# PORTFOLIO

## URBAN AND REGIONAL PLANNING

ARPITA BANERJEE, B.Planning | SCHOOL OF PLANNING AND ARCHITECTURE, NEW DELHI

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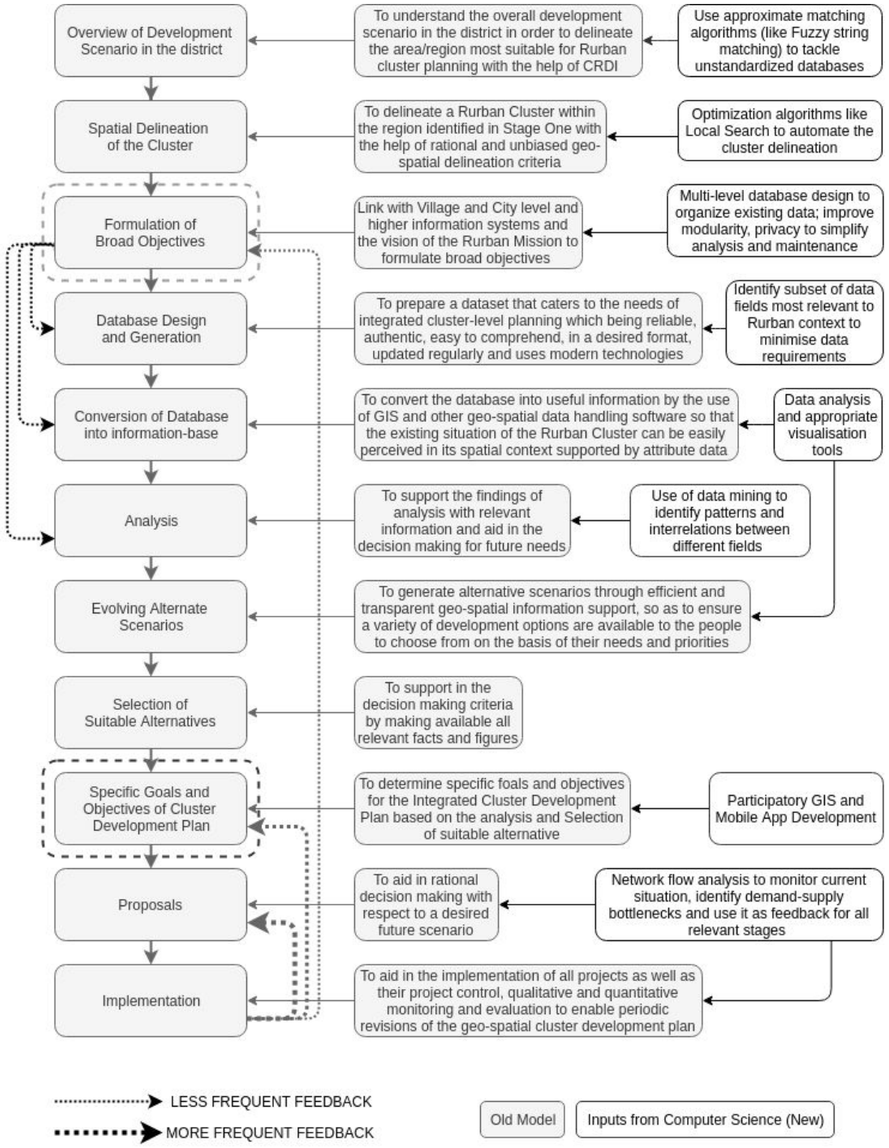
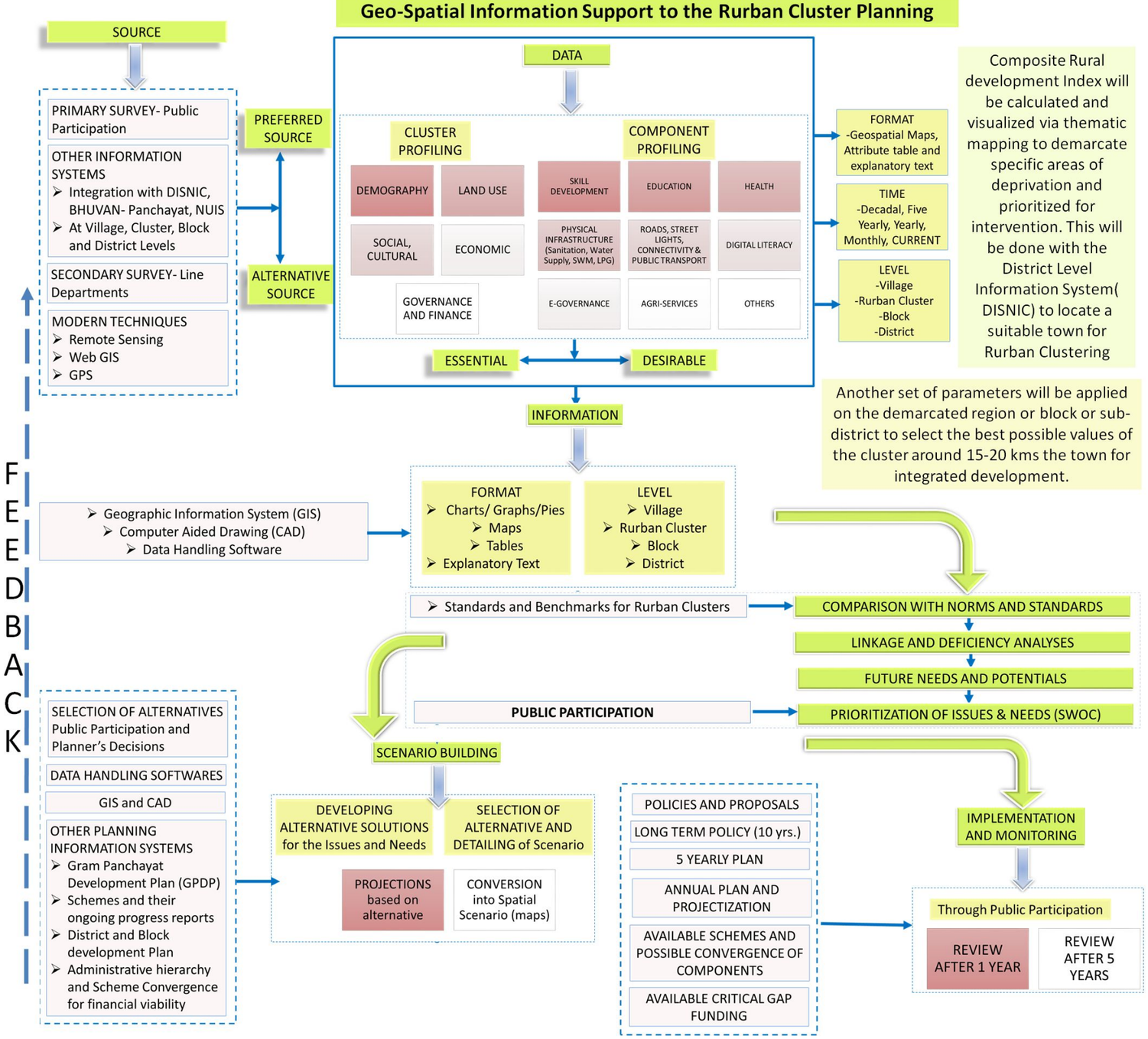
## ACADEMIC & OTHER PROJECTS




## Need for the Study

•Lack of Standardized Spatial Planning Methodology for Rurban Clusters. The concept is new and evolving and thus requires an methodology for integrated planning.
•Lack of Information regarding the present scenario leading to failure of schemes and hindering integrated development.
•Absence of Database Management preventing multi-level planning. No information system or agency to collect/process/analyze data on Rurban Clusters.
•Existing Information Systems in the country have an urban bias and are incapable of handling the unique needs of the Rurban.

## Geo-Spatial Information Support to the Rurban Cluster Planning



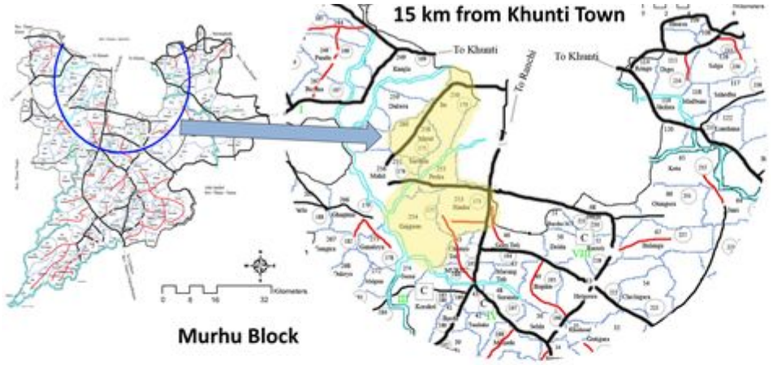

## Objectives of the Study

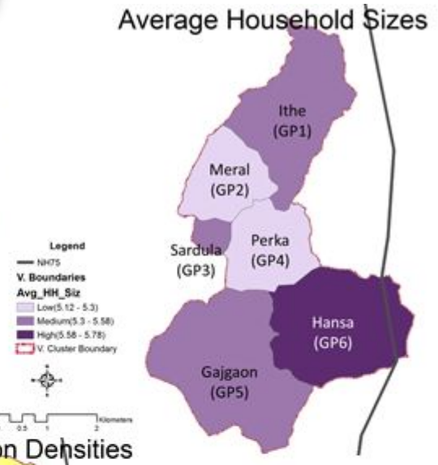
1.To review the existing planning methodologies for Rurban Clusters to develop a standard methodology for Rurban Planning.
2.To develop a conceptual Geo-spatial Information Systems based model to support the planning methodology evolved.
3.To apply the evolved methodology on a study area to test its applicability.
4.To suggest broad measures to improve the existing institutional framework in order to support the standard methodology and the geo-spatial information system model evolved in the above objectives.

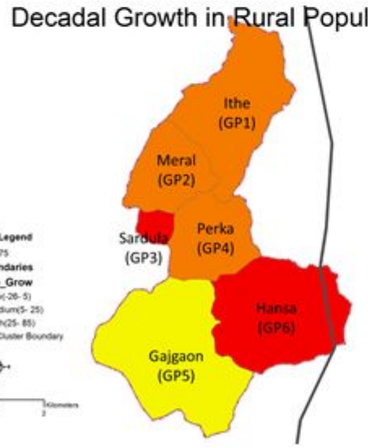
UNDERGRADUATE THESIS

# A MODEL FOR GEO-SPATIAL APPROACH TO PLANNING FOR RURBAN CLUSTERS

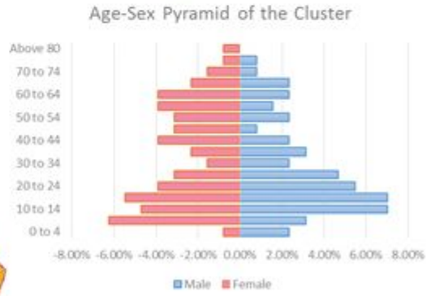
## SOCIAL AND DEMOGRAPHIC PROFILE



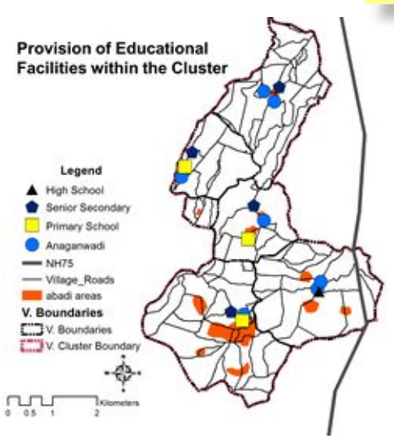



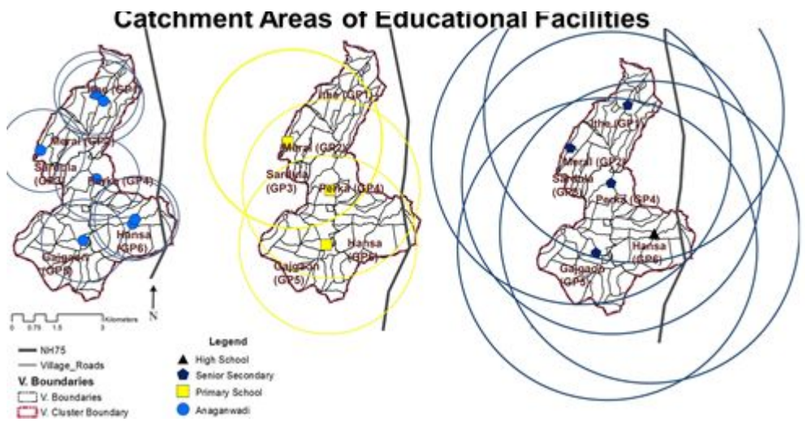








## EDUCATION FACILITIES: COMPONENT PROFILING

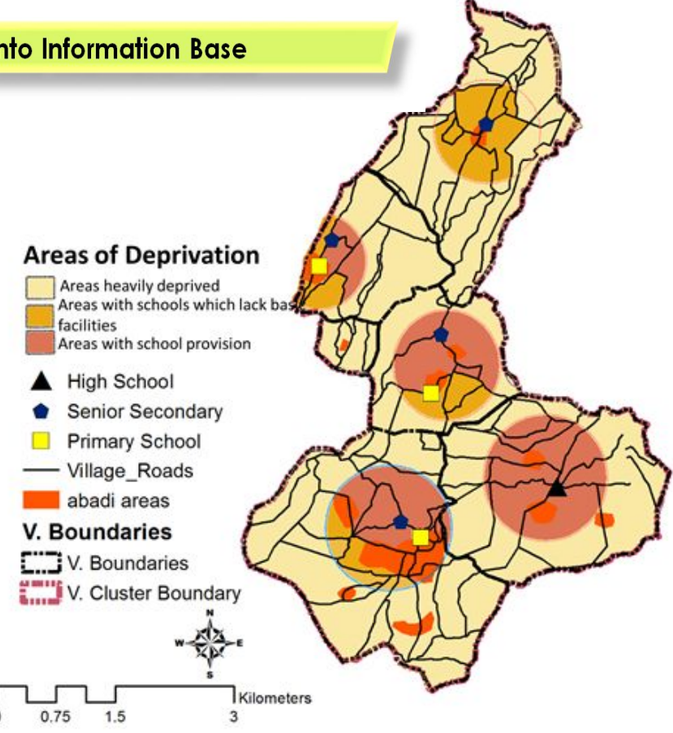



| Name | Total Population | Mobile Phone Coverage | Anganwadi | Community Toilets | All Weather Road | Primary School | Drainage | Daily Newspaper | Industry | High School | Individual Toilets | Admin Office | Power Supply | Health Centres | Street Lights | Sewerage Network | Solid Waste Management | LPG Centre | Market/ Commercial Facility |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Khunti (Town) | 36390 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Hansa (GP6) | 2212 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | □ | ■ | ■ | ■ | □ | □ | □ | □ | □ | □ | □ |
| Gajgaon (GP5) | 1267 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ |
| Ithe (GP1) | 1556 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ |
| Meral (GP2) | 488 | ■ | ■ | ■ | □ | ■ | ■ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ |
| Perka (GP4) | 835 | ■ | ■ | ■ | ■ | ■ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ |
| Sardula (GP3) | 143 | ■ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ |

