centre, Police / Police Headquarter / Police Lines, Fire Stations / Disaster Management Centres, Religious, Burial Ground / Cremation. Transmission Site / Centre Sports Facilities / Complex / Stadium / Sports Centre
9	Green Belt/ and Water Body	Plant Nursery Green Belt / Agricultural Green River and Water body

ANNEXURE- 2

Comparative Analysis of URDPFI standards and Proposed Gross Density in Haryana towns

Table 1: Comparative Analysis of URDPFI standards and Proposed Gross Density in Haryana towns

Sr. No.	Town	Population	Gross Density (pph)
SMALL TOWNS			
1	Gual-Pahadi	19000	53
2	Beri	28000	70
3	Nuh	30000	57
4	Talwandi Rana and Behbalpur	32500	85
5	Agroha	40000	53
6	HSIIDC Estate at Alipur	42300	62
7	Ferozpur Jhirkha	46000	53
8	Hathin	46000	62
	Average		61.875
	URDPFI Standard		75-125
MEDIUM TOWNS			
9	Naraingarh	50000	70
10	Meham	51000	67
11	Kalanaur	52000	85
12	Mansa Devi Urban Complex	60000	96
13	Uchana	66000	109
14	Samalkha	67200	89
15	Indri	75000	133
16	Saha	75000	81
17	Dadri	75000	63
18	Assandh	79000	74
19	Gharaunda	80000	95
20	Ganaur	85000	55
21	Safidon	90000	106
22	Bawal	100000	30
23	Dabwali	100000	114
24	Mahendragarh	100000	112
25	Ratia	114500	158
26	Prithla	122000	34
27	Panchkula Extension	124085	102
28	Nilokheri – Taraori	125000	65
29	Farukh Nagar	125000	133
30	Kharkauda	125000	40
31	Narwana	127000	74
32	Shahabad	130000	50

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33	Hansi	150000	82
34	Gohana	150000	32
35	Hodal	170652	126
36	Pataudi-Haily mandi	190000	131
37	Dharuhera	200000	104
38	Tohana	214200	130
39	Kot-Behla	231400	104
40	Narnaul	250000	111
41	Fatehabad	270000	80
42	Sampla	335000	57
43	Bhiwani	360000	99
44	Sirsa	390000	100
45	Palwal	400000	121
46	Rewari	450000	90
47	Taoru	450000	86
48	Kaithal	465000	130
49	Bahadurgarh	484000	102
	Average		91
	URDPFI Standard		100-150
	LARGE CITIES		
50	Jhajjar	500000	90
51	Pinjore-Kalka	500000	131
52	Jind	517000	134
53	Sonipat	576364	80
54	Sohna	640000	90
55	Panipat	700000	115
56	Kurukshetra	750000	110
57	Karnal	900000	112
	Average		108
	URDPFI Standard		100-150
	METRO CITIES		
58	Hisar	1000000	125
59	Ambala City and Cantonment	1024000	173
60	Yamunagar-Jagadhri	1150000	163
61	Rohtak	1300000	89
62	Manesar Bawal Investment Region	3315000	124
63	Faridabad	3886407	113
64	Gurgaon-Manesar Urban Complex	4250000	128.8
	Average		131
	URDPFI Standard		100-150

Source: Development Plans of Haryana

ANNEXURE -3

Comparative Analysis of URDPFI standards and %age of different Landuses in Haryana towns

Table 1: Comparative Analysis of URDPFI standards and %age of different Landuses in Haryana towns

Sr. No.	Town	Population	Landuse (%age)							
			Residential	Commercial	Industrial	Transport & Communication	Public Utilities	Public/Semi-Public	Open Space	Agri/Special Zone
SMALL TOWNS										
1	Gual-Pahadi	19000	21.0	0.0	15.4	8.4	42.7	12.6	0.0	0.0
2	Beri	28000	32.6	7.0	7.0	7.0	12.4	12.4	19.4	2.3
3	Nuh	30000	18.4	6.1	8.0	12.7	7.6	16.5	30.9	0.0
4	Talwandi Rana and Behbalpur	32500	34.0	6.0	0.0	21.0	6.0	15.0	18.0	0.0
5	Agroha	40000	43.8	8.3	9.5	2.2	5.4	20.2	10.7	0.0
6	HSIIDC Estate at Alipur	42300	25.0	1.1	44.0	7.7	0.0	17.7	4.4	0.0
7	Ferozepur Jhirkha	46000	26.5	5.0	12.3	18.1	6.2	10.8	21.1	0.0
8	Hathin	46000	30.3	5.5	15.4	20.7	3.8	7.0	17.2	0.0
	Average		28.9	4.9	13.9	12.2	10.5	14.0	15.2	0.3
	URDPFI Standard		45-50	2-3	8-10	10-12	-	6-8	12-14	Balance
MEDIUM TOWNS										
9	Naraingarh	50000	36.6	6.1	8.03	7.7	4.01	7.22	30.34	0
10	Meham	51000	31.18	5.3	24.94	14.02	2.11	1.88	20.57	0
11	Kalanaur	52000	34.03	4.96	11.7	21.1	4.45	6.81	16.95	0
12	Mansa Devi Urban Complex	60000	45	5.16	0	10.8	1.29	1.93	6.45	29.14
13	Uchana	66000	44.12	5.82	6.02	17.71	7.29	5.01	14.04	0
14	Samalkha	67200	47.47	6.37	19.91	14.86	3.32	1.99	6.08	0
15	Indri	75000	41.52	8.91	8.76	13.29	3.45	6.11	17.96	0
16	Saha	75000	35	4	29	10	2.2	3.3	16.5	0
17	Dadri	75000	55.9	6.79	17.24	4.73	4	8.82	2.49	0
18	Assandh	79000	37.65	11.06	10.23	17.34	3.8	3.99	15.93	0
19	Gharaunda	80000	46.42	5.97	18.14	7.16	6.92	7.64	7.75	0
20	Ganaur	85000	45.49	3.71	27.58	12.32	2.89	4.96	3.05	0
21	Safidon	90000	36.9	6.67	15.48	10	5.48	4.52	20.95	0
22	Bawal	100000	16.67	2.08	43.19	14.86	2.36	7.78	13.06	0
23	Dabwali	100000	52.63	9.94	12.29	9.39	2.23	9.16	4.36	0
24	Mahendragarh	100000	49.83	4.72	11.48	11.13	6.07	7.64	9.11	0
25	Ratia	114500	33.2	10.6	17.84	13.36	6.39	3.24	15.34	0