## Conversion of Data-base into Information Base

| | No. Required | No. Present | Average Distance | Catchment Area | Drop-Out Rates |
|---|---|---|---|---|---|
| **Anganwari** | | | | | |
| GP1 | 1 per 5000 population | 2 | 1/2 km | 2 Km | 15% |
| GP2 | | 1 | 1/2 km | 1 km | 10% |
| GP3 | | NA | 4 km | NA | NA |
| GP4 | | 1 | 1/2 km | 1 KM | 10% |
| GP5 | | 1 | 1/2 km | 1 KM | 10% |
| GP6 | | 2 | 1 kM | 2 KM | 15% |
| Total | 1 | 77 | 0.6 km | 1.4 km | 12% |
| **Primary School** | | | | | |
| GP1 | 1 for every 500 Students | NA | 4KM | NA | NA |
| GP2 | | 1 | 1 KM | 3 Km | 5% |
| GP3 | | NA | 4 km | NA | NA |
| GP4 | | 1 | 1 KM | 3 KM | 5% |
| GP5 | | 1 | 1/2 km | 4 km | 10% |
| GP6 | | NA | NA | NA | NA |
| Total | 2 | 4 | 2.1 km | 3.34 KM | 6.70% |
| **Senior Secondary School** | | | | | |
| GP1 | 1 for every 1000 Students | 1 | 2 Km | 5 KM | 10% |
| GP2 | | 1 | 2 KM | 5 KM | 10% |
| GP3 | | NA | 5 KM | NA | NA |
| GP4 | | 1 | 2 km | 4 KM | 10% |
| GP5 | | 1 | 2 km | 30 KM | 5% |
| GP6 | | NA | 5 KM | NA | NA |
| Total | 1 | 4 | 3.6 KM | 11 KM | 8.70% |
| **High School** | | | | | |
| GP1 | 1 for every 5000 Students | NA | 6 KM | NA | NA |
| GP2 | | NA | 9 KM | NA | NA |
| GP3 | | NA | 5 KM | NA | NA |
| GP4 | | NA | 3 km | NA | NA |
| GP5 | | NA | 2 km | NA | NA |
| GP6 | | 1 | 5 KM | 30 KM | NA |
| Total | 1 | 1 | 5.4 KM | 11 KM | 11.25% |




| No. of Children of School Going Age | | | | |
|---|---|---|---|---|
| Facility | Anganwari | Primary | Secondary | High |
| GP 1 | 35 | 269 | 82 | 70 |
| GP 2 | 10 | 79 | 24 | 21 |
| GP 3 | 3 | 20 | 6 | 5 |
| GP 4 | 15 | 118 | 36 | 31 |
| GP 5 | 32 | 243 | 74 | 63 |
| GP 6 | 45 | 346 | 105 | 90 |
| Total | 140 | 1075 | 327 | 280 |
| Attending | 59 | 280 | 236 | 170 |
| Gap | 81 | 795 | 91 | 110 |
| % | 58% | 74% | 39% | 65% |

The Standardized planning methodology along with the geo-spatial support system (designed database and prescribed geo-spatial techniques) are applied to a tribal cluster in the Khunti District of Jharkhand. Here, the creation of database and its subsequent conversion to information base occurs in two parts: cluster profiling (Cluster Profiling: Demography, Land Use and Land Utilizations, Facilities, Social Profile, Economic Profile, Governance and Finance Profile) and component profiling (Sanitation, SWM and Sewerage, Skill Development, Agro-processing and Agri-services, Upgrading Educational Facilities, Provision of Health, Digital Literacy and E-Governance). For the ease of demonstration, this sheet shows only Demographic and Social Profile partially (from cluster profiling) and Provision of Educational Facilities (from component Profiling). As depicted, the representation of information is primarily geo-spatial in nature which provides spatial insights in decision making. The thesis also looks at a stage-wise comparison of each component with the Integrated Cluster Plan Action Method of the Shyama Prasad Mukherji National Rurban Mission (2016) and depicts how this method is more beneficial than the one in use .

**UNDERGRADUATE THESIS**

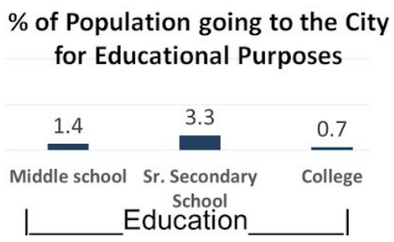
# A MODEL FOR GEO-SPATIAL APPROACH TO PLANNING FOR RURBAN CLUSTERS

# Analysis

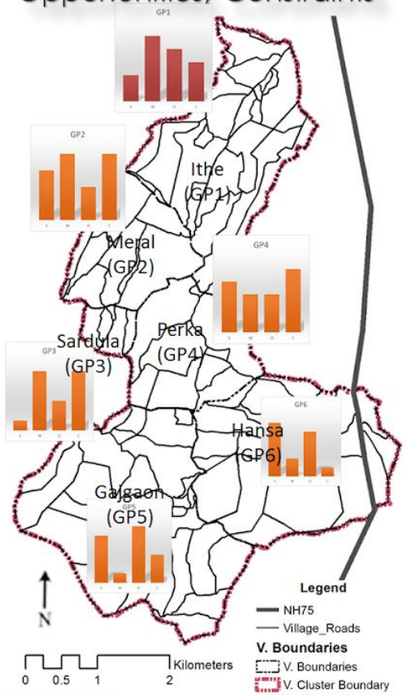
## Deficiency Analysis

| Desirable Standard | Deficiency | | | | | | Cluster Level |
|---|---|---|---|---|---|---|---|
| | GP1 | GP2 | GP3 | GP4 | GP5 | GP6 | |
| Access to education facilities | Considering walkable distance is 1.5km, Primary*, S. Secondary and High Schools are not accessible | | | | | | |
| 100% enrollment in schools at cluster level | Anganwari | | Primary School | | Senior Secondary | | High School |
| | 58% | | 74% | | 39% | | 65% |
| Provision of electricity, water, sanitation, etc. in schools | N/A | N/A | N/A | N/A | N/A | Only Toilet | |


| Village | % Population going to the City | Persons/ Day |
|---|---|---|
| GP1 | 45% | 700 |
| GP2 | 26% | 127 |
| GP3 | 31% | 44 |
| GP4 | 40% | 254 |
| GP5 | 39% | 494 |
| GP6 | 42% | 929 |
| Total | 40.4% | 2549 |




## Analysis: Strengths, Weaknesses, Opportunities, Constraints




| Issues | Strengths | Weaknesses | Opportunities | Challenges | Potentials |
|---|---|---|---|---|---|
| Low levels of Literacy, High Drop-out rates despite adequate provision of schools+ teachers | Adequate provision of schools and teachers are qualified enough to teach. PTR is also adequate. | % Gap: Anganwadi: 58% Primary:74% SS: 39% High School: 65% | Using the school as a tool for skill development and enhancement of digital literacy by providing facilities. | Making schools accessible and inviting for the pupils | Providing bicycles to students who live beyond a threshold radius, regularizing midday meals, electrification + sanitation provision, Computer education and initiative for skill development+ digital literacy |

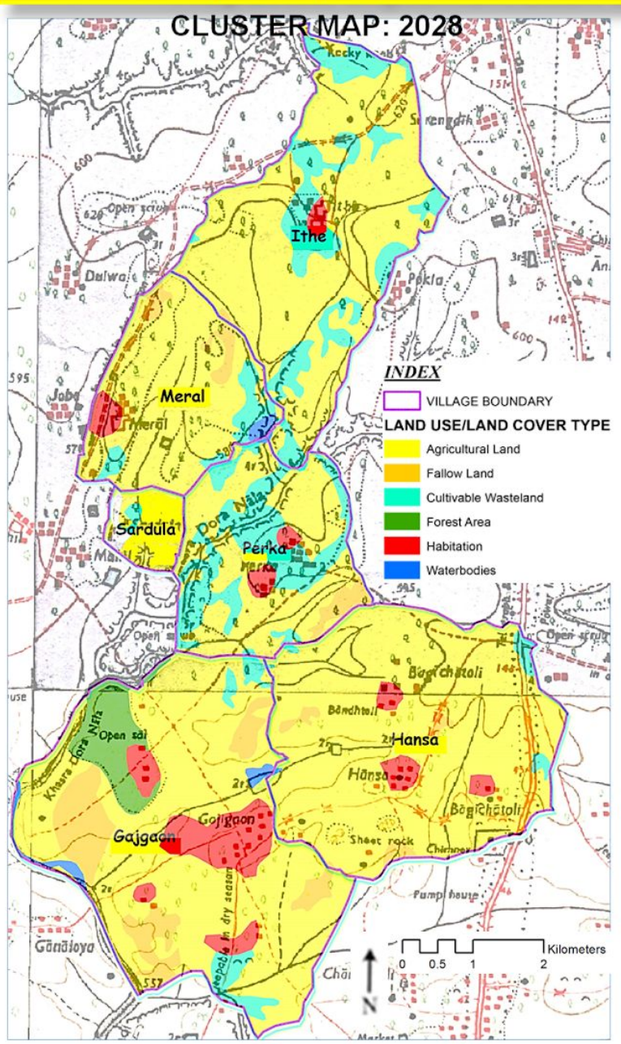
- As we move from north to south, the deficiencies increase. At the same time, the ratio of Strengths: Weakness and Opportunity: Challenge also increases.
- **The Southern Villages ( namely Hansa and Gajgaon) can be developed as Rurban Centres within the Cluster.**
- As we go higher up, the Strengths gradually decrease while the Weaknesses and Challenges increase.
- GP4 shows a unique scenario where both the weaknesses and opportunities are low. There are strengths but with a higher % of challenges in exploiting them due to its interior, removed location.

# Alternative Scenario Building and Selection

| Alternative | Assumptions | Growth Rate | Assigned Population (2018-2028) |
|---|---|---|---|
| Natural Growth of Population | Slow overall growth rate of the cluster in the past (~19%) | 19% | 41200 (Villages: 6180) |
| A comparatively higher Growth Rate | Rurban development would cause the overall cluster to develop at the rate similar to the urban centre (24%) and proximity to Ranchi (State Capital) would further enhance its growth (26.4% growth) | 25% | 43198 (Villages: 6700) |

**The 2nd alternative, commensurate with the objectives of rurban planning is chosen.**

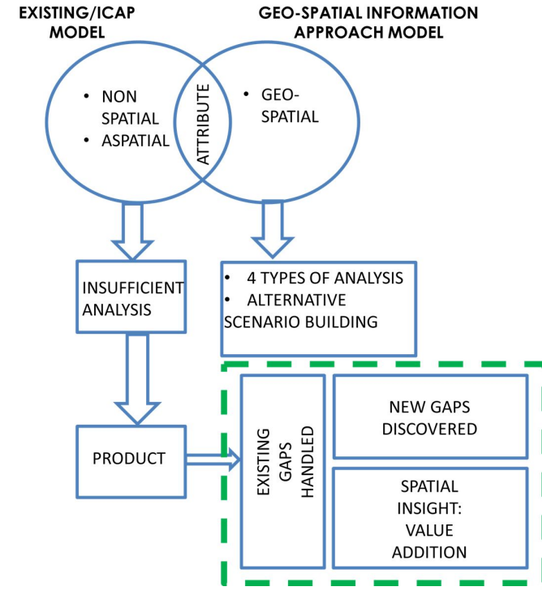
# Proposals, Implementation and Monitoring




The rurban mission had 100% enrollment in Schools, Access to facilities & Provision of water, electricity, sanitation in schools as its goals.**After the study, specific <u>spatial development goals</u> were evolved for the component:**

- **Judging the appropriateness of development with respect to literacy level and % enrollment**
- **Promoting a mix of different facilities**
- **Ensuring appropriate land supply with respect to various uses and activities( of the sector).**
- **Reducing the need to travel and ensuring energy efficiency and sustainable modes of travel**
- **Provision of local services with access to jobs**
- **Meeting the deprivation of educational services**
- **Meeting the deprivation of basic services in educational facilities.**

## Comparison of the Model with the old ICAP Method




The Standardized planning methodology along with the geo-spatial support system enables types of analyses which were impossible in the old ICAP method. New Stages such as alternative Scenario Building and Selection were added and stress on public participation is put on every step through e-governance strategies. Finally, geo-spatially referenced proposals were evolved which were better oriented to suit the needs of the people. Diagram (bottom right corner) shows the efficiency of the new v/s old method.

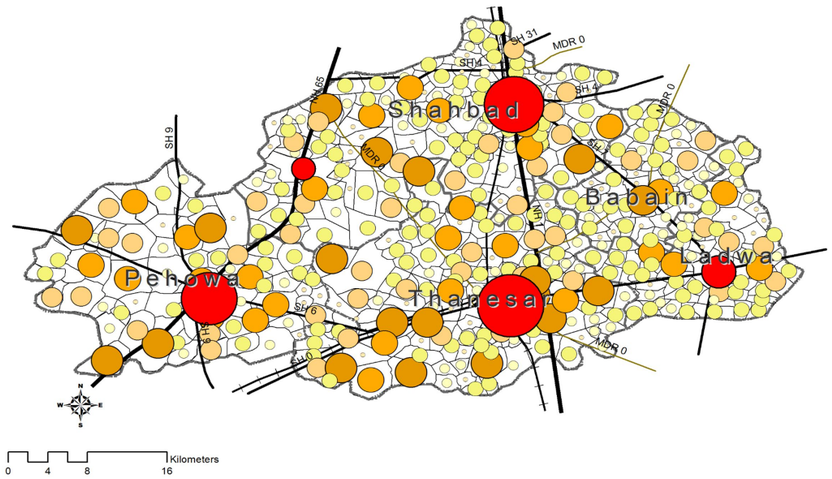
**UNDERGRADUATE THESIS**

# A MODEL FOR GEO-SPATIAL APPROACH TO PLANNING FOR RURBAN CLUSTERS

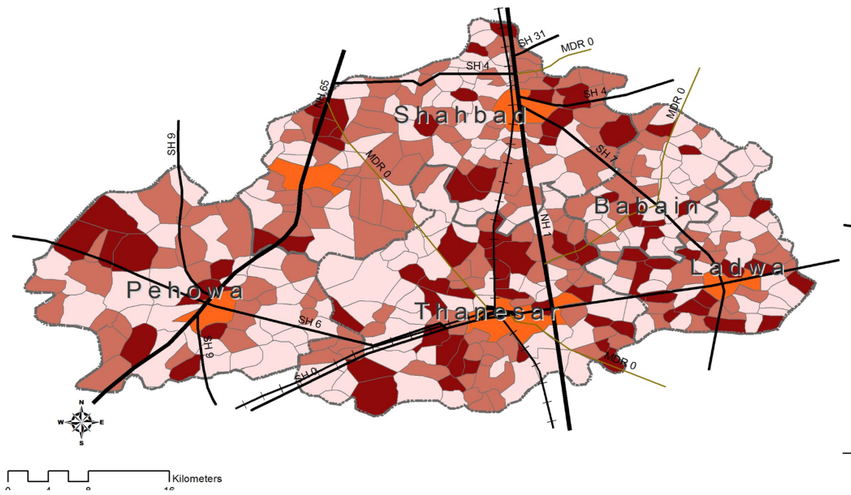
| Criteria | Baseline | Comparison |
|---|---|---|
| **Population density (persons per sq. Km)** | 630 ppsq.km | • **Baseline is the District Average for the Criteria**<br>• Low ( less than 70% of Baseline)<br>• Moderate (70-100% of Baseline.<br>• High ( Greater than Baseline) |
| **Decadal population growth (2001 – 2011)** | 23.3% | |
| **Sex ratio** | 888 females per 1000 males | |
| **Literacy rate** | 76.31% | |
| **Percentage of SC population** | 25.32% | |
| **Accessibility through roads** | Villages within 2 km of national and state highways, district roads. | |

| Criteria | Baseline | Comparison |
|---|---|---|
| **Work Force Participation Rate** | 37% | • Low ( less than 70% of Baseline)<br>• Moderate (70-100% of Baseline.<br>• High (> Baseline) |
| **Proportion of non-agricultural workers** | 54% of Total WFPR | |
| **Irrigated area (percentage of the total area)** | 69.4% | |
| **Provision of educational and health facilities**<br>**Facility** **Standards as per URDPFI Guidelines**<br>Anganwari 1 per 5000 pop<br>Pre-primary <200 students(2,500 population)<br>Primary 500 students (5000 population)<br>SS/Middle School 1000 Students(7,500 population)<br>1 Health subcentre 5000 population | | • Provision less than norms,<br>• According to norms,<br>• Provision greater than required ( as per norms). |