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				2						
26	Prithla	122000	11.29	1.52	35.49	40.59	2.29	1.32	7.49	0
27	Panchkula Extension	124085	31.1	1.59	8.25	8.64	0.33	6.16	2.32	41.48
28	Nilokheri - Taraori	125000	33	7.98	16.95	13.47	1.59	3.3	15.61	8.1
29	Farukh Nagar	125000	40	3.87	6.83	15.44	4.25	15.38	14.23	0
30	Kharkauda	125000	15.65	4.91	36.05	11.91	2.83	5.6	23.45	0
31	Narwana	127000	40.2	6.1	7.83	12.2	3.28	4.95	12.31	13.13
32	Shahabad	130000	33.9	9.23	11.77	18.27	2.63	3.95	18.74	1.51
33	Hansi	150000	54	4	12	18	5	2	5	0
34	Gohana	150000	37.22	5.01	11.56	14.72	2.19	3.82	25.48	0
35	Hodal	170652	39.72	4.63	12.86	19.34	3.1	4.19	13.16	3
36	Pataudi-Haily mandi	190000	40.69	8.52	5.5	26.67	4.12	5.22	9.28	0
37	Dharuhera	200000	37.85	4.54	32.69	13.11	1.93	0.79	9.09	0
38	Tohana	214200	51.69	4.64	7.91	14.24	5.15	4.69	11.68	0
39	Kot-Behla	231400	42	4.43	21.1	12.79	5.72	3.57	10.39	0
40	Narnaul	250000	44.23	10.0 1	9.64	4.64	7.51	3.54	20.43	0
41	Fatehabad	270000	38.74	4.68	3.66	10.53	5.85	4.53	24.41	7.6
42	Sampla	335000	26.93	3.53	9.65	17.53	2.81	8.97	30.58	0
43	Bhiwani	360000	45.5	5.5	12.5	9.3	7.13	11.5	8.36	0
44	Sirsa	390000	53.64	3.43	17.19	9.5	1.76	7.18	7.3	0
45	Palwal	400000	36.43	7.15	14.79	8.28	1.35	5.2	7.52	19.28
46	Rewari	450000	45.26	7.95	3.98	12.62	4.95	8.05	17.19	0
47	Taoru	450000	26.86	0.14	12.38	16.19	6.67	8.76	20	0
48	Kaithal	465000	50.84	6.92	11.27	6.36	10.79	3.45	10.37	0
49	Bahadurgarh	484000	35.98	5.1	18.54	12.97	4.55	6.29	16.57	0
	Average		39.1	5.7	15.2	13.6	4.0	5.5	13.7	3.0
	URDPFI Standard		43-48	4-6	7-9	10-12	-	6-8	12-14	Balance
LARGE CITIES										
50	Jhajjar	500000	35.95	5.43	13.04	15	6.52	9.21	14.85	0
51	Pinjore-Kalka	500000	28.86	6.38	15.7	11.4	1.5	2.18	33.98	0
52	Jind	517000	45.14	5.4	11.7	12.5	2.61	8.1	14.61	0
53	Sonipat	576364	33.57	14.5 3	22.38	10.08	2.41	8.49	8.54	0
54	Sohna	640000	30.7	4.55	22.07	11.2	4.3	10.23	16.95	0
55	Panipat	700000	42.53	3.74	24.1	7.37	3.1	4.18	8.18	6.8
56	Kurukshetra	750000	35.09	8.12	9.35	16.45	4.31	12.04	14.64	0
57	Karnal	900000	44.3	5.32	6.76	8.94	1.78	19.5	13.4	0
	Average		37.0	6.7	15.6	11.6	3.3	9.2	15.6	0.9
	URDPFI Standard		36-39	5-6	7-8	12-14	-	10-12	14-16	Balance
METRO CITIES										
58	Hisar	1000000	36.85	3.38	12.87	5.68	2.19	31.65	1.52	5.86
59	Ambala City and Cantonment	1024000	56.18	4.2	13.36	4.5	3.16	7.97	8.77	1.86
60	Yamunagar-Jagadhri	1150000	47.5	4.6	19.3	7.4	3	5	13.2	0

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61	Rohtak	1300000	28.81	4.06	14.84	16.45	4.85	10.96	19.36	0.67
62	Manesar Bawal Investment Region	3315000	36.37	4.3	19.62	15.96	1.48	3.53	18.74	0
63	Faridabad	3886407	41.69	6.02	17.98	11.7	1.86	3.78	15.46	1.5
64	Gurgaon-Manesar Urban Complex	4250000	49	5	14	13.4	1.84	6.14	8.87	2.25
	Average		42.3	4.5	16.0	10.7	2.6	9.9	12.3	1.7
	URDPFI Standard		36-38	5-6	7-8	12-14	-	10-12	14-16	Balance



ANNEXURE -4

Space Standards Recommended/Followed by different agencies

Table 1: Space Standards Recommended/Followed by different agencies.

Sr. No	Category	Organization	Sub- Category	Population/ unit	Plot Area (Sq.m)	Plot Area (ha)	Access-ibility	Max. Ground Coverage	Max. FAR	Max. Height	Remarks
1	Health	DDA	Hospital A (501 beds & above)	5 lakh	25000 to 45000	2.5 to 4.5	-	30% + additional 5% for multi level parking (not to be included in FAR)	200	37 m.	-
		URDPFI	Intermediate Hospital (A) (200 beds)	1 lakh	37000	3.7	-	-	-	-	-
		HUDA	Hospital (500 beds)	10 lacs	141640	14	-	-	-	-	-
		DDA	Hospital B (201 beds to 500 beds)	2.5 lakh	15000 to 25000	1.5 to 2.5	-	-	-	-	-
		URDPFI	Intermediate Hospital (B) (80 beds)	1 lakh	10000	1	-	-	-	-	-
		NBC 2016	Intermediate Hospital (B) (80 beds)	1 for 1 lakh	10000	1	-	-	-	-	-
		DDA	Hospital C (101 beds to 200 beds)	1 lakh	5000 to 10000	0.5 to 1.0	-	-	-	-	-
		NBC 2016	Intermediate Hospital (A) (200 beds)	1 for 1 lakh	37000	3.7	-	-	-	-	-
		DDA	Hospital D (Upto 100 beds)	1 lakh	2500 to 5000	0.25 to 0.5	-	-	-	-	-
		HUDA	Hospital (50 bedded)	1 lakh	20234.28	2.02	-	-	-	-	-
		DDA	Other Health Facilities a. i) Maternity Home (Upto 50 beds) ii) Nursing Home/ Polyclinic/ Dispensary (Upto 50 beds)	1 per 0.5 lakh as required and observation beds only	1000 to 2000	0.1 to 0.2	-	30%	150	18m	-
		NBC 2016	Nursing home, child welfare and maternity center (25 to 30 beds)	1 for 45,000 to 1,00,000	2000 to 3000	0.2 to 0.3	-	-	-	-	-
		URDPFI	Nursing home, child welfare and maternity center	1 for 45000 to 1 lakh	2000 to 3000	0.2 to 0.3	-	-	-	-	-
		HUDA	Nursing home	-	418	0.04	-	-	-	-	-
		URDPFI	Polyclinic	1 lakh	2000 to 3000	0.2 to 0.3	-	-	-	-	-
		PUDA	Polyclinic	1 for 1 lakh	10000	1	-	-	-	-	-
		NBC 2016	Poly-clinic with some observation beds	1 for 1 lakh	2000 to 3000	0.2 to 0.3	-	-	-	-	-
		TCP Haryana	Hospital	1 for 1 lakh	121406	12	-	-	-	-	-