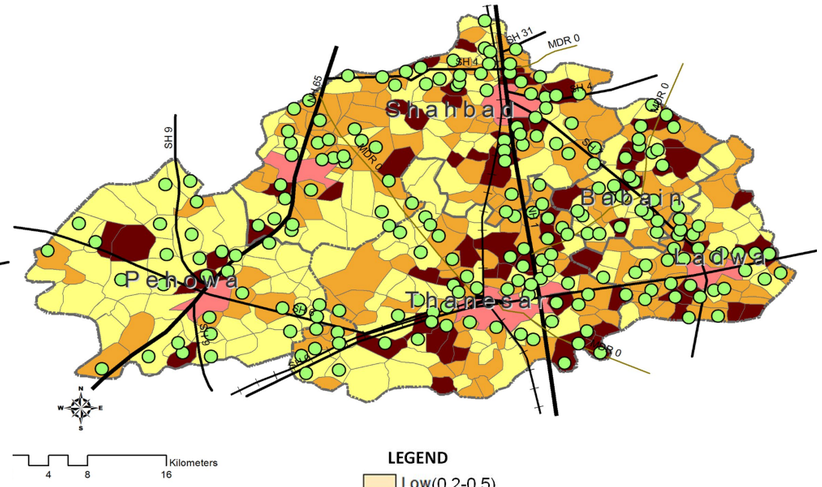
## Population of villages in the Kurukshetra District




## Decadal Growth Population of Villages in the Kurukshetra District




## Population Density and Proximity to Major Roads of villages in the Kurukshetra District

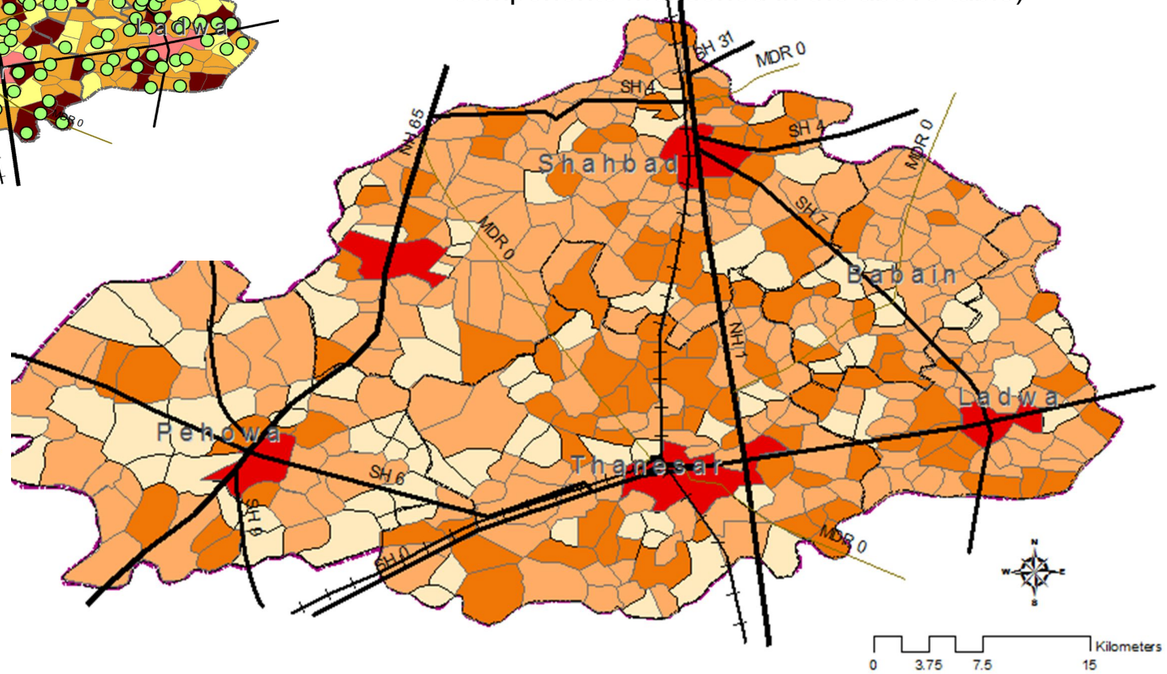



LEGEND
- Low(0.2-0.5)
- Medium (0.5-0.8)
- High (0.8-0.98)
- Urban Areas
- District boundary
- Railway

**Road**
- <all other values>

**Type**
- NH
- SH

## Composite Rural Development Index (Consisting of all 11 components mentioned in the above table)




## Distribution of Literacy Rates in Villages of the Kurukshetra District

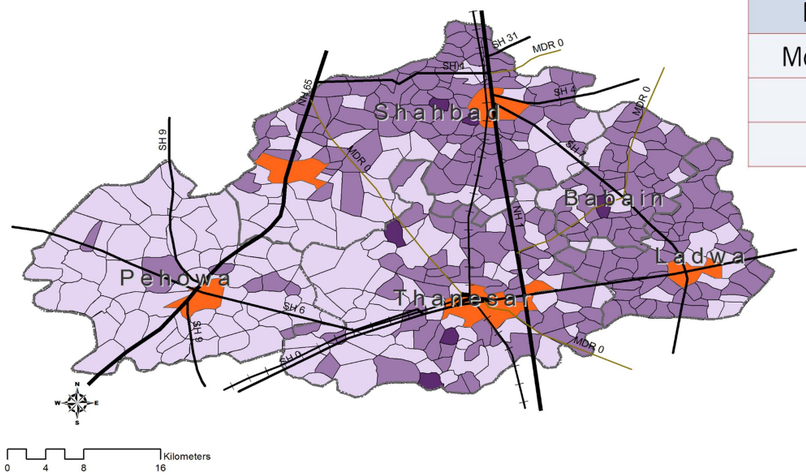



Table showing **Distribution of CRDI**

| CRDI | No of Villages | |
|---|---|---|
| Poor Development | 197 | 47% |
| Moderately Developed | 201 | 49% |
| Highly Developed | 17 | 4% |
| Total | 415 | |

**NOTES**

The composite rural development index is the final outcome of all the 10 indicators of rural development. The values under each indicator was compared with a baseline to give a weight to each village under every indicator. For the purpose of evaluation, all indicators were deemed equally necessary for a rural settlement.Maximum number of moderately and highly developed villages are located in Shahbad and Pehowa. As we move from west to east, the RDI for individual villages increases and then slightly decreases. **Pehowa displays the maximum number of villages with poor development.**

In order assess the overall rural development in the district, all 415 villages are compared on the basis of 10 indicators of rural development (table, top left corner). This gives us an approximate picture of overall rural development in the district. For a further detailed analysis of the village settlements, assessed Village development in 9 selected villages (4 in a cluster, 5 scattered).

REGIONAL PLANNING

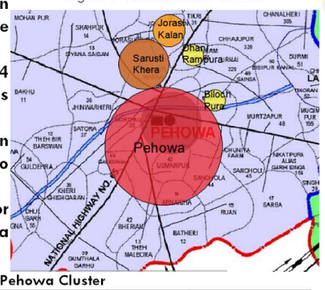
Cluster Selection → Delineation of Planning Area → Cluster Profiling → Component Profiling → Linkages to the City → Deficiency Analysis → Hierarchy of Settlements with the Cluster

- **6 Parameters**
- Presentation of Cluster Map
- Demography, Socio-economic, Cultural
- Finance and Administration
- Detailed analysis of 12 components
- Understanding the connections between city and villages
- Identification of Gaps in the cluster
- Identification of Growth centre and Final Issues from Rural and Village Development

## Methodology for Cluster Selection

- Villages that occur in clusters around an urban centre (Pehowa) are chosen to promote an integrated development of both.
- Villages within a radius of 5 kms from the 4 important urban centres are considered as possible clusters.
- Possible clusters of 4 villages are then weighed against the evaluation criteria to achieve a possible ranking.
- The cluster with the highest rank is chosen for the conduction of village surveys and data collection.

Figure 14.2.1 **Pehowa Cluster**



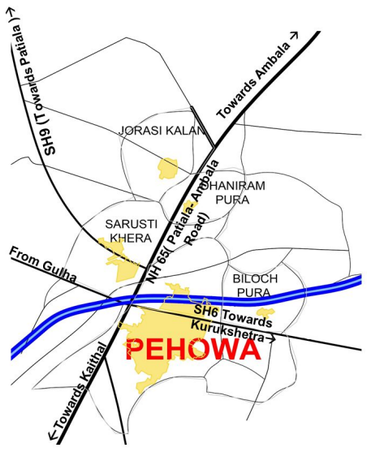

**Best Possible Values for the Pehowa Cluster**

| Village Name | Population | Connectivity | Decadal Growth in Population | Workforce Participation | Sex Ratio | Decadal Growth in SC Population |
|---|---|---|---|---|---|---|
| Sarusti Khera | 3731 | NH | 35.00% | 32% | 921 | 48% |
| Weights | 36 | 20 | 83 | 200 | | |
| Jorasi Kalan | 1686 | ODR | 10.70% | 31% | 997 | 5% |
| Weights | 27 | 5 | 74 | 167 | | |
| Dhani Rampura | 873 | NH | 2.41% | 37% | 885 | 89% |
| Weights | 17 | 20 | 48 | 1000 | | |
| Bilochpura | 595 | _ | -7.13% | 44% | 1080 | 36% |
| Weights | 12 | 0 | 33 | 143 | | 906.25(V) |
| Final Values | 85.5( V) | 45( A) | 238(A) | 1510(A) | 971(A) | 33%(A) |

A : Aggregate Values V : Variance of Data among the Villages

## ASSIGNMENT OF WEIGHTS

| Criteria | Description | Weights | Desirable Status |
|---|---|---|---|
| **Population** | ❑ 4 villages are shortlisted (1 from each population bracket)<br>❑ Variance is calculated for the total cluster | Population Weights<br><500 10<br>500 - 1000 10<br>1000 -2000 10<br>2000 - 5000 10 | ❑ 1 village from each population bracket<br>❑ Greater Variance among Data |
| **Connectivity** | ❑ Overall Good Connectivity is appreciated. | Road Type Weights<br>NH 20<br>SH 10<br>MDR/ODR 5 | ❑ Higher Aggregate of Weights |
| **Decadal Growth in Rural Population** | ❑ Representative of the District<br>❑ Baseline (BL) = 23.3%<br>❑ Closeness to the Baseline is evaluated through Formula | Formula for Weights:<br>= 1000/ \|(BL- \|%Decadal Growth\|)\| | ❑ Higher Aggregate Value of Closeness to the Baseline |
| **Decadal Growth in SC Population** | ❑ Total growth of SC population is calculated<br>❑ Variable values given preference | % Growth of SC population in the Cluster<br>Variance of the data among component Villages | ❑ Higher the value greater the Preference ( requires policy attention)<br>❑ Higher Variance Preferred |
| **Work Force Participation** | ❑ Representative of the District<br>❑ Baseline (BL) = 37%<br>❑ Closeness to the Baseline is evaluated through Formula | Formula for Weights:<br>= 1000/ \|(BL- \|%Decadal Growth\|)\| | ❑ Higher Aggregate Value of Closeness to the Baseline |
| **Sex Ratio** | ❑ Sex Ratio of the Cluster is calculated | Values are compared to yield greater one. | ❑ Greater Sex Ratio of the two is preferred |




| Village | Gram Panchayat |
|---|---|
| Jorasi Kalan | GP 1 |
| Bilochpura | GP 2 |
| Dhani Rampura | GP 3 |
| Sarusti Khera | GP 4 |

| Gram Panchayat | Length of Pucca Road(km) | % | Length of Kutcha Road(km) | % | Total length of Roads(km) | Total Length of Drains( km) | % | Presence of Street lights |
|---|---|---|---|---|---|---|---|---|
| GP1 | 2.5 | 66.70% | 1.25 | 33.30% | 3.75 | 1.50 | 40% | 0 |
| GP2 | 0.9 | 60% | 0.6 | 40% | 1.5 | 0.75 | 50% | 0 |
| GP3 | 3.5 | 100% | 0 | 0 | 3.5 | 1.05 | 30% | 50 |
| GP4 | 2.2 | 70% | 0.94 | 30% | 3.14 | 0.63 | 20% | 0 |
| Total | 9.1 | 76% | 2.78 | 24% | 11.89 | 3.93 | 33% | 50 |
| Required | 11.8 | 100% | 0 | 0% | | 11.89 | | 213 |
| Gap | 2.7 | | | | | 7.96 | | 163 |

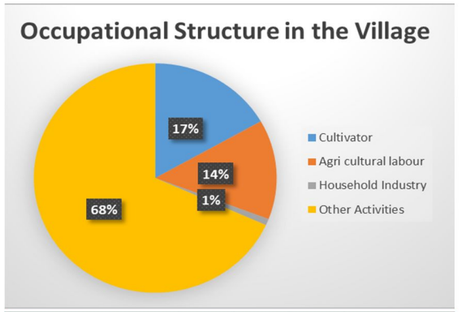
## Major Routes along the Cluster

| Village Name | Connected to |
|---|---|
| Jorasi Kalan | ODR |
| Bilochpura | Rural Roads |
| Dhani Rampura | NH |
| Sarusti Khera | NH and SH |

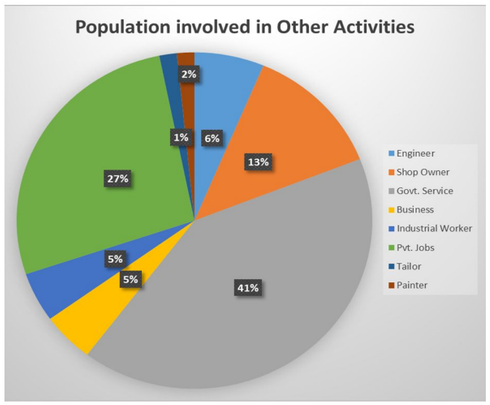
- National Highwa
- State Highway
- Other District R
- Village Boundar
- River
- Built Up Area

## Connectivity

- There is a National Highway (65) Which connects Ambala and Kaithal.
- There is SH9 towards Patiala which is also passing through the cluster.
- SH6 which passes through Pehowa connects Pehowa and Thanesar to Saharanpur, UP.
- All the Villages are connected to the city (Pehowa)and to each other through All Weather Roads.
- There is also a network of Rural roads which serve as the feeder roads of the other Highways as well as the roads for inter-village movements.




| Activity | GP1 | GP2 | GP3 | GP4 | Total |
|---|---|---|---|---|---|
| Cultivator | 28% | 23% | 15% | 11% | 17% |
| Agricultural labour | 17% | 7% | 20% | 12% | 14% |
| Household Industry | 0% | 1% | 0% | 1% | 1% |
| Other Activities | 54% | 68% | 65% | 75% | 68% |




**Flow of Funds from the State to the PRIs**

State Planning Department ( Nodal Agency)
- Collection of District wise Schematic allocation of Annual Plan and FYP from various departments and convey to Planning Units in the field.
- Collection of approved Village Plan, Block Plan and District Plan
- Integration of district plan into State Annual plan and FYP.
- Accordingly the State Annual Plan FYP will be submitted to the Planning Commission, GOI.