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	TCP Haryana	Hospital	1 for 30000	10117	1	-	-	-	-	-
	PUDA	Hospital	1 for 1 lakh	37000	3.7	-	-	-	-	-
	ITPI, SPA & TCPO for Athani town	Hospital	1 for 50,000	20000	2	-	-	-	-	-
	URDPFI	Multi- Speciality Hospital	1 lakh	90000	9	-	-	-	-	-
	URDPFI	Speciality Hospital	1 lakh	37000	3.7	-	-	-	-	-
	NBC 2016	Multi- Speciality Hospital (200 beds)	1 for 1 lakh	90000	9	-	-	-	-	-
	NBC 2016	Speciality Hospital	1 for 1 lakh	37000	3.7	-	-	-	-	-
	Urban Planning and Implementation Manual Ethiopia	District Hospital	1 for 2,50,000	20000	2	-	-	-	-	-
	Urban Planning and Implementation Manual Ethiopia	General Hospital	1 for 10 lakh	10000-11500	1-1.15	-	-	-	-	-
	URDPFI	General Hospital	1 for 2.5 lakh	60000	6	-	-	-	-	-
	NBC 2016	General Hospital	1 for 2.5 lakh	60000	6	-	-	-	-	-
	TCP Haryana	Dispensary	1 for 10,000 to 15,000	5059	0.5	-	-	-	-	-
	URDPFI	Dispensary	1 for 15000	800 to 1200	0.08 to 0.12	-	-	-	-	-
	HUDA	Dispensary		5059	0.5	-	-	-	-	1 in each sector
	PUDA	Dispensary	1 for 15000	2000	0.2	-	-	-	-	-
	ITPI, SPA & TCPO for Athani town	Dispensary	1 for 5000	1000	0.1	-	-	-	-	-
	NBC 2016	Dispensary	1 for 15000	800 - 1200	0.08 to 0.12	-	-	-	-	-
	Urban Planning and Implementation Manual Ethiopia	Health Post	1 for 5000-7000	1100	0.11	<1 km	-	-	-	-
	Urban Planning and Implementation Manual Ethiopia	Health Center	1 for 25000	4500 - 6000	0.45-0.6	<2km	-	-	-	-
	PUDA	Health Center	1 for 50,000	6000	0.6	-	-	-	-	-
	ITPI, SPA & TCPO for Athani town	Health Center	1 for 20,000	4000	0.4	-	-	-	-	-
	URDPFI	Family Welfare Centre	1 for 50,000	500 to 800	0.05 to 0.08	-	-	-	-	-
	NBC 2016	Family Welfare Centre	1 for 50,000	500 to 800	0.05 to 0.08	-	-	-	-	-

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		DDA	b. i) Family Welfare Centre ii) Pediatric Centre iii) Geriatric Centre iv) Diagnostic Centre.	1 per 0.5 lakh	500 to 800	0.05 to 0.08	-	-	-	-	-
		URDPFI	Diagonistic Centre	1 for 50,000	500 to 800	0.05 to 0.08	-	-	-	-	-
		NBC 2016	Diagonistic Centre	1 for 50,000	500 to 800	0.05 to 0.08	-	-	-	-	-
		URDPFI	Veterinary Hospital for pet animals and birds	1 for 5 lakh	2000	0.2	-	-	-	-	-
		NBC 2016	Veterinary Hospital for pets and animals	1 for 5 lakh	2000	0.2	-	-	-	-	-
		URDPFI	Dispensary for pet animals and birds	1 for 1 lakh	300	0.03	-	-	-	-	-
		NBC 2016	Dispensary for pet animals and birds	1 for 1 lakh	300	0.03	-	-	-	-	-
		DDA	a. Veterinary Hospital for pet animals and birds	1 per 5 lakh	2000	0.2	-	30%	150	-	-
		DDA	b. Dispensary for pet animals and birds	1 per 1 lakh	300	0.03	-	30%	100	15 m	-
		HUDA	Veterinary Hospital	1 for each town	2023	0.2	-	-	-	-	-
		DDA	a. Medical College	1 per 10 lakh	As per the Medical Council of India/Ministry of Health norms (subject to availability of land)	As per the Medical Council of India/Ministry of Health norms (subject to availability of land)	-	-	-	-	-
		DDA	b. Nursing and Paramedic Institute	1 per 10 lakh	2000 sqm (subject to Nursing Council of India, Ministry of Health norms)	0.2	-	30%	150	18 m	-
		ITPI, SPA & TCPO for Athani town	District Tuberculosis Centre	1 for 10 to 20 lakh	20000	2	-	-	-	-	-
2	Education	TCP Haryana	Creche	1 for 10,000 to 15,000	809	0.08	-	-	-	-	-
		PUDA	Creche	1 for 25,000	500	0.05	-	-	-	-	-
		HUDA	Creche/Nursery School		2023	0.2	-	-	-	-	1 in each sector
		TCP Haryana	Nursery School	1 for 2500	809	0.08	-	-	-	-	-
		ITPI, SPA & TCPO for Athani town	Nursery School	1 for 1500	2000	0.2	-	-	-	-	-
		ITPI, SPA & TCPO for Athani town	Basic Primary School	1 for 3500	10000	1	-	-	-	-	-

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		PUDA	Nursery cum Primary School	1 for 5000	3000	0.3	-	-	-	-	-
		Urban Planning and Implementation Manual Ethiopia	Pre-Primary/Nursery	1 for 1000-2500	70-175	0.007 to 0.0175	≤ 400m	-	-	-	-
		URDPFI	Pre-Primary/Nursery	1 for 2500	800	0.08	-	-	-	-	-
		NBC 2016	Pre-Primary/Nursery	1 for 2500	800	0.08	to be located near a park	-	-	-	-
		HUDA	Primary School		4047	0.4	-	-	-	-	4 in each sector
		Urban Planning and Implementation Manual Ethiopia	Kindergarten	1 for 1000-2500	500-3000	0.05 to 0.3	≤ 1km	-	-	-	-
		Urban Planning and Implementation Manual Ethiopia	Primary education	1 for 12,000-18,000	15000 - 25000	1.5 -2.5	≤ 3km	-	-	-	-
		URDPFI	Primary School	1 for 5000	4000	0.4	-	-	-	-	-
		NBC 2016	Primary School	1 for 5000	4000	0.4	-	-	-	-	-
		DDA	Primary School/Middle School	5000	2000	0.2	-	30%	120	15 m	-
		TCP Haryana	Primary School	1 for 5000	4047	0.4	-	-	-	-	-
		TCP Haryana	High School	1 for 10,000 to 15,000	20234	2.02	-	-	-	-	-
		Urban Planning and Implementation Manual Ethiopia	Secondary education	1 for 10,000 to 15,000	25000 - 60000	2.5-6	3-5 km	-	-	-	-
		URDPFI	Sr. Secondary School	1 for 7500	18000	1.8	-	-	-	-	-
		NBC 2016	Sr. Secondary School	1 for 7500	18000	1.8	-	-	-	-	-
		DDA	Sr. Secondary School	10000	6000	0.6	-	35%	150	18m	-
		HUDA	Higher Secondary School		20234	2.02	-	-	-	-	2 in each sector
		PUDA	Higher Secondary School	1 for 15,000	16000	1.6	-	40%	1	15 m	-
		ITPI, SPA & TCPO for Athani town	Higher Secondary School	1 for 15,000	20000	2	-	-	-	-	-
		Urban Planning and Implementation Manual Ethiopia	Post Sec. education or specialized high schools	1 for 10,000 to 6,00,000	25000 - 60000	2.5-6	3-5 km	-	-	-	-
		URDPFI	Integrated School without hostel facility	1 for 90,000 to 1 lakh	35000	3.5	-	-	-	-	-

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		NBC 2016	Integrated School without hostel facility	1 for 90,000 to 1 lakh	35000	3.5	-	-	-	-	-
		URDPFI	Integrated School with hostel facility	1 for 90,000 to 1 lakh	39000	3.9	-	-	-	-	-
			Integrated School with hostel facility	1 for 90,000 to 1 lakh	39000	3.9	-	-	-	-	-
		DDA	School for Mentally/Physically Challenged	1 lakh	2000	0.2	-	50%	120	12.5m	-
		URDPFI	School for Physically Challenged	1 for 45,000	7000	0.7	-	-	-	-	-
		NBC 2016	School for children with disabilities	1 for 45,000	7000	0.7	-	-	-	-	-
		URDPFI	School for Mentally Challenged	1 for 10 lakh	2000	0.2	-	-	-	-	-
		NBC 2016	School for children with intellectual and developmental disabilities	1 for 10 lakh	2000	0.2	-	-	-	-	-
		HUDA	School for handicapped	1 for 5 lakh	-	-	-	-	-	-	1 in each sector
		URDPFI	Technical Education Centre	1 for 10 lakh	40000	4	-	-	-	-	-
		NBC 2016	Technical Education Centre	1 for 10 lakh	40000	4	-	-	-	-	-
		ITPI, SPA & TCPO for Athani town	Technical Institution	1 for 50,000	50000	5	-	-	-	-	-
		DDA	Vocational Training Centre: ITI/ Polytechnic/ Vocational Training Institute/ Management Institute/ Teacher Training Institute etc.	5 lakh	4000	0.4	-	35%	150	26m	-
		DDA	General College	5 lakh	As per norms of the concerned professional governing bodies.	As per norms of the concerned professional governing bodies.	-	35%	150	26m	-
		TCP Haryana	College	1 for 1 lakh	60703	6.07	-	-	-	-	-
		HUDA	College	1 for 1 lakh	40469	4.04	-	-	-	-	-
		URDPFI	College	1 for 1.25 lakh	50000	5	-	-	-	-	-
		NBC 2016	College	1 for 1.25 lakh	50000	5	-	-	-	-	-
		PUDA	College	1 for 1 lakh	40000	4	-	-	-	-	-
		ITPI, SPA & TCPO for Athani town	College	1 for 50,000	30000 - 40000	3 to 4	-	-	-	-	-

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		URDPFI	Professional College (Engineering college)	1 for 10 lakh	60000	6	-	-	-	-	-
		NBC 2016	Professional College (Engineering college)	1 for 10 lakh	60000	6	-	-	-	-	-
		DDA	Professional College (Engineering college)	5 lakh	As per the AICTE norms.	As per the AICTE norms.	-	35%	150	26m	-
		NBC 2016	Other Professional Colleges	1 for 10 lakh	20000	2	-	-	-	-	-
		URDPFI	Medical College	1 for 10 lakh	150000	15	-	-	-	-	-
		NBC 2016	Medical College	1 for 10 lakh	150000	15	-	-	-	-	-
		URDPFI	Nursing and Paramedical Institute	1 for 10 lakh	2000	0.2	-	-	-	-	-
		NBC 2016	Nursing and Paramedical Institute	1 for 10 lakh	2000	0.2	-	-	-	-	-
		URDPFI	University Campus		100000 - 600000	10 to 60	-	-	-	-	-
		NBC 2016	University Campus		100000 - 600000	10 to 60	-	-	-	-	-
		DDA	University Campus including International Education Centre (IEC)	4 sites in urban extension.	200000	Upto 20	-	30%	120	33m	-
3	Sports Facilities	DDA	Divisional Sports Centre	10 lakh	300000	30	-	-	-	-	-
		URDPFI	Divisional Sports Centre	10 lakh	200000	20	-	-	-	-	-
		NBC 2016	Divisional Sports Centre	10 lakh	200000	20	-	-	-	-	-
		DDA	District Sports Centre	5 lakh	100000	10	-	-	-	-	-
		URDPFI	District Sports Centre	1 lakh	80000	8	-	-	-	-	-
		NBC 2016	District Sports Centre	1 lakh	80000	8	-	-	-	-	-
		DDA	Community Sports Centre	1 lakh	30000	3	-	-	-	-	-
		DDA	Neighborhood Play area	10,000	10,000	1	-	-	-	-	-
		URDPFI	Neighborhood Play area	15,000	15,000	1.5	-	-	-	-	-
		NBC 2016	Neighborhood Play area	15,000	15,000	1.5	-	-	-	-	-
		DDA	Housing Area Play Ground	5,000	5,000	0.5	-	-	-	-	-
		URDPFI	Residential unit play area	5,000	5000	1	-	-	-	-	-
		NBC 2016	Residential unit play area	5,000	5000	1	-	-	-	-	-
		HUDA	Stadium/Sports	1 for 2.5 to 5	40,469	4	-	-	-	-	-

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			Complex	lakh							
4	Communica tion Facilities	DDA	Head Post Office with Administrative office & with / without delivery office.	10 lakh	2500	0.25	-	30%	120	26m	-
		ITPI, SPA & TCPO for Athani town	Post and Telegraph office	1 for 10,000	1000	0.1	-	-	-	-	-
		NBC 2016	Post office counter without delivery	1 for 15000	85	0.0085	-	-	-	-	-
		NBC 2016	Head Post Office and Administrative office	1 for 5 lakh	2500	0.25	-	-	-	-	-
		NBC 2016	Head Post Office with delivery office	1 for 250000	750	0.075	-	-	-	-	-
		TCP Haryana	Sub Post Office	1 for 10,000 to 15,000	40	0.004	-	-	-	-	-
		PUDA	Sub Post Office	1 for 25,000	80	0.008	-	-	-	-	-
		TCP Haryana	Telephone Exchange	1 for 1 lakh	4047	0.4	-	-	-	-	-
		DDA	Telephone Exchange	10 lakh	2500	0.25	-	30%	120	26m	-
		PUDA	Telephone Exchange	1 for 1 lakh	8000	0.8	-	-	-	-	-
		NBC 2016	Telephone Exchange	1 for 4 lakh	40000	4	-	-	-	-	-
		DDA	RSU (Remote Subscriber Unit)	1 for 3Km radius	300	0.03	-	30%	100	12.5m	-
		NBC 2016	RSU (Remote Subscriber Unit)	1 for 3Km radius	300	0.03	-	-	-	-	-
		NBC 2016	Radio/TV Station	1 for 5 to 8 lakh	1700	0.17	-	-	-	-	-
5	Security Facilities	DDA	Police Post	1.0 lakh	1000	0.1	-	35%	120	15m	-
		TCP Haryana	Police Post	1 for 30,000	4047	0.4	-	-	-	-	-
		URDPFI	Police Post	1 for 40,000 to 50,000	1600	0.16	-	-	-	-	-
		NBC 2016	Police Post	1 for 40,000 to 50,000	1600	0.16	-	-	-	-	-
		HUDA	Police Post		2023	0.2	-	-	-	-	1 in each sector
		PUDA	Police Post	1 for 30,000	2000	0.2	-	-	-	-	-
		DDA	Police Station	2.5 lakh	5000	0.5	-	30%	120	26m	-
		TCP Haryana	Police Station	1 for 1 lakh	8094	0.8	-	-	-	-	-
		URDPFI	Police Station	1 for 90,000	15000	1.5	-	-	-	-	-
		NBC 2016	Police Station	1 for 90,000	15000	1.5	-	-	-	-	-
		HUDA	Police Station	1 for every 4 sectors	8094	0.8	-	-	-	-	-