District Development and Monitoring Committee
- Funds received from the Nodal Department in two installments.
- Allocation to districts on the basis of budget, area and population.

District Development and Panchayat Office
- Funds after being approved by the DDMC flows to the DDPO.
- Allocation to the blocks on the basis of projects, area and population.

Block Development and Panchayat Office
- Funds after being allocated by the DDPO flows to the BDPO.
- Distribution of funds to the Panchayats through the SDO and JE ( Executive Officers)

Sub divisional Office
- SDO and JE ( Executive Officers) distribute the funds further to the Gram Panchayat on the basis of projects and population

Gram Panchayat
- Lowest Tier, funds allocated for various projects

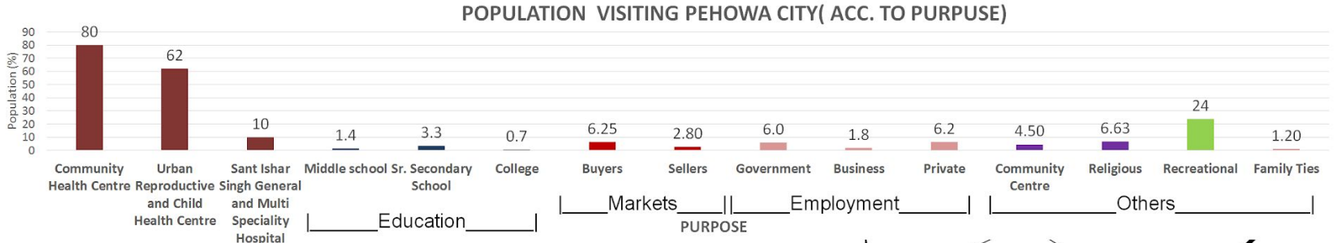
On observing the settlement pattern in the district, it was noticed that the rural settlements cluster around the central town, creating an opportunity for linkages and an integrated development for both.
Pehowa represented the most underdeveloped block, this potential for a robust integrated development was exploited. A cluster villages (rurban cluster) along the central town were evaluated for the same.

REGIONAL PLANNING

## Institutional Scalogram of the Cluster

| Settlement Rank | Village Name | Total Population of Town/Village | Nutritional Centres | Power Supply | Telephone (landlines) | Primary School | All Weather Road | Mobile Phone Coverage | Daily Newspaper Supply | Drainage | Tube Wells/Borehole | Middle School | Bus Service | Secondary School | Primary Health Sub Centre | Bank | Post Office | Community Centre | ATM | Community Health Centre | College | Veterinary Hospital | Sports Field/ Club | Railway Station |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | Pehowa | 38853 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ | | | |
| 34 | Sarusti Khera (34) | 3731 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | |
| 102 | Dhani Rampura (47) | 873 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | | | | | | | | | | | |
| 104 | Baloch Pura (46) | 595 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | |
| 100 | Jorasi Kalan (32) | 1686 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | | | | | | | | | | | | |

## POPULATION VISITING PEHOWA CITY( ACC. TO PURPUSE)

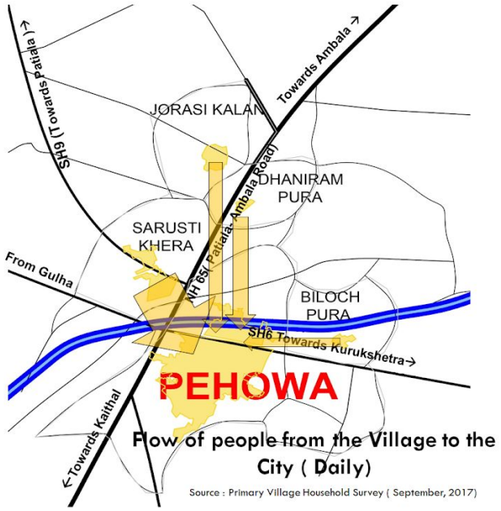



### Persons going to the City Daily

| Village | % Population going to the City | Persons/ Day |
|---|---|---|
| GP1 | 11% | 185 |
| GP2 | 26% | 152 |
| GP3 | 31% | 271 |
| GP4 | 42% | 1567 |
| Total | 31.6% | 2173 |

Source : Primary Village Household Survey ( September, 2017)

- **As per the Scalogram depicted above, the farther we move from the city ( Northward and Eastwards), the number of facilities reduce.**
- Sarusti Khera therefore has the maximum number of facilities and Jorasi Kalan, the least, followed closely by Biloch Pura.
- Similarly, almost 42% of the population of Sarusti Khera goes daily to Pehowa. Out of the total, almost 60% go for jobs alone.
- Bilochpura on the east has the highest % of Agricultural labour and the least number of people who go to the city daily for work.
- **Maximum number of villagers from the cluster visit the city for health purposes.**
- Other important reasons ( in order of priority are Recreational, Religious (more so in case of Muslims and Sikhs), Markets (Mandis, LPG Gas, items other than daily necessities), and Jobs ( employment in Government and Private Service sectors).




**Flow of people from the Village to the City ( Daily)**

Source : Primary Village Household Survey ( September, 2017)

Tables showing **Assigned Population and Area of the Cluster for different years**

| Details of the Cluster | 2011 | 2017 | 2021 | 2031 | 2035 |
|---|---|---|---|---|---|
| Town Population | 38853 | 47,358 | 53,800 | 72,900 | 82,100 |
| Village Cluster Population | 6885 | 8,274 | 9,400 | 12,600 | 14,100 |
| Total Cluster Population | 45,738 | 55,632 | 63,200 | 85,500 | 96,200 |
| Houeholds in the total cluster | 8,968 | 10,908 | 12,400 | 16,800 | 18,900 |
| Households in the Village Cluster | 1,366 | 1,642 | 1,900 | 2,500 | 2,800 |

**ASSUMPTIONS:**

- The Growth Rate for the Town and the Village Populations is calculated for three decades only( 1991-2011) as per the data given by the Census of India.
- The Growth Rates are assumed to be same for all the 3 methods.
- The Population growth is based on the assumption that the earlier trends of the population will be followed and individual contributions of sector wise developmental activities (industries, agriculture, etc.) are not taken into consideration due to constraints of time and skill.

## BUDGETING OF PROJECTS AND THEIR FINANCING UNDER SCHEMES

| Component | Location | Proposed Projects | No./ Kms | Unit Cost(in Lakhs) | Total Cost(in Lakhs) | Scheme Convergence | Critical gap Funding | Number of Years |
|---|---|---|---|---|---|---|---|---|
| Inter Village Road Connectivity | GP1 | 1.25 kms of metalled road with drains | 1.25 | 35.00 | 43.75 | Mahatma Gandhi National Rural Employment Guarantee Scheme and Pradhan Mantri Gramin Sadak Yojana | 13.13 | Within 1 year |
| | GP2 | 0.6 kms of metalled road with drains | 0.6 | 35.00 | 21.00 | | 6.30 | |
| | GP3 | 0 | 0 | 35.00 | 0.00 | | 0.00 | |
| | GP4 | 0.94 kms of metalled road with drains | 0.94 | 35.00 | 32.90 | | 9.87 | |
| | Total | 2.78 kms of metalled road with drains | 2.78 | 35.00 | 97.30 | | 29.19 | |
| | Village Cluster | 7.4 kms of metalled Road with drains | 7.4 | 35.00 | 259.00 | | 77.70 | 24 years (by 2035) |
| | Total Funds | | 10.18 | | 356.30 | | 106.89 | |

## IDENTIFICATION OF ISSUES AND SWOC ANALYSIS

| Topic | Issues | Strengths | Weaknesses | Opportunities | Challenges |
|---|---|---|---|---|---|
| **Common Issue** | Inadequate provision of health facilities (in terms of dispensaries and sub-centres) at the village level leading to heavy dependence on urban infrastructure | Availability of Village health guides, ASHA and Anganwari Workers and Digitally literate persons in the villages | Lack of infrastructure in terms of public (Panchayat) land for erection of subcentres and dispensaries, lack of required skills among the people | Large scale demand for local level health facilities as survey reveals that 80% of the people travel to nearby towns for health facilities. | Funding for adequate infrastructure and provision of doctors, nurses and other health service providers who have the necessary skills to work effectively and comfortably in these areas |
| **District Level Issue** | 47% of the villages have poor Rural Development Indices vis-a-vis 48% villages with Moderate Rural Development Indices and 4% High Rural Development Indices. Large Villages (in terms of population) have poor Rural Development Indices. They are located in Pehowa and Thanesar Blocks in the southwestern part of the District and concentrated in Pehowa. | These villages cluster around the central urban centre and are well to the towns through roads. | Weak economic linkages as compared to the rest of the District ( North-eastern side is better connected to major economic centres in UP and Delhi) and lower road density | Using the clustering of villages around the central town as an opportunity for Rurban Development ( integrated development of town and village ) | Spatial selection of probable clusters which could stimulate growth in the region and identification of representative issues which cause these villages to have a lower RDI |

| Cluster Level Issues | | | | | |
|---|---|---|---|---|---|
| **Sanitation** | Inadequacy of private and community toilets may cause 27% of the population to resort to open defecation | High levels of motivation to achieve Open Defecation Free(ODF) Status due to incentives such as cash prices, priority in project sanctions, etc. under the SBM, which is exhibited in a few neighboring villages. | No Sanitary marts or production centres, poor maintenance and cleanliness of existing public toilet facilities and neglecting the other aspects of sanitation such as sewerage, sullage and disposal of animal wastes. | Tapping of available resources under the SBM and using ASHA Workers to further motivation. All the work related to village sanitation (i.e., selling hardware, masonry work, maintenance and repair, selling sanitary items like brooms, disinfectants, brushes, etc. and the responsibility of the collection of cattle dung, composting and vermiculture, cleaning drains, maintenance of community gardens and tree plantations) can be combined together and handed over to an SHG ( of preferably women) through a contract at the Grampanchayat level. | Changes in local political administration and motivation which might affect sustainability of the project, and overcoming the internal differences between various social groups. |
| **Employment and Skilling** | Underexploitation of speacilized handicraft skills due to lack of mobilization. | As per Primary survey, most of the women in the village posses handicraft skills such as blanket making, rug making and other decorative items which are in high demand outside the village | Lack of encouragement and mobilization. Women choose to work as agricultural laborers due to availability of work and good payments | Potential for creation of SHGs among women who can mobilize resources in the villages | Incomplete assessments of rural households, preventing beneficiaries from taking advantage of SHGs. lack of links to market and credit facilities. Training and Capacity Building. |

A major issue in the district level analysis was **that the villages in the south-western side housed large populations but exhibited poor Rural Development Indices**. **Pehowa** displayed the lowest Rural Development Index. This provided an opportunity for a special strategy for a robust Integrated Rural Development using "*Rurban Development"* and "*Bridging the divide between the two halves of the District, as well as the parity between the rural and urban areas by Stimulating and spreading Cluster Development"( Policy Level 1).*

Ø The identified cluster was then analyzed in depth to understand deficiencies and issues which are dealt with in Policy level 2.

Ø Policy Level 2 was further detailed out into Projects and their individual material requirements are enlisted and their financing detailed through convergence of schemes.

Ø Finally, a Scalogram shows how the Proposals bridge the rural urban divide and create a self sufficient cluster which is capable of spreading the impact of its development in the entire block. A spatial prediction of the future settlement pattern was also depicted.