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		PUDA	Police Station	1 for 1 lakh	8000	0.8	-	-	-	-	-
		ITPI, SPA & TCPO for Athani town	Police Station	1 for 10,000	2000	0.2	-	-	-	-	-
		ITPI, SPA & TCPO for Athani town	Police Station (major)	1 for 50,000	8000	0.8 (including staff quarters)	-	-	-	-	-
		DDA	District Office and Battalion	1 for each administrative zone	10000	1	-	30%	120	26m	-
		URDPFI	District Office and Battalion	10 lakh	48000	4.8	-	-	-	-	-
		NBC 2016	District Office and Battalion	10 lakh	48000	4.8	-	-	-	-	-
		DDA	Police Lines	1 for each administrative zone	20000	2	-	-	-	-	-
		URDPFI	Police line	20 lakh	40000 - 60000	4 to 6	-	-	-	-	-
		NBC 2016	Police line	20 lakh	40000 - 60000	4 to 6	-	-	-	-	-
		DDA	District Jail	25.0 lakh	50000	5	-	30%	120	24m	-
		URDPFI	District Jail	10 lakh	100000	10	-	-	-	-	-
		NBC 2016	District Jail	10 lakh	100000	10	-	-	-	-	-
		DDA	Police Training Institute / College	City level (to be located in fringe area)	50000	5	-	30%	120	26m	-
		URDPFI	Police Training Institute / College	City level (to be located in fringe area)	50000	5	-	-	-	-	-
		NBC 2016	Police Training Institute / College	1 at City level (to be located in fringe area)	50000	5	-	-	-	-	-
		DDA	Police Firing Range (temporary structures only)	City level (to be located in fringe area)	100000	Upto 10	-	12.5%	25	9m	-
		URDPFI	Police Firing Range (temporary structures only)	City level (to be located in fringe area)	100000	Upto 10	-	-	-	-	-
		NBC 2016	Police Firing Range (temporary structures only)	City level (to be located in fringe area)	100000	Upto 10	-	-	-	-	-
		DDA	Police camp (temporary structures only)	City level (to be located in fringe area)	100000	Upto 10	-	12.5%	25	9m	-
		URDPFI	Police camp including CPO/Security forces	City level (to be located in fringe area)	100000	Upto 10	-	-	-	-	-

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		NBC 2016	Police camp including CPO/Security forces	City level (to be located in fringe area)	100000	Upto 10	-	-	-	-	-
		NBC 2016	Police booth (to be provided by transport planners)	-	10 to 12	0.001 to 0.0012	At major road intersections	-	-	-	-
		DDA	Traffic and police control room (temporary structures only)	As per requirement	As per requirement	As per requirement	-	-	-	-	-
		URDPFI	Civil defence and home guards	10 lakh	20000	2	-	-	-	-	-
		NBC 2016	Civil defence and home guards	10 lakh	20000	2	-	-	-	-	-
6	Safety (Fire) Facilities	DDA	Fire Station	5 to 7 km radius	10000	1	-	30%	120	26m	-
		TCP Haryana	Fire Station	1 for 1 lakh	8094	0.8	-	-	-	-	-
		URDPFI	Fire Station	1 for 2 lakh	10000	1 ha with resi. Accomodation	-	-	-	-	-
		NBC 2016	Fire Station	1 for 2 lakh	10000	1 ha with resi. Accomodation	1 within 5 to 7 km radius	-	-	-	-
		HUDA	Fire Station	1 for 2.5 lakhs 1 for 2.5 to 5 lakhs 1 for more than 5 lakhs	8094 10117 10117	0.8 1 1	-	-	-	-	-
		ITPI, SPA & TCPO for Athani town	Fire Station	1 for 50,000	8000	0.8	-	-	-	-	-
		NBC 2016	Sub fire station/fire post		6000	0.6	1 within a radius of 3 to 4 km	-	-	-	-
		TCP Haryana	Grid Sub-station	1 for 1 lakh	5059	0.5	-	-	-	-	-
		HUDA	Grid Sub-station	1 for 2.5 lakh	8094	0.8	-	-	-	-	-
		ITPI, SPA & TCPO for Athani town	Electricity Sub-station	1 for 50,000	2000	0.2	-	-	-	-	-
		NBC 2016	Electrical Sub-Station (11 kv)	1 for 15000	500	0.05	-	-	-	-	-
		NBC 2016	Electrical Sub-Station (66 kv)	1 for 100000	6000	0.6	-	-	-	-	-
		NBC 2016	Electrical Sub-Station (220 kv)	1 for 500000	40000	4	-	-	-	-	-

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		DDA	Disaster Management Centre	One in each Administrative Zone	10000	1.0 Ha along with suitable open area (2Ha) for soft parking, temporary shelter, parade ground etc	-	30% (on building area only)	120	26m	-
		URDPFI	Disaster Management Centre	One in each Administrative Zone	10000	1.0 Ha along with suitable open area (2Ha) for soft parking, temporary shelter, parade ground etc	-	-	-	-	-
		NBC 2016	Disaster Management Centre	One in each Administrative Zone	10000	1.0 Ha along with suitable open area (2Ha) for soft parking, temporary shelter, parade ground etc	-	-	-	-	-
		DDA	Fire Training Institute / College	City level (one site in urban extension)	30000	3	-	30%	120	26m	-
		URDPFI	Fire Training Institute / College	City level (one site in urban extension)	30000	3	-	-	-	-	-
		NBC 2016	Fire Training Institute / College	City level (one site in urban extension)	30000	3	-	-	-	-	-
7	Distributive Services	DDA	Milk Booth /Milk and Fruit & Vegetable Booth	1 per 5000 population	-	-	-	Permitted in all zones as per approved layout plan			-
		NBC 2016	Fruit and vegetable distribution booth	1 booth for every 5000 population	250	0.025	-	-	-	-	-
		URDPFI	Milk Distribution	1 per 5000 population	150	0.015	-	-	-	-	-
		NBC 2016	Milk Distribution	1 per 5000 population	150	0.015	-	-	-	-	-
		HUDA	Milk booth		12	0.0012	-	-	-	-	2 in each sector
		URDPFI	LPG godown/ Gas Godown	1 for 40,000 to 50,000	520	0.052	-	-	-	-	-
		NBC 2016	LPG godown/ Gas Godown	1 for 40,000 to 50,000	520	0.052	-	-	-	-	-
		DDA	LPG godown including booking office	3 LPG Godowns per 1 lakh population	-	-	-	-	-	-	-
		DDA	SKO / LDO outlets	As per standard design of the concerned department	-	-	-	-	-	-	-

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		ITPI, SPA & TCPO for Athani town	Filling Station	1 for 15,000	500	0.05	-	-	-	-	-
		ITPI, SPA & TCPO for Athani town	Filling cum Service Station	1 for 25,000	1000	0.1	-	-	-	-	-
8	Socio-Cultural Facilities	DDA	Multipurpose Community Hall which may include provision for marriages, small public gathering, function, eating joint, and library etc	10000	2000	0.2	-	30%	120	20m	-
		URDPFI	Anganwadi	1 per 5000 population	200-300	0.002 to 0.003	-	-	-	-	-
		NBC 2016	Anganwadi	1 per 5000 population	200-300	0.002 to 0.003	-	-	-	-	-
		URDPFI	Community room	1 per 5000 population	750	0.075	-	-	-	-	-
		NBC 2016	Community room	1 per 5000 population	750	0.075	-	-	-	-	-
		URDPFI	Community hall	1 for 15,000	2000	0.2	-	-	-	-	-
		NBC 2016	Community hall	1 for 15,000	2000	0.2	-	-	-	-	-
		TCP Haryana	Community Centre/Club	1 for 10,000 to 15,000	8094	0.8	-	-	-	-	-
		HUDA	Community Centre/Club/Janj Ghar		8094	0.8	-	-	-	-	1 for each sector
		PUDA	Community Centre	1 for 30,000	6000	0.6	-	-	-	-	-
		HUDA	Dharamshala		1672	0.16	-	-	-	-	1 for 5 sectors
		DDA	Banquet Hall	1.0 lakh	800	0.08	-	33.33%	75	15 m	-
		DDA	Community Recreational Club	1.0 lakh	2000	0.2	-	25%	100	26m	-
		URDPFI	Recreational Club	1 lakh	10,000	1	-				-
		NBC 2016	Recreational Club	1 lakh	10,000	2	-				-
		DDA	Recreational Club	5.0 lakh	5000	0.5	-				-
		DDA	Socio-cultural activities such as auditorium, music, dance & drama centre/ meditation & spiritual centre etc.	1.0 lakh	1000	0.1	-	30%	120	18m	-
		URDPFI	Socio-cultural centre/exhibition cum fair ground	10 lakh	150000	15	-	-	-	-	-
		NBC 2016	Socio-cultural centre/exhibition cum fair ground	10 lakh	150000	15	-	-	-	-	-
		URDPFI	Music, Dance and Drama Centre	1 lakh	1000	0.1	-	-	-	-	-

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		NBC 2016	Music, Dance and Drama Centre	1 lakh	1000	0.1	-	-	-	-	-
		URDPFI	Meditation and Spiritual Centre	1 lakh	5000	0.5	-	-	-	-	-
		NBC 2016	Meditation and Spiritual Centre	1 lakh	5000	0.5	-	-	-	-	-
		DDA	Exhibition –cum-Fair Ground	2 sites in new urban extension	400000	Upto 40 ha each	-	20%	20	Subject to statutory clearances	-
		URDPFI	Science Centre	10 lakh	As per requirement	As per requirement	-	-	-	-	-
		NBC 2016	Science Centre	10 lakh	As per requirement	As per requirement	-	-	-	-	-
		URDPFI	International Convention Centre	City level	As per requirement	As per requirement	-	-	-	-	-
		NBC 2016	International Convention Centre	City level	As per requirement	As per requirement	-	-	-	-	-
		HUDA	Public Library	More than 10 lakhs	8094	0.8	-	-	-	-	-
		HUDA	Auditorium	1 for each town	20234	2	-	-	-	-	-
		ITPI, SPA & TCPO for Athani town	Auditorium	1 for 20,000	4000	0.4	-	-	-	-	-
		ITPI, SPA & TCPO for Athani town	Cinema	1 for 20,000	2500	0.25	-	-	-	-	-
		ITPI, SPA & TCPO for Athani town	Community hall and Library	1 for 25,000	7500	0.75	-	-	-	-	-
		ITPI, SPA & TCPO for Athani town	Open Air Theatre	1 for 50,000	8000	0.8	-	-	-	-	-
9	Other Community Facilities	DDA	a) Old Age Home b) Care Centre for Physically-Mentally challenged c) Working women- men hostel d) Night Shelter e) Adult Education Centre f) Orphanage/ Children's centre. (one each)	5 lakh	1000	0.1	-	30%	120	26m	-
		URDPFI	Orphanage/Children's centre. (one each)	10 lakh	1000	0.1	-	-	-	-	-
		NBC 2016	Orphanage/Children's centre. (one each)	10 lakh	1000	0.1	-	-	-	-	-
		URDPFI	Care Centre for Physically-Mentally challenged	10 lakh	1000	0.1	-	-	-	-	-

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		NBC 2016	Centre for support services for persons with disabilities	10 lakh	1000	0.1	-	-	-	-	-
		URDPFI	Working women-men hostel	10 lakh	1000	0.1	-	-	-	-	-
		NBC 2016	Working women-men hostel	10 lakh	1000	0.1	-	-	-	-	-
		HUDA	Working women hostel	1 for each town	4047	0.4	-	-	-	-	-
		URDPFI	Adult Education Centre	10 lakh	1000	0.1	-	-	-	-	-
		NBC 2016	Adult Education Centre	10 lakh	1000	0.1	-	-	-	-	-
		URDPFI	Old Age Home	5 lakh	1000	0.1	-	-	-	-	-
		NBC 2016	Old Age Home	5 lakh	1000	0.1	-	-	-	-	-
		HUDA	Old Age Home	1 for each town	4047	0.4	-	-	-	-	-
		URDPFI	Night Shelter	10 lakh	1000	0.1	-	-	-	-	-
		NBC 2016	Night Shelter	10 lakh	1000	0.1	-	-	-	-	-
		DDA	Religious a) At neighbourhood level b) At sub city level in urban extension	5000 5 lakhs	400 40000	0.04 4	-	35%	70	15m including shikhara	-
		URDPFI	Religious a) At neighbourhood level b) At sub city level in urban extension	5000 10 lakhs	400 40000	0.04 4	-	-	-	-	-
		NBC 2016	Religious a) At neighbourhood level b) At sub city level in urban extension	5000 10 lakhs	400 40000	0.04 4	-	-	-	-	-
		TCP Haryana	Religious building	1 for 10,000 to 15,000	809	0.08	-	-	-	-	-
		ITPI, SPA & TCPO for Athani town	Religious building	1 for 3000	1000	0.1	-	-	-	-	-
		HUDA	Religious sites		836	0.08	-	-	-	-	2 in each sector
		PUDA	Religious sites	1 for 15,000	1000	0.1	-	-	-	-	-
		HUDA	Taxi stand		4047	0.4	-	-	-	-	1 for 2 sectors
		HUDA	Dhobi ghat	1 for 3 lakh	8094	0.8	-	-	-	-	-
		HUDA	Orphanage	1 for 5 lakh	12140	1.21	-	-	-	-	-
10	Cremation Ground, Burial Ground and Cemetery	DDA	Cremation Ground	1 per 5.0 Lakh	10000	1	-	-	-	-	-