**REGIONAL PLANNING**

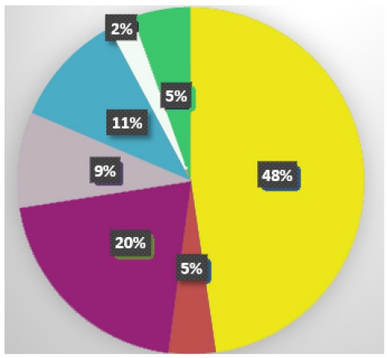
## DISTRIBUTION OF PROPOSED LAND USES WITHIN CONTROLLED AREA

| S. No. | Land use | Existing in 2017 (in ha) | % | Proposed for 2031 (in ha) | % |
|---|---|---|---|---|---|
| 1 | Residential | 1547 | 19% | 2160 | 26% |
| 2 | Commercial | 144 | 2% | 187 | 2% |
| 3 | Industrial | 662 | 8% | 840 | 10% |
| 4 | Transport and Communication | 287 | 4% | 613 | 7% |
| 5 | PSP | 349.65 | 4% | 416.15 | 5% |
| 6 | Utilities | 78.1 | 1% | 92.6 | 1% |
| 7 | Open Spaces and Parks | 176 | 2% | 1556.4 | 19% |
| 8 | Agriculture | 4956.25 | 60% | 2334.85 | 28% |
| | Total | 8200 | 100% | 8200 | 100% |

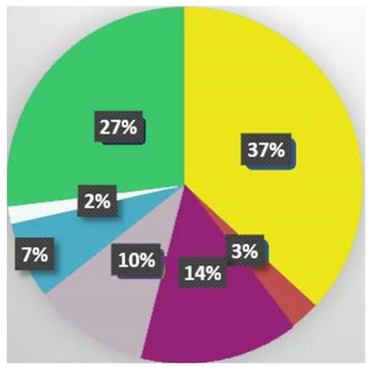
## DISTRIBUTION OF PROPOSED LAND USES WITHIN DEVELOPABLE AREA

| S. No. | Land use | Existing in 2017 (in ha) | % | Proposed for 2031 (in ha) | % | Increase in area | % Increase | UDPFI Guidelines |
|---|---|---|---|---|---|---|---|---|
| 1 | Residential | 1547 | 48% | 2160 | 37% | 613 | 23% | 40% |
| 2 | Commercial | 144 | 4% | 187 | 3% | 20 | 1% | 4% |
| 3 | Industrial | 662 | 20% | 840 | 14% | 178 | 7% | 12% |
| 4 | Transport and Communication | 287 | 9% | 613 | 10% | 326 | 12% | 14% |
| 5 | PSP | 349.65 | 11% | 416.15 | 7% | 66.5 | 3% | 14% |
| 6 | Utilities | 78.1 | 2% | 92.6 | 2% | 14.5 | 1% | |
| 7 | Open Spaces and Parks | 176 | 5% | 1556.4 | 27% | 1380.4 | 54% | 18% |
| | Total | 3243.75 | 100% | 5865.15 | 100% | 2621.4 | 100% | 100% |

## PROPOSED LAND USE FOR BAHADURGARH 2021




Bahadurgarh Existing Land use




Bahadurgarh Proposed Land use

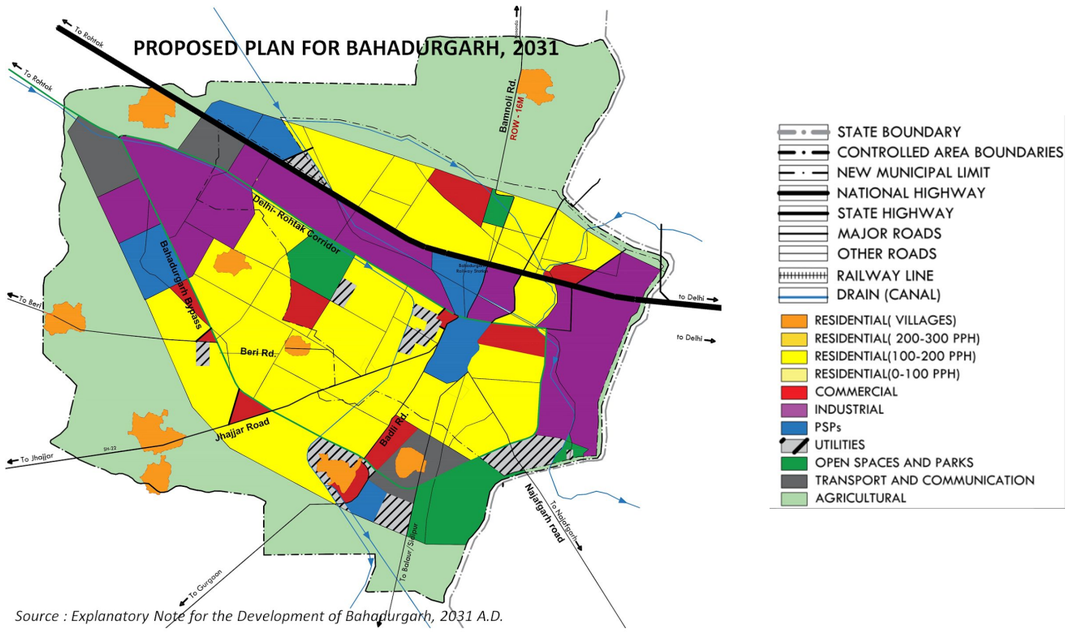
*Source : Primary Survey, Bahadurgarh ( February, 2017).*

## LAND USE DISTRIBUTION, BAHADURGARH, 2017

| S.no. | | Controlled Area | | Developed Area | | Municipal Area | | UDPFI Guidelines |
|---|---|---|---|---|---|---|---|---|
| | Land use Category | Existing(in ha) | % | Existing (in ha) | % | Existing (in ha) | % | |
| 1 | Residential | 1547 | 19% | 1547 | 48% | 1293.5 | 44% | 40% |
| 2 | Commercial | 144 | 2% | 144 | 4% | 105 | 4% | 3-4% |
| 3 | Industrial | 662 | 8% | 662 | 20% | 465 | 16% | 10-12% |
| 4 | Transport and Communication | 287 | 4% | 287 | 9% | 175 | 6% | 12-14% |
| 5 | PSP | 349.65 | 4% | 349.65 | 11% | 240 | 8% | |
| 6 | Utilities | 78.1 | 1% | 78.1 | 2% | 24 | 1% | 14% |
| 7 | Open Spaces and Parks | 176 | 2% | 176 | 5% | 144 | 5% | 18% |
| 8 | Agriculture | 4956.25 | 60% | 0 | 0% | 503.5 | 17% | |
| | Total | 8200 | 100% | 3243.75 | 100% | 2950 | 100% | 100% |

## COMPARISON BETWEEN PROPOSED AND EXISTING SITUATION

| S.no. | | Land use Plan for 2031 | | Area within Planning Boundary | | % Accomplished |
|---|---|---|---|---|---|---|
| | Land use Category | Area in ha. | % | Area in ha. | % | |
| 1 | Residential | 1700 | 0.3598 | 1358 | 29% | 80% |
| 2 | Commercial | 241 | 5.10% | 144 | 3% | 60% |
| 3 | Industrial | 876 | 18.54% | 662 | 14% | 76% |
| 4 | Transport and Communication | 613 | 12.97% | 287 | 6% | 47% |
| 5 | PSP | 215 | 4.55% | 349.65 | 7% | 163% |
| 6 | Utilities | 297 | 6.29% | 78.1 | 2% | 26% |
| 7 | Open Spaces and Parks | 783 | 16.57% | 176 | 4% | 22% |
| 8 | Agriculture | 0 | 0% | 1670.25 | 35% | 0% |
| | Total | 4725 | 100% | 4725 | 100% | 65% |




*Source : Explanatory Note for the Development of Bahadurgarh, 2031 A.D.*

## APPROXIMATE DEVIATIONS OF LAND USES FROM THE PLAN

| Proposed Land Use as per 2031 plan | | | | Land Use Bahadurgarh , 2017 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Residential | Commercial | Industrial | Transport | Public Utilities | Public and Semi Public Uses | Open Spaces and Green Belts | Total |
| | | | Areas(Ha) | 1358 | 144 | 662 | 287 | 78.1 | 349.6 | 176 | 3054.7 |
| | | Areas(Ha) | % | 79.88% | 59.75% | 75.57% | 46.82% | 26.30% | 162.79% | 22.48% | 64.65% |
| | Residential | 1700 | 35.98% | 0 | 62 | 72 | 0 | 52 | 147 | 45 | 378 |
| | Commercial | 241 | 5.10% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Industrial | 876 | 18.54% | 225 | 38 | 0 | 0 | 13 | 116.55 | 13 | 405.55 |
| | Transport | 613 | 12.97% | 0 | 0 | 94 | 0 | 0 | 0 | 0 | 94 |
| | Public Utilities | 297 | 4.55% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Public and Semi Public Uses | 215 | 6.29% | 0 | 30 | 0 | 0 | 0 | 0 | 0 | 30 |
| | Open Spaces and Green Belts | 783 | 16.57% | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 10 |
| | Total | 4725 | 100% | 225 | 130 | 166 | 0 | 65 | 273.55 | 58 | 917.55 |
| | %s | | | 17% | 90% | 25% | 0% | 83% | 78% | 33% | 31% |

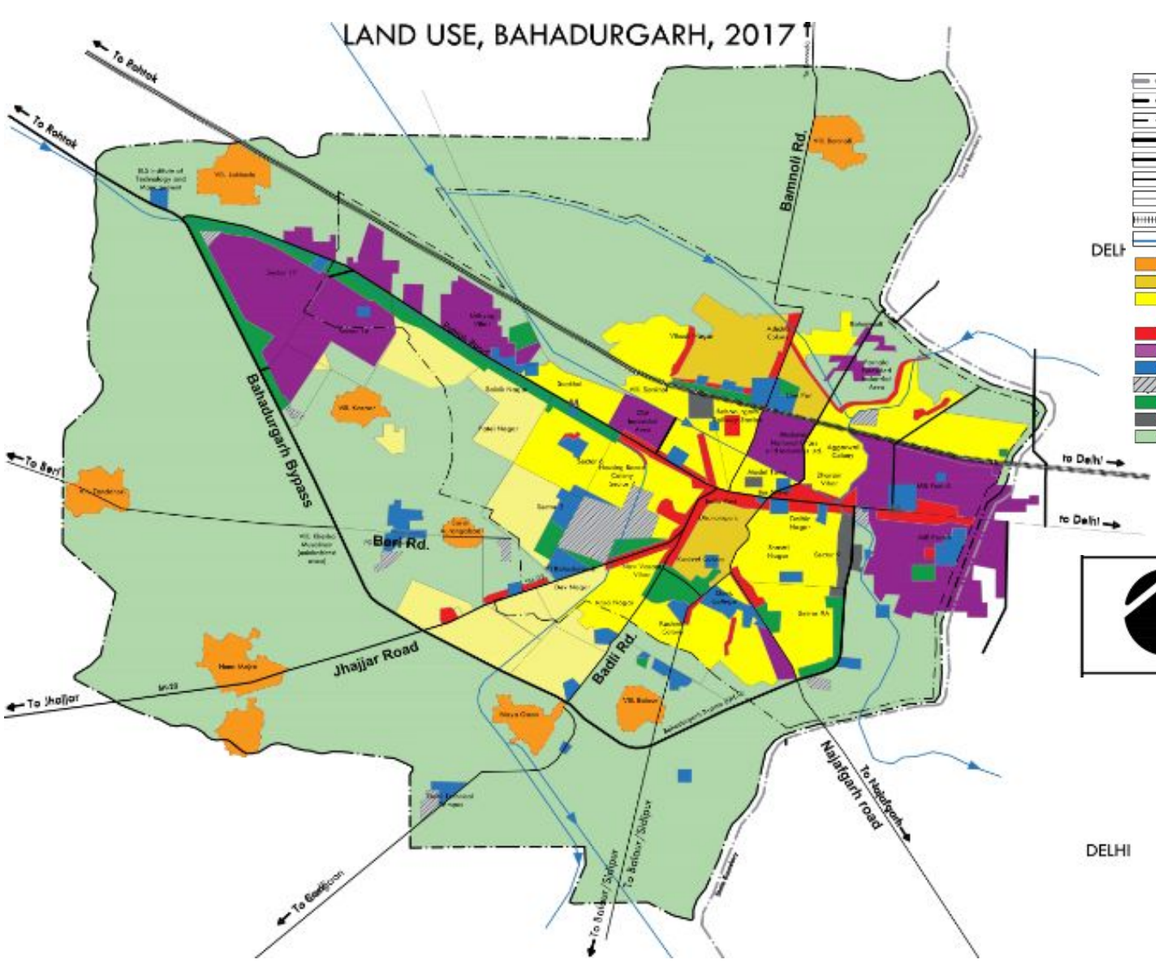
## OBJECTIVES

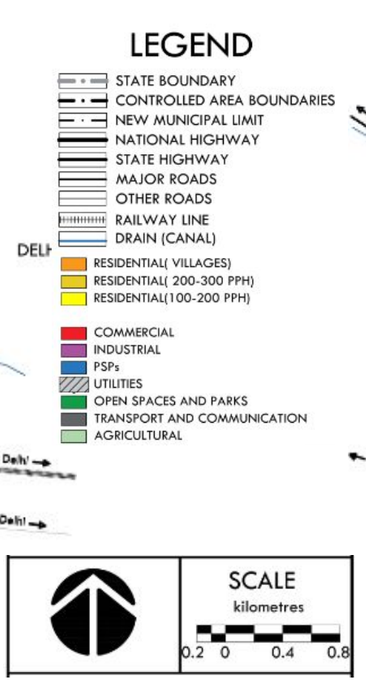
- To prepare an existing Land Use Inventory of the town and analyze the present Scenario.
- To understand the Settlement form and the various barriers to expansion and development of the town.
- To understand the current scenario of land ownership and land values operating in the area.

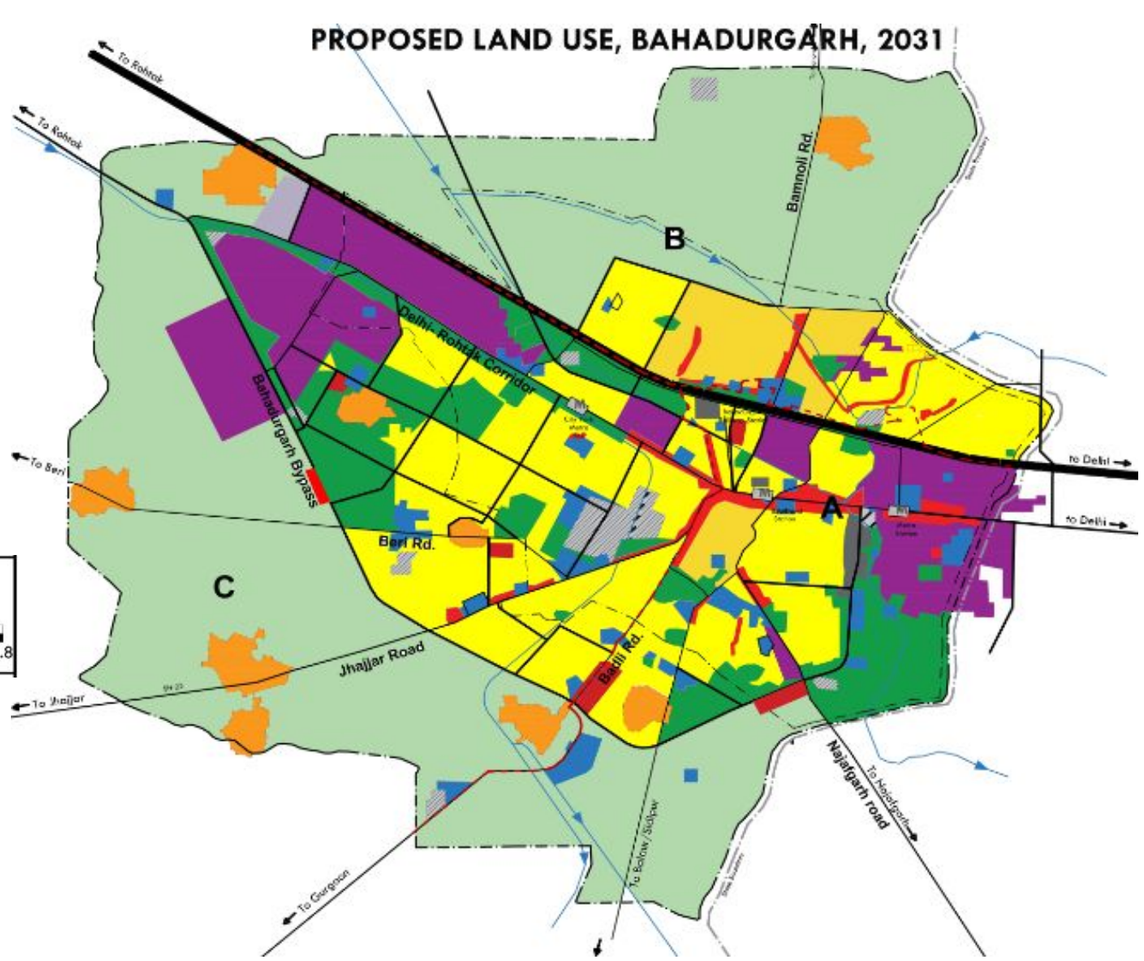
Since there was no original study of existing situation available with the development authority for the procurement of the Master Plan for Bahadurgarh 2031, we have compared the Master Plan of 2031 with the situation existing in Bahadurgarh in 2017 (as per Primary Survey, February, 2017). The deviations have been recognized solely on the basis of this comparison and their legality is not confirmed. Hence, the term deviations in this sense refers to "approximate points of departure of existing land use distributions from the proposed".