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		NBC 2016	Cremation Ground	1 per 5.0 Lakh	25000	2.5	-	-	-	-	-
		HUDA	Cremation/Burial Ground	1 for 5 lakh	24281	2.4	-	-	-	-	-
		DDA	Burial Ground and Cemetery	1 per 10.0 lakh population	10000	1	-	-	-	-	-
		NBC 2016	Burial Ground	1 for 5 lakh	40000	4	-	-	-	-	-
		NBC 2016	Electric Crematorium	1 for large size towns	20000	2	-	-	-	-	-
11	Open Spaces	URDPFI	Housing Area Park	5000	5000	0.5	-	-	-	-	-
		URDPFI	Neighbourhood Park	15000	10000	1	-	-	-	-	-
		ITPI, SPA & TCPO for Athani town	Neighbourhood Park	1 for 5,000	8000	0.8	-	-	-	-	-
		ITPI, SPA & TCPO for Athani town	Neighbourhood Playground	1 for 1,000	2000	0.2	-	-	-	-	-
		URDPFI	Community Park	1 lakh	50000	5	-	-	-	-	-
		URDPFI	District Park	5 lakh	250000	25	-	-	-	-	-
		URDPFI	Sub city Park	10 lakh	1000000	100	-	-	-	-	-
		URDPFI	Sub city level multipurpose ground	10 lakh	80000	8	-	-	-	-	-
		URDPFI	District level multipurpose ground	5 lakh	40000	4	-	-	-	-	-
		URDPFI	Community level multipurpose ground	1 lakh	20000	2	-	-	-	-	-
		HUDA	Children Park		2023	0.2	-	-	-	-	2 in each sector
		ITPI, SPA & TCPO for Athani town	Children Park	1 for 2000	2000	0.2	-	-	-	-	-
		ITPI, SPA & TCPO for Athani town	Tot Lot	1 for 500	500	0.05	-	-	-	-	-
		ITPI, SPA & TCPO for Athani town	Total area required for Parks, Playground and Open spaces	1 for 1000	15000	1.5	-	-	-	-	-

ANNEXURE -5

Growth rate of towns – Haryana

Table 1: Growth rate of towns – Haryana

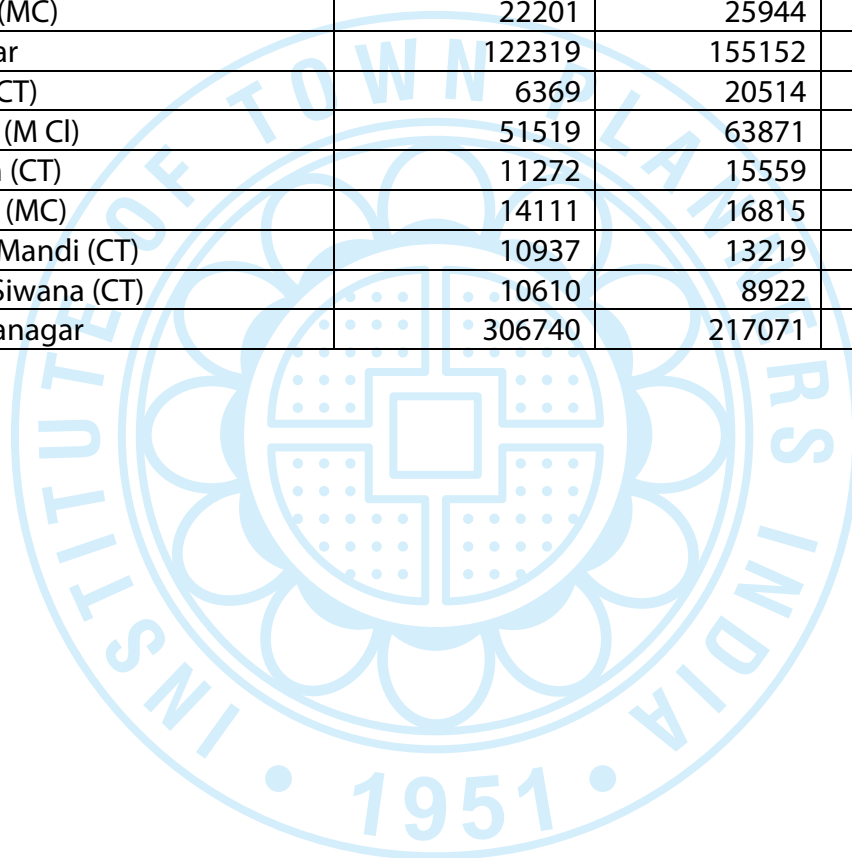
Sr. no.	Name of town	Population 2001	Population 2011	% Increase/Decrease
1	Ambala	168316	195153	16
2	Ambala Cantt. (CB)	61748	55370	-10
3	Ambala city	139279	104974	-25
4	Asan Khurd (CT)	8066	6873	-15
5	Assandh (MC)	22707	27125	19
6	Ateli (MC)	5673	7619	34
7	Babiyal (CT)	21644	26412	22
8	Bahadurgarh	131925	170767	29
9	Barwala (MC)	33132	43384	31
10	Bawal (MC)	12144	16776	38
11	Bawani khera (MC)	17424	20289	16
12	Beri (MC)	16162	15934	-1
13	Bhiwani	169531	196057	16
14	Bilaspur (CT)	9621	11733	22
15	Buria (CT)	9830	10903	11
16	Charkhi Dadri (MC)	44895	56337	25
17	Cheeka (MC)	32128	38952	21
18	Chhachhrauli (CT)	9710	10533	8
19	Dharuhera (MC)	18892	30344	61
20	Ellenabad (MC)	32795	36623	12
21	Farakhpur (CT)	8740	9569	9
22	Faridabad (M Corp)	1055938	1414050	34
23	Farrukhnagar (MC)	9521	13513	42
24	Fatehabad	59917	70777	18
25	Ferozpur jhirka (MC)	17755	24750	39
26	Ganaur (MC)	29006	35603	23
27	Gharaunda (MC)	30172	37816	25
28	Gohana (MC)	48532	65708	35
29	Gurugram	228820	886519	287
30	Hailey Mandi (MC)	17081	20906	22
31	Hansi	75747	86770	15
32	Hassan Pur (MC)	9090	11569	27
33	Hathin (MC)	10916	14421	32
34	Hisar	263186	307024	17
35	HMT Pinjore (CT)	4199	3873	-8
36	Hodal (MC)	38309	50143	31
37	Indri (MC)	14511	17487	21
38	Jagadhri	101290	124894	23