Maximum conversions are from Industrial to Residential, indicating the profitability of residential vis-a-vis Industrial uses. 90% of commercial development occurs in outside the proposed areas, along the major streets. A chunk of area under Transportation has been completely converted to industrial use. The situation indicates a land use pattern guided by market forces.

MASTER PLANNING




The population of Bahadurgarh showed a rise in population from 57,235 in 1991, to 1, 31,925 in 2001 (150.62% decadal growth percentage), due to inclusion of village abadi in urbanizable area. This period of time also witnessed The Haryana State Industrial policy and its revisions (1992, 1997 and 1999) which accounted for its urbanization and further population growth. The total urbanizable area underwent significant changes in the subsequent Development plans. 1394.82ha(1991)à3950 ha(2021) à4960(including villages) ha(2031). The area under industrial use was almost doubled from 1991 to 2021 plan. More area was added in the 2031 plan.

1.) The Industrial development runs along the central spine.
2.) The commercial development is concentrated along the roads radiating from the centre.
3.) The growth of the city follows a mixture of linear and radial pattern of development.
4.) The land Use distribution of Bahadurgarh City, does not comply with the URDPFI Standards for Industrial towns. Major deficiencies are observed in the proportion of Industries, Transport and Green Belts. The city has a very slow growth.
5.)The Residential development is very high for an Industrial town. The proportion of residential development is similar to that of Delhi (45-55%).
6.)Most of the Residential and Other uses come within the Municipal Limits. However a chunk of Industries and land acquired for housing lies outside the Municipal boundaries.

Comparing the existing land uses with the ones already proposed laid the foundation for the final proposal ( depicted above)

1.)The residential development is very high (80% accomplished within 1/4th time period) in comparison to Industrial development.
2.)This indicates the presence of important work centres outside the city, which employs most of its people.
3.)The industrial development is dependent upon the development of the transport and utility networks which remain under accomplished.
4.)Recreational facilities are in severe shortage.
5.)65%( 3243 ha) of the proposals have been achieved within 5 years. The rest 53% is under agriculture
1.)Maximum conversions are from Industrial to Residential, indicating the profitability of residential vis-a-vis Industrial uses.
2.)90% of commercial development occurs in outside the proposed areas, along the major streets.
3.)The situation indicates a land use pattern guided by market forces.

After assessment of each individual land uses and projecting the population and land requirements for various activities, the final land use plan. was proposed for Bahadurgarh for 2031. Various land use conflicts arising due to the competing land uses and their functions were mitigated through rational evidence followed by debate, discussions and coordination of every sector. The final land use plan was an effort to coordinate transportation, housing, industry, commercial and agricultural land uses and several other issues arising due to the change in their areas.

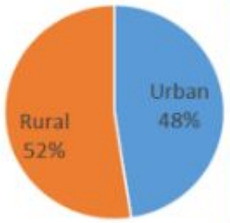
MASTER PLANNING

## GENERAL CHARACTERISTICS OF THE ZONES

| S.No | General Characteristics | Specifications |
|---|---|---|
| 1. | Total Area in the Zone | 5658 ha (17.8% of BBN SA) |
| 2. | Total Urban Area | 929 ha(16.4% of the Zones) |
| 3. | Total Rural Area | 4729 ha ( 83.6% of the Zones) |
| 4. | Total Area under Residential Use | 430 ha (7.6 % ) |
| 5. | Total Population of the Zones | 63873 persons |
| 6. | Gross Residential Density | 150 persons/ hectare |
| 7. | Net Residential Density | 273 persons/ sq. km |

Table 1.1 Major Characteristics of the Area ( Source : Primary Survey, 2016).

## URBAN AND RURAL AREAS




| S.No. | Characteristics | Zone B | Zone A |
|---|---|---|---|
| 1. | Total Population | 48114 | 15759 |
| 2. | Total Urban Population | 30548 | - |
| 3. | Average Household Size | 3.3 | - |
| 4. | Total Rural Population | 17556 | 15759 |
| 5. | Average Household Size | 3.6 | 3.7 |

Table 1.2 Characteristics of thetwo Zones ( Source : Primary Survey, 2016).

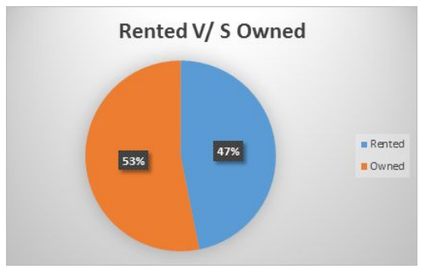
Total Number of Households =18329.

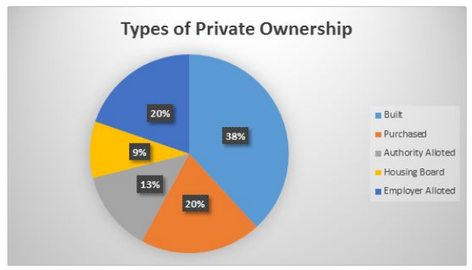
Total Number of Households in Zone B= 13375( 8709 Urban, 4666 Rural)

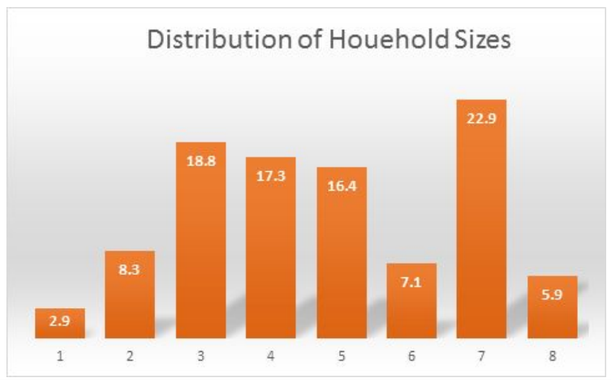
Total Number of Households in Zone A= 4954(Rural only)

## INCOME GROUPS

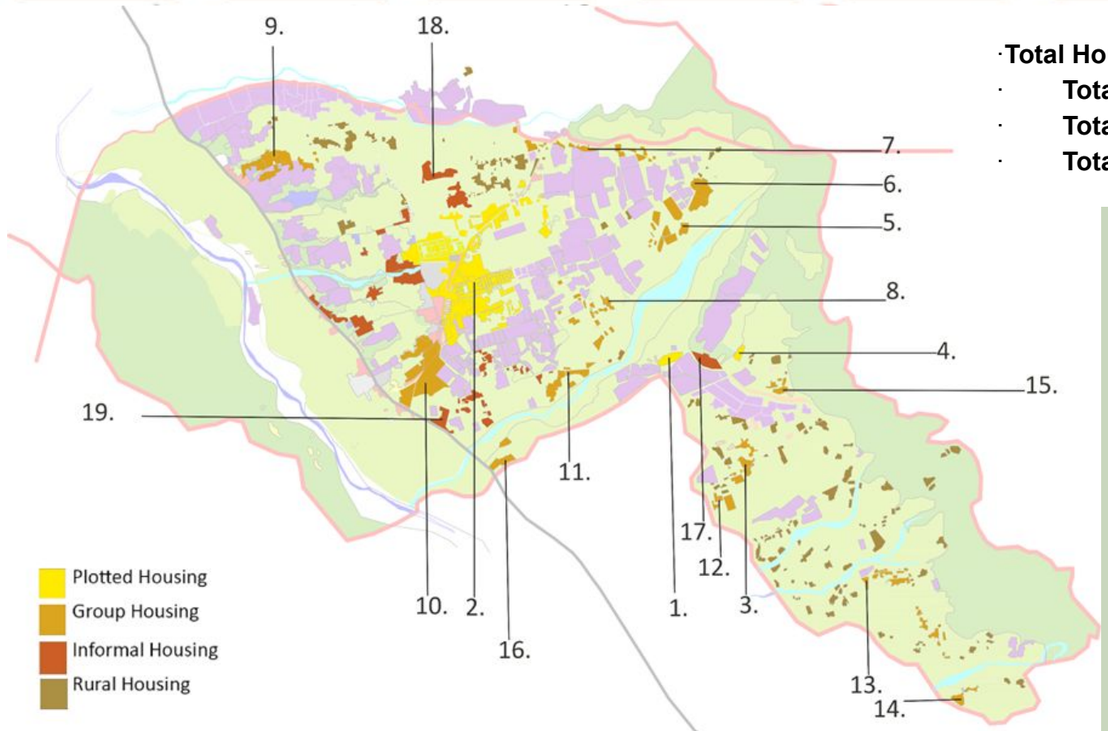
| Monthly Income | Category | Total Population | Percentages | No. Of households |
|---|---|---|---|---|
| < Rs. 8334 | Economically Weaker Section | 17198 | 27 | 4882 |
| Rs. 8334-Rs. 40,000 | Low Income Group | 23346 | 37 | 6381 |
| Rs. 40,000-Rs. 70,000 | Middle Income Group | 13508 | 21 | 3983 |
| >Rs. 70,000 | High Income Group | 9821 | 15 | 3083 |
| | | 63873 | 100 | 18329 |








- **Total Housing Stock = 17710 Dwelling Units**
- **Total Number of Formal Units = 8460**
- **Total Number of Informal Units = 2385**
- **Total Number of Rural Units = 686**

**OBJECTIVES:**

To understand the various Housing Typologies.

To identify the locations of prevalence of slum conditions and low housing quality, and infrastructure issues related with them.

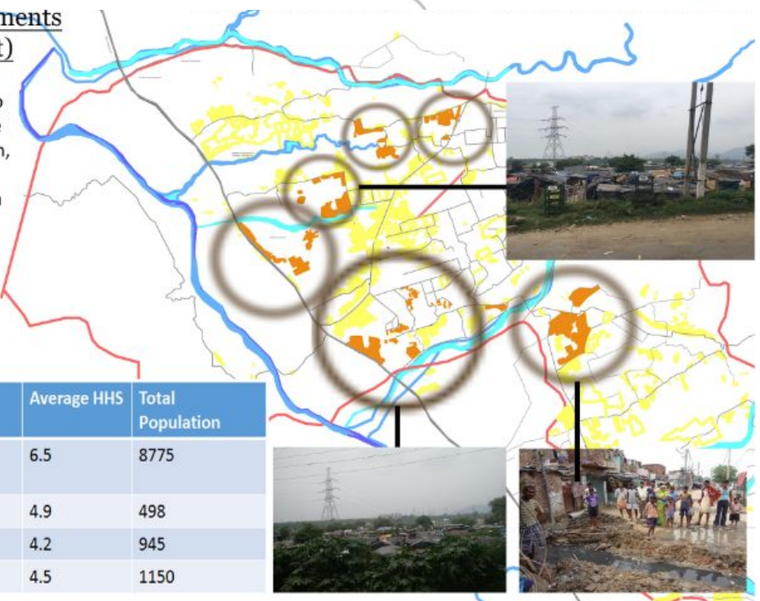
To analyze the existing Housing Gap from the figures of Demand and Supply.

On observing the two zones and their general characteristics, we notice that Zone A and Zone B (the river being the separator) have some marked differences. These inferences can shortlisted as:

- There is a sharp contrast between the characters of the two Zones, Zone B being primarily Urban, and Zone A being rural in nature.
- The urban residential density (309 pph, net) is much larger than the rural density (74 pph). This is due to the presence of forests, farmlands and the 26% non-developable area which lies in this area.
- The average household size in Zone B is less than the Average household size in Zone A. This is on account of the family structure which differs because of the urban and rural nature of the areas. Zone B has a predominant nuclear family structure, whereas Zone A is dominated by Joint families. Since the % of rural area is much larger than urban areas, norms for rural areas shall apply mostly in these areas.

### Location of Informal Settlements (Temporary and Permanent)

Permanent Settlements (Unautho-rized) have been constructed in Dasso Majra, Bhud, and Mauza Katha. Three Major Clusters are called Basanti Bagh, Kailash Vihar and Shivalik Society. Shivaik Society coincides with the Squatter colony in Jharmajri. A total popuation of 1419 people are oused here in 327 DUs.



| S.No. | Location | Number of Squatters | Average HHS | Total Population |
|---|---|---|---|---|
| 1. | Near SP Office, Jharmajri | 1350 | 6.5 | 8775 |
| 2. | Katha | 102 | 4.9 | 498 |
| 3. | Barotiwala | 225 | 4.2 | 945 |
| 4. | Billanwali Gujjaral | 256 | 4.5 | 1150 |

*Fig 1.4 Informal settlements of the Area. ( Source: Primary Survey, Documents on LCWH obtained from BBNDA)*

ZONAL PLANNING

Maximum Housing gap is observed in case of the Lower Income groups followed by the Economically weaker section. This is very predominantly observed in case of Zone B, and Zone A barely suffers from this issue. Hence, the housing Stock in Zone A is more or less sufficient to house the existing rural need for housing, whereas Zone B exhibits major discrepancies. The existing housing stock fails to house less than 25% of the LIG population in Zone B. Similarly, only 34% of the Economically weaker Sections are provided with housing in Zone B. This point directly towards the lack of affordable housing facilities in Zone B, unlike Zone A. Zone A has no clearly defined housing facilities for EWS categories.

· % of overcrowding in case of Zone A (1.3%) is very similar than the degree of overcrowding in case of Zone B(1.4%).

· Zone B is peculiarly prone to Disaster risk , as per analysis done in the Risk and Hazard Management Chapter, whereas Zone A is relatively safer. However, most of the area falls under a similar risk factor in a seismic zone IV.

·

## CONCLUSIONS : HOUSING GAPS

**Table 9.5 Quantitative Gaps of the Area.**

| | EWS( < Rs. 8334) | | | | | LIG( Rs. 8334-Rs. 40,000) | | | | | MIG(Rs. 40,000-Rs 70,000) | | | | | HIG(>Rs. 70,000) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | House holds | % | Units Available | % | Gaps | House holds | % | Units Available | % | Gaps | House holds | % | Units Available | % | Gaps | House holds | % | Units Available | % | Gaps |
| Total | 4882 | 27% | 3175 | 18% | 1707 | 6381 | 37% | 3205 | 18% | 3176 | 3983 | 21% | 6865 | 39% | -2882 | 3083 | 15% | 4465 | 25% | -1382 |
| Zone A | 9 | 0.2% | 0 | 0 | 9 | 1580 | 31.9% | 1580 | 32% | 0 | 2792 | 56.4% | 2792 | 56% | 0 | 573 | 11.6% | 573 | 12% | 0 |
| Zone B | 4873 | 36% | 3175 | 25% | 1698 | 4801 | 36% | 1625 | 13% | 3176 | 1191 | 9% | 4073 | 32% | -2882 | 2510 | 19% | 3892 | 30% | -1382 |

( Source: Primary Survey)

**Table 9.6 Qualitative Gaps of the Area.**

| | Households | Total Units | Good | Livable | Dilapidated/ Obsolete | Overcrowded and not dilapidated | Functional Units | Qualitative Gaps | No.of Household Vulnerable to Natural Disasters(Highly Vulnerable) | Households suffering from issues related to physical Infrastructure | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Quality | Quantity |
| Total | 18329 | 17710 | 11579 | 3869 | 2262 | 247 | 15201 | 3128 | 4428 | 5160 | 4770 |
| Zone A | 13375 | 12765 | 8350 | 2731 | 2091 | 179 | 10495 | 2880 | 4428 | 5110 | 3810 |
| Zone B | 4954 | 4945 | 3229 | 1138 | 171 | 68 | 4706 | 248 | 0 | 50 | 960 |

( Source: Primary Survey)

## The Housing Strategy

| Housing Standards | Present Standards For EWS/LIG | Proposed Standards for EWS | Proposed Standards for LIG |
|---|---|---|---|
| Type of Housing | Plotted/ Row Housing* | Plotted/ Row Housing* | Plotted/ Row Housing* |
| Minimum Plot Sizes | 30 sq. m. ( Should not be less than 15 sq.m.) | 65 sq. m. | 100 sq. m. |
| Floor Area Ratio | 100 | 140 | 195 |
| Ground Coverage | 100 | 70 | 65 |
| Density (Dus/ha.) | 500 | Should not exceed 400 | Should not exceed 300 |

*EWS: Considering 40 sq. m. as the Carpet Area, and 5 sq. m. as the circulation space, ie. 45 sq m. Plinth area. Hence with FAR 140, max height = 2 storeys, Density = 307 Dus/ha.
*LIG: Considering 60 sq. m. as the Carpet Area, and 5 sq. m. as the circulation space, ie. 65 sq m. Plinth area. Hence with FAR 195, max height = 3 storeys, Density = 300 Dus/ha.

- **Total Area Required for EWS Housing : 6.8 ha**
- **Total Area Required for LIG Housing : 12.2 ha**
- **Total Area Required for Fresh housing Stock : 19 ha**

### Provision of Basic Amenities

- Adequate sanitation , water supply and power(Group Toilets of one Water Closet, one bath room and washing place can be used by two to three families. One Water tap for every 150 persons, one latrine for every 20-25 persons and one street light for every 30 persons)
- Vicinity to Community Spaces ( Parks, Schools and healthcare facilities )@ 0.50 sq. m per person.
- **Total area that is required for greens( for the fresh housing stock) at neighborhood level= 1.28 ha**

### Cost of the House

- Cost of the house should be such that the EMI/ Rent should not exceed 30-40% of the gross monthly income of the buyer.
- This indicates that cost of an affordable should be with 3.25 lakhs for the EWS and 7 lakhs for the LIG.
- **For EWS monthly rent should be from Rs. 1200- Rs. 2300( as per the affordability of the household)**
- **For LIG monthly rent should range between Rs. 2000- Rs. 7000.**
- Reasonable maintenance costs are necessary
- 80% Central Grant Share, 20% Parastatal/ State/ ULB Share ( as per MHUPA and JNNURM guidelines)

### Location of the House

- **Within 5 km of major sources of employment( industries), If further apart, should be adequately connected to major transit hubs.**
- **Proximity to the Baddi urban area in order to avail of the higher order (city level ) facilities.**
- **Pedestrian and NMT Friendly environment.**
- Strengthening the site to surrounding relationship by addressing the individual needs of land parcels.
- Using Landscape features to enhance spaces and induce Character.

## ECOLOGICAL APPROACH – HOUSING PROPOSALS

The policy for Housing is based on providing ***"Housing For All" in consonance with the twin principles of "Affordability" and "Sustainability"*** by achieving the full potential of the public, private/ corporate and household sectors.

- Identification of land parcels manifesting inadequate housing conditions and specific approaches for development of new housing areas.
- Energy saving and cost-effective strategizing to make housing more accessible, pedestrian friendly and inclusive to all the sections of the population within the area.
- Promoting Community Value, Aesthetic values and User Sensitivity while meeting the Housing Demand.

### The Housing Need

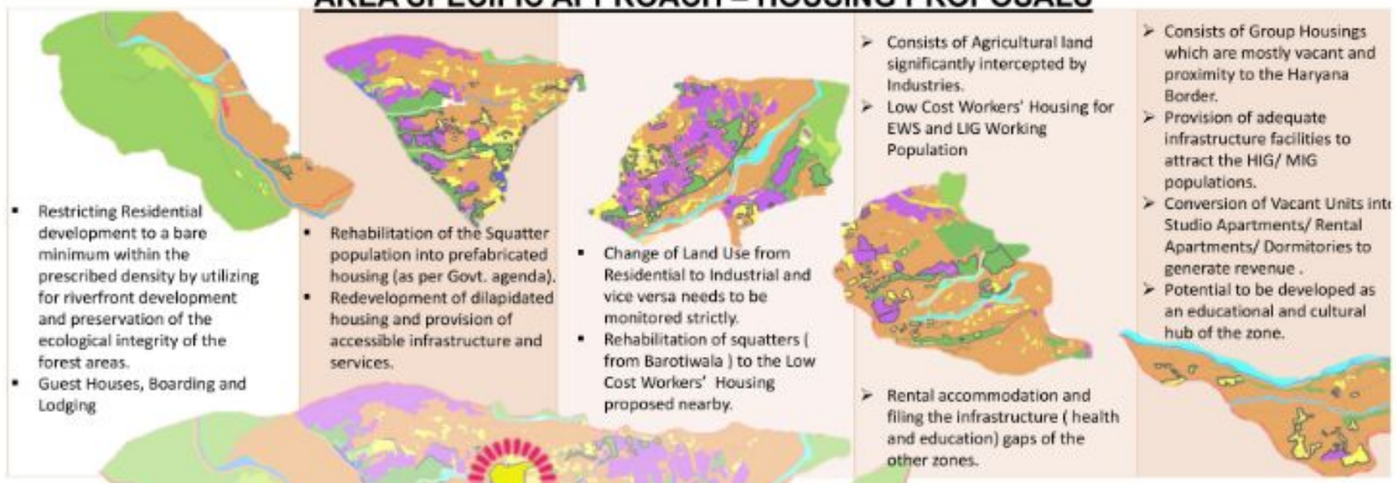
| Monthly Income | Category | % | Population (as per 2025) | Households | Units Present | No. Of units to be built |
|---|---|---|---|---|---|---|
| < Rs. 8334 | Economically Weaker Section | 26% | 18436 | 5234 | 3175 | 2059 |
| Rs. 8334- Rs. 40,000 | Low Income Group | 36% | 25027 | 6840 | 3205 | 3635 |
| Rs. 40,000- Rs. 70,000 | Middle Income Group | 21.% | 14481 | 4270 | 6865 | -2595 |
| >Rs. 70,000 | High Income Group | 15% | 10528 | 3305 | 4465 | -1160 |

- Non-institutional component viz. Unauthorized colonies, Slums/ Squatters and JJ clusters is as significant as 16% of the total stock.
- **The Total Housing Gap is 5694 units .**

(Total of 2059 units needs to be built for the Economically weaker section. Of the existing stock of EWS Housing, 1933(93.8%) households are living in squatter settlements( Jhuggies). On adding the qualitative gap, the number of units required to be built = 3992 units.)

- An excess is observed in case of MIG and HIG units, which is sufficient enough to cater to the expected rise of population. Focus needs to be directed towards provision of affordable housing units for the EWS and LIG population.

## AREA SPECIFIC APPROACH – HOUSING PROPOSALS




### ZONE B

- Total Area= 3405 ha
- Net Developable area =1195 ha
- Gross Area under Residential =247 ha
- Population= 50180.
- No. of Dus= 11151
- Gross Density= 45 Dus / Ha.
- Proposed Area under Residential = 272
- Population(2025) = 52264
- Number of Dus = 11614
- Gross Density ( Proposed)= 43 Dus/ Ha.

**Reduction of Existing Density.**

TOTAL AREA: 25 ha.
TOTAL AREA FOR RESIDENTIAL DEVELOPMENT: 10 ha.
LIG : 50% EWS : 50%

TOTAL AREA: 20 ha.
TOTAL AREA FOR RESIDENTIAL DEVELOPMENT: 9 ha.
LIG : 70% EWS : 30%

**LOCATIONS SUITABLE FOR HOUSING THE EWS AND LIG POPULATION.**

### ZONE A

- Total Area= 2263 ha
- Net Developable area =1184 ha
- Gross Area under Residential =183 ha
- Population= 13693.
- No. of Dus= 2928
- Gross Density= 16 Dus / Ha.
- Proposed Area under Residential = 203
- Population(2025) = 13779
- Number of Dus = 3062
- Gross Density ( Proposed)= 17 Dus/ Ha.

**Slight Enhancement of Existing Density.**

ZONAL PLANNING

## Housing Provision Approach Group 1 : Sector Plan

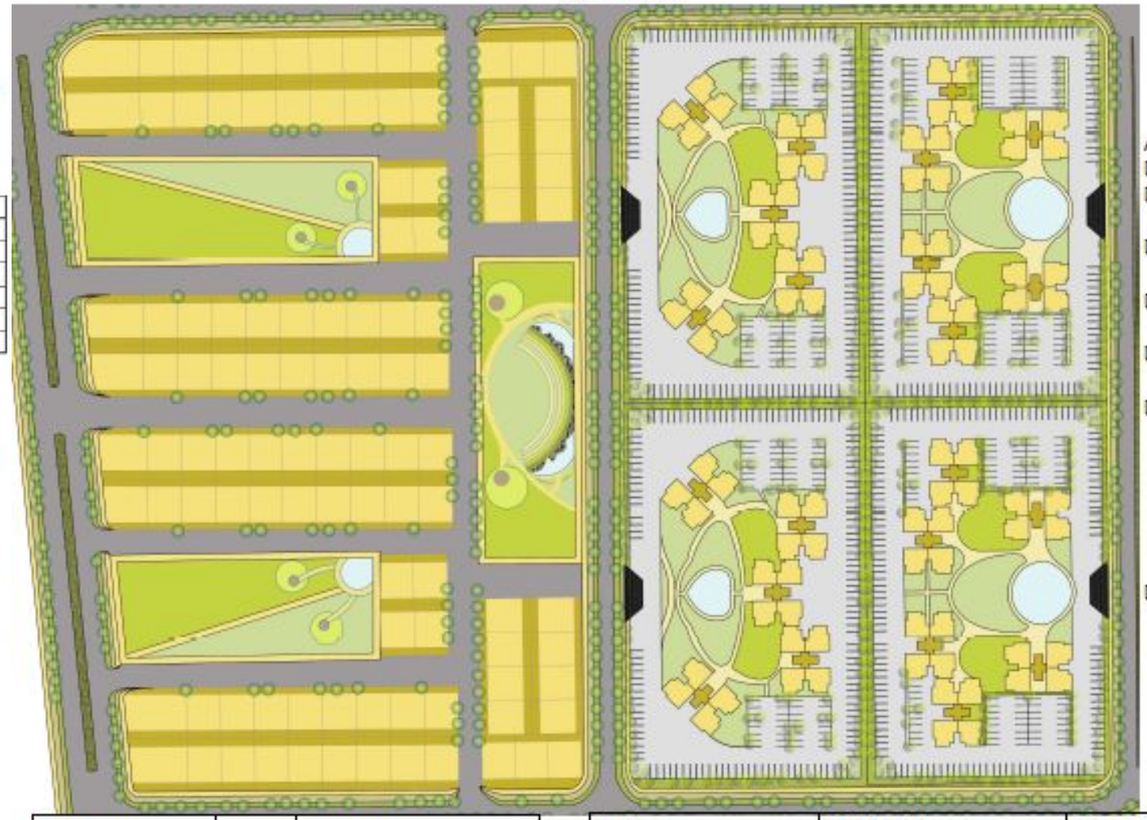

Total area of given site = **50 ha**
Population density to be achieved = **500 pph**
Target population = **25000 persons**
Number of dwelling units required = **5435**

**DISTRIBUTION OF LAND USES**

| Land Use | Proposed Area | Percentage |
|---|---|---|
| Residential | 28 | 56% |
| Commercial | 2.5 | 5% |
| Industrial (IT) | 0 | 0% |
| PSP | 6.5 | 13% |
| Recreational Zone | 7 | 14% |
| Roads | 6 | 12% |

### *Principles of Housing Provision Approach*

- *Maximization of population density*
  - By providing 56% are under Residential land use
  - By providing 500 persons per hectare.
  - By utilizing Maximum Permissible FAR and Ground Coverage, small DU size.
- *Integration of different facilities of lower hierarchies into a higher order facility*
  - By Integrating of different facilities of lower hierarchies into a higher order facility



AREA SPECIFICATIONS

- No. of Plots = 110+4
- Housing Class =MIG ,HIG
- Pocket Area = 10.93 HA
- Total Population = 5934
- Net Density = 543 persons per hectare
- Surrounding Roads = Bound by Collector Roads on 4 sides (24 M on the east and 30M on the west, 18 m each on north and south)
- Type of Housing Proposed =MIG Group Housing and HIG Plotted Housing

| Type of Housing | Type of DU | DU Area (sqm) | Plot Area (sqm) | FAR | Dwelling Units | | No. of Plots | Total Area (ha) |
|---|---|---|---|---|---|---|---|---|
| | | | | | Number | Percentage | | |
| Plotted | HIG | 200 | 200 | 175 | 375 | 7% | 125 | 3 |
| Plotted | HIG | 250 | 250 | 175 | 180 | 3% | 60 | 2 |
| Group | EWS | 61 | | 175 | 1346 | 25% | | 5 |
| Group | LIG | 61 | | 175 | 1076 | 20% | | 4 |
| Group | MIG | 100 | | 175 | 1332 | 25% | | 8 |
| Group | HIG | 120 | | 175 | 980 | 19% | | 7 |
| **Total** | | | | | **5289** | | | **29** |

| Land use | % | Area in hectares |
|---|---|---|
| Residential | 70.9% | 7.75 |
| Circulation | 14.7% | 1.57 |
| Recreational | 14.4% | 1.61 |

| Land use | Residential | | Recreational/ Green Spaces | |
|---|---|---|---|---|
| Type | HIG Plotted | MIG Group | Neighbourhood Park | |
| Area( % wrt land use) | 2.75,35.4 % | 5, 64.6% | 0.45 X 2, 53.9% | 0.75,46.1 % |
| Area of the Plots | 250 sq. m. | 1.25 ha. | 6484 sq. m | 3035 sq. m |
| No. Of Plots | 110 | 4 | 2 | 1 |
| Total Area(ha, %) | 7.75, 70.9 % | | 1.61, 14.7% | |


MIG Group Housing Layout 1

| Specifications | Permissible | MIG Layout 1 |
|---|---|---|
| Dwelling Units | - | 240 |
| Population | - | 1108 |
| Density (DU/Ha.) | 247 | 192 |
| Ground Coverage | 33.33% | 14.4% |
| Parking( open) | 1 ECS per 100 Sq. m. built up | 218 |
| Floors | No limit | 12+ Stilts |
| Floor Area Ratio | 175 | 173 |
| Green Spaces | 15% | 27% |


MIG Group Housing Layout 2

| Specifications | Permissible | MIG Layout 1 |
|---|---|---|
| Dwelling Units | - | 240 |
| Population | - | 1108 |
| Density (DU/Ha.) | 247 | 192 |
| Ground Coverage | 33.33% | 17.3% |
| Parking( open) | 1 ECS per 100 Sq. m. built up | 206 + 12(stilt) |
| Floors | No limit | 12+ Stilts |
| Floor Area Ratio | 175 | 173 |
| Green Spaces | 15% | 27% |

The Concept for this development includes the following main points:

1.Maximization of population density (compact, smaller DUs) within the permissible GC and FAR.
2. Higher % of group housing instead of plotted housing.
3. Integrating facilities of lower hierarchy into a higher one.
4. Using existing site features and prospective views for providing green spaces and connecting them via boulevards, avenues and smaller parks.
5.Staggered circulation network to prevent through traffic within the sector, thereby reducing nuisance and pollution

For further details on the site and sector plans, refer to the link mentioned below.

**SITE PLANNING**

## Research Experience and Publications

This section includes kinds of research other than the undergraduate thesis project. It also looks at various conference presentations, peer reviewed papers, book chapters and papers in different journals and magazines.

### Research Experience

- *Smart Planning for Smart Cities*
  Guide - Prof. Dr. Kusum Lata
  *Jan 2018 - Present*
  Authored conference papers and 3 book chapters on topics ranging from geo-spatial intelligence to smart planning for smart cities as an independent researcher.

- *Colonial and Post-Independence Planning in India*
  Guide - Prof. Dr. Ashok Kumar
  *May-Jun 2017*
  Studied topics varying from Sanitation Deprivation, Modernity, Liberalization of the Economy, Growth of GDP vis-a-vis Borrowings from Multilateral Organizations and Shifting Economic Geographies of Indian Cities to visualize colonial and post colonial planning in India.

### Peer Reviewed Publications

- "A Geospatial Model for Rurban Planning" in *24th International Conference on Urban Planning and Regional Development in the Information Society*, REAL CORP (2019) at Karlsruhe, Germany

- "Examining the Role of Urban Planning with respect to Smart Cities in India: Case Study of Surat" in *International Conference: Smart Cities (2019)* at Jamia Millia Islamia, New Delhi

- "Spatial Strategies for Rurban Clusters: Case Study of Kurukshetra" at *International Conference on Future Cities*, Indian Institute of Technology (IIT) Roorkee (2019), Uttar Pradesh

### Book Chapters (Works in Progress)

- "Geospatial Intelligence for Smart Living: Case Study New Delhi" in *Smart Living for Smart Cities*, Springer (2021)

### Conference Presentations

- "A Sustainable Approach towards Sanitation in India: Challenges in Accessibility, Economy and Design" at the *International Conference on Global Environmental Challenges Human Health and Sustainable Development*, Annual Conference of Environment and Social Development Association, ESDACON (2019) at Jawaharlal Nehru University (JNU), New Delhi

### Accepted Papers

- "Unpacking a Geospatial Model for Rurban Planning: Inputs from Computer Science" in *16th International Conference on Computers in Urban Planning and Urban Management (2019)* at Wuhan, China
- "The Role of M-Governance in creating Connected Smart Cities in India" in *5th International Conference on Connected Smart Cities (2019)* at Porto, Portugal

### Other Publications

- "Application of a Geo-Spatial Planning Model on a Tribal Rurban Cluster: Case Study of Khunti, Jharkhand" in *SPACE (the Official Journal of SPA Delhi)* (2019)
- "Geo-Spatial Information Approach to Planning for Rurban Clusters" in *Coordinates* Volume XIV, Issue 9 (2018)
- "A Literary Outlook on Informal Urban Settlements" in S*PACE (the Official Journal of SPA Delhi)*, Vol. 20 No.-3-4 (Special Mention, Editorial) (2018)

### Book Chapters (Works in Progress)

- "Smart Innovative Megacity Hyderabad" in *Smart Global Megacities*, Springer Nature (2021)
- "Smart Cultural Megacity Chennai" in *Smart Global Megacities*, Springer Nature (2021)

## Work Experience - Research Associate, Indian Institute of Public Administration (February-April 2019)

3rd Party Evaluation of Pre and Post-Matriculation Scholarship Scheme under the Ministry of Tribal Affairs (MoTA), Government of India.

**Responsibilities**

- Conducted meetings with the MoTA Officials regarding the nature of study that was to be conducted and creating minutes of the meeting.
- Translating the minutes of the meeting into tangible steps of the study program.
- Identification of stakeholders and designing of questionnaire for primary survey.
- Identification of schools and colleges within each state for the study

## Part-time Work Experience - Project Intern, Regional Center for Environmental and Urban Studies, Ministry of Housing and Urban Affairs (January-April 2019)

Preparation of Solid Waste Management Detailed Project Report for Baraut, UP.

**Responsibilities**

- Review of background information to under best practices under SWM.
- Diagnosis of existing conditions under the Baraut Municipal Council (Nagar Palika).
- Analysis of Alternatives to improve service levels.
- Investment plan for primary collection, secondary storage and transportation of solid waste to processing plant.

## Work Experience - Project Intern, Environmental Defense Fund, New York(November-February 2019) at Delhi

Preparation of Comprehensive Air Pollution Studies Database under National Environmental Engineering and Research Institute, NEERI, India.

**Understanding the socio-political, economic and judicial aspects of air pollution and its research in India and designing a comprehensive online library of secondary research on the topic.**

MISCELLANEOUS

## Office of the Chief Town Planner, East Delhi Municipal Corporation (June-July 2016)

Fundamentals of Town Planning at the ULB Level

| S. No. | Activity | Level of action | Time frame |
|---|---|---|---|
| 1 | To receive application and put a diary number. | Applications pertaining to grant of MCL are received in this deptt. through CSB and diarized in L-I register.. Thereafter, the same are marked by the A.O. to the concerned Factory Inspector. | 1-2 days |
| 2. | To mark application to concerned Inspector | As above | As above. |
| 3 | To visit premises of applicant and verify the facts | Inspector | 3-4 days |
| 4 | To prepare report and submit through proper channel. | Do | Within time-frame only after completion of formalities by the applicants. |
| 5 | To approve reject application | Addl. Commissioner | Within 18 working days after receipt in the deptt.. |
| 6 | To prepare licence if approved and submit to concerned authority | CSB/ Zonal Admn. Officer | Within 18 working days after receipt in the deptt. |
| 7 | To sign and return licence | CSB/ Zonal Admn. Officer | Within 18 working days after receipt in the deptt. |
| 8 | To deliver MCL to applicant | CSB/ Zonal Admn. Officer | Within 18 working days after receipt in the dept.. |

## Design Innovation Centre Project of the MHRD (June-July 2017)

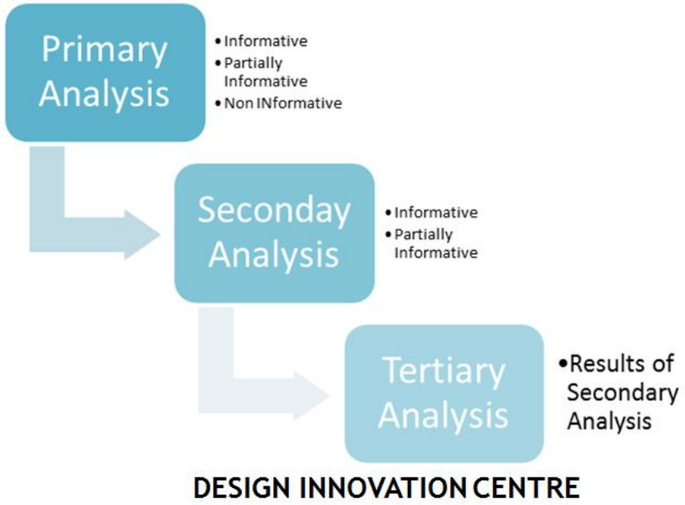
A comprehensive study of **E-Services for Change in Land Use and Master Plan Modification** of 19 cities worldwide to innovate in the domain of e-public participation in the planning process (later proposed to the DDA)

| Ease of Access | Relevant Information | | | | Flow |
|---|---|---|---|---|---|
| | Public Notice | Plan Document (Map+ Text) | Plan modification process | Public Participation/ Virtual Engagement Space | |
| Incomplete website/ very difficult to locate information. | Unavailable | Unavailable | Unavailable | Unavailable | Lack of information and no flow |
| Information available and easy to locate | Available | Available | Available | Only Feedback forms with no accountability | Flow exists but not smooth |
| Highly efficient arrangement of information | | | | Available | Proper categorization of information and smooth flow |

**Informative**
- Containing dedicated links for the above mentioned criteria with detailed information available
- Grouping of relevant links to show some degree of flow.

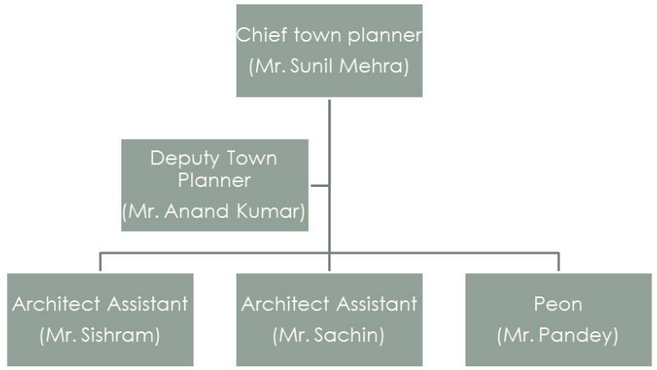
**Partially informative**
- Containing links which outlines the planning process but does not detail it out for the user's understanding or participation.
- Containing links which may not be synchonized to yeild a holistic picture of the process

**Non informative**
- Does not include relevant details on the planning process.
- Complete lack of flow.




19 cities worldwide were put through 3 stages of analyses to yield what is missing in the e-domain for public participation in plan modification. The third stage involved analyses of factual information, process of decision making and the quality of engagement space. Best Practices were also taken into account and conclusions and recommendations drawn.The work was consolidated into a report and presented before the department. It was deemed as "excellent" by the scrutinizing committee.

## TOWN PLANNING DEPARTMENT




The interns were mainly concerned with closely observing and learning the fundamentals of the Town Planning Practice at ULB Level. Some work like preparation of LOSC Agendas, Notings, Building files and sending reminders was assigned to us. The work was consolidated into a report and presented before the department. It is attached below.

## Other Studio Project (1) : Transportation Study of Raipur, Chattisgarh: Traffic Volume Count (August- December, 2015)

Detailed Traffic Volume Studies to recognize bottlenecks and their causes, and proposing implementable solutions on the basis of 12 Transport Surveys in Raipur.

## Other Studio Project (2) : Area Appreciation of Mayur Vihar Phase I: Quality of Life, History of the Area and Social Infrastructure (Education) (January- May, 2015)

Understanding of QOL as a tool for evaluating community development; Formulating indicators to evaluate the QOL in terms of land use, demography, housing, commercial, transport, social and physical infrastructure, and environment. Detailed analysis of social infrastructure to assess inadequacies and provide preliminary recommendations

## | ASSIGNMENTS |

**Professional Practices (Jan-May, 2018)**
*Technical Scrutiny of an Issue*
*Solving an Ethical Dilemma*

**Rural & Resource Planning (Jul-Dec, 2017)**
*Critical Appreciation of one's Hometown*

**Urban Design and Conservation (Jan-May, 2017)**
*Social Fabric and Demographic analysis of Connaught Place*

MISCELLANEOUS

# INVENTORY OF LINKS

| S. No. | Name of the Project | Year | Link to the Project |
|---|---|---|---|
| 1. | Undergraduate Thesis: A Geospatial Approach to Planning for Rurban Clusters (All Sheets) | 2018 | https://drive.google.com/open?id=1djdz-xIg_1TW3ZPyZIkd42AzoAtZ6zFh |
| 2. | Undergraduate Thesis: A Geospatial Approach to Planning for Rurban Clusters (Thesis Report) | 2018 | https://drive.google.com/open?id=13TiDcrTn5XFomfv9_VP4l0IcgevN0-2F |
| 3. | Regional Planning: District Development Plan for Kurukshetra 2035: Overview of Rural Development (All Sheets- only Arpita Banerjee's Section) | 2017 | https://drive.google.com/open?id=19YIvfGyI0hgH_YlMAy3MY436lE9iMxoR |
| 4. | Regional Planning: District Development Plan for Kurukshetra 2035: Rurban Cluster Development (All Sheets- only Arpita Banerjee's Section) | 2017 | https://drive.google.com/open?id=1v_A6VtZmynreG4w_h0B5OK95etb-y5jD |
| 5. | Regional Planning: District Development Plan for Kurukshetra 2035: SWOC Analysis and Proposals (All Sheets- only Arpita Banerjee's Section) | 2017 | https://drive.google.com/open?id=1SCTUI6MXBiLy-v-Dr19EU-5xsrOsLe0P |
| 6. | Master Planning: Master Plan for Bahadurgarh 2031: Land Use (All Sheets- only Arpita Banerjee's Section) | 2017 | https://drive.google.com/open?id=1rJnSDx3Qap0hUcilkLouV5RM0ixezwyN |
| 7. | Zonal Planning: Zonal Plan for Baddi Barotiwala Nalagarh Special Area 2025: Housing (All Sheets) | 2016 | https://drive.google.com/open?id=1slRpfpMFZIldByhD4Pkvx4JhPO2qEfyE |
| 8. | Site Planning: Site and Sector Planning for Sector 28, Panchkula, Haryana (All Sheets) | 2016 | https://drive.google.com/open?id=1Vev0JXQJs1ZTKokbViJxif6uE5xLoZId |
| 9. | Traffic and Transport Planning: Transportation Study of Raipur, Chattisgarh: Traffic Volume