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39	Jhajjar (MC)	39002	48424	24
40	Jhakal Mandi (CT)	6895	7788	13
41	Jind	135855	167592	23
42	Julana (MC)	13635	18755	38
43	Kaithal	117285	144915	24
44	Kalanaur (MC)	16853	23319	38
45	Kalanwali (MC)	25163	22095	-12
46	Kalayath (MC)	17051	18660	9
47	Kalka (MC + OG)	30830	34134	11
48	Kanina (MC)	10195	12989	27
49	Kansepur (CT)	14952	18909	26
50	Kardhan (CT)	9579	18662	95
51	Karnal	221236	302140	37
52	Kharkhoda (MC)	18763	25051	34
53	Ladrawan (CT)	8008	6905	-14
54	Ladwa (MC)	22339	28887	29
55	Loharu (MC)	11421	13937	22
56	Maham (MC)	18174	20484	13
57	Mahendragarh (MC)	24323	29128	20
58	Mandi Dabwali (MC)	53811	52873	-2
59	Mustafabad (CT)	8516	9042	6
60	Nagal Chaudhry (CT)	7368	8538	16
61	Naraingarh (MC)	18210	22832	25
62	Narnaul	62077	74581	20
63	Narnaund (MC)	15116	17242	14
64	Narwana (M CI)	50435	62090	23
65	Nilokheri (MC)	16405	17938	9
66	Nuh (MC)	11039	16260	47
67	Palwal	100722	131926	31
68	Panchkula	140925	211355	50
69	Panipat	354148	295970	-16
70	Panipat Taraf Ansar (CT)	31279	42877	37
71	Panipat Taraf makhdum Zadgan	35155	67998	93
72	Panipat Taraf Rajputan (CT)	18815	28803	53
73	Pataudi (MC)	16085	20418	27
74	Pehowa (MC)	33564	38853	16
75	Pinjore (MC)	29609	35912	21
76	Punahana (MC)	13179	24734	88
77	Pundri (MC + OG)	17018	33484	97
78	Radaur (CT)	11737	13690	17
79	Raipur Rani (CT)	7031	9028	28
80	Rania (MC)	20961	25123	20
81	Ratia (MC)	23826	37152	56
82	Rewari	100684	143021	42

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83	Rohtak	294577	374292	27
84	Sadaura (CT)	13176	14818	12
85	Safidon (MC)	27541	34728	26
86	Samalkha (MC + OG)	29866	39710	33
87	Shahbad (MC)	37289	42607	14
88	Sirsa	160735	182534	14
89	Siwani (MC)	15850	19143	21
90	Sohna (MC)	27570	36552	33
91	Sonipat	225074	289333	29
92	Taoru (MC)	17328	22599	30
93	Taraori (MC)	22201	25944	17
94	Thanesar	122319	155152	27
95	Tilpat (CT)	6369	20514	222
96	Tohana (M CI)	51519	63871	24
97	Tosham (CT)	11272	15559	38
98	Uchana (MC)	14111	16815	19
99	Uklana Mandi (CT)	10937	13219	21
100	Uncha Siwana (CT)	10610	8922	-16
101	Yamunanagar	306740	217071	-29



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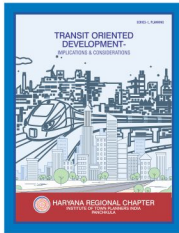
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Landuse Forecasting,
Town Planning Norms and Standards



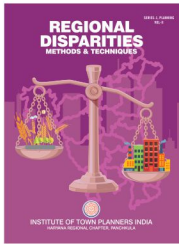
Other Publications of ITPI HRC.....



Series 1, Planning

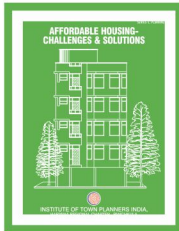
Transit Oriented Development

This study aims to understand the intricacies of TOD concept. It also gives specific recommendations vis-à-vis TOD policy of Haryana.



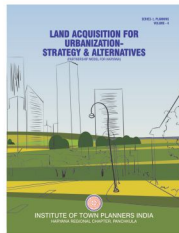
Regional Disparities Methods & Techniques

The study explains the concepts and elaborates the efforts made in attaining balanced development and also prevails upon the methodology and techniques which can be used to identify the level of development.



Affordable House Challenges & Solutions

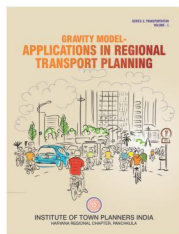
The objective of this study is to understand the challenges and solutions of Affordable Housing.



Land Acquisition for Urbanization – Strategy and Alternatives (Partnership Model for Haryana)

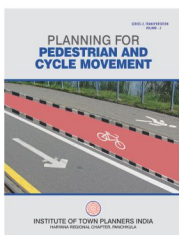
The objective of this study is to understand the land acquisition alternatives for public purposes in order to suggest a balanced framework which caters to the concerns of both demand side players (mainly public agencies) as well as supply side (mainly farmers).

Series 2, Transportation



Gravity Model – Applications in Regional Transport Planning.

The objective of this study is to quantify the pattern of interaction between A class (1 Lakh plus) towns of Haryana in terms of road linkage, to identify the traffic load on roads for augmentation purposes and to suggest the inter town public/private transportation requirements/rationale. It also touches upon the need to rationalize the urban form according to the interaction pattern.



Planning for Pedestrian and Cycle Movement

This study covers the need, importance, problems, solutions and planning aspects relating to pedestrian and cycle movement with their application to Indian studies

About Us...

The Institute of Town Planners, India (ITPI) was established in July 1951 with the objective to advance the study of Town Planning, to promote planned, economic, scientific and artistic development of cities and rural areas, to foster the teaching of subjects related to town planning, to hold conferences and meetings on matters relating to Town & Country Planning and to ascertain and notify the law and practice relating to Town & Country Planning. Presently the Institute has 23 Regional Chapters in various states of the Country and have about five thousand registered Town Planners. It is the apex body of Town Planners and guide the Government in Town Planning matters.

Haryana Regional Chapter (HRC) is one of its Regional Chapters which came into existence in the year 2003. The chapter has 230 town planners and it is actively engaged in promoting the objectives of ITPI by undertaking activities such as workshops, conferences, seminars, publications and research studies. The Chapter has published research studies; Transit Oriented Development-Implications and Considerations; Affordable Housing - Challenges and Solutions; Regional Disparities - Methods and Techniques; Land Acquisition for Urbanization – Strategy and Alternatives (Partnership Model for Haryana); Applications of Gravity Model in Regional Transport Planning and Planning for Pedestrian and Cycle Movement.

This study has been conducted by Ms Rajdeep Kaur and Ms. Gurpreet Kaur, Research Officers, who are B. Tech in Urban and Regional Planning with Masters in Infrastructure Planning under the guidance of Sh. Raj Vir Singh ,M Tech (MRP), LLB,FITP, Ex CTP Haryana Govt., having over 42 years of experience of working in public and private sectors.



INSTITUTE OF TOWN PLANNERS INDIA

HARYANA REGIONAL CHAPTER, PANCHKULA

BAY SITE NO. 59-62, SECTOR-2, PANCHKULA, HARYANA - 134113

Email: itpihrc@gmail.com | Website: www.itpihrc.org.in

Ph: 0172 2570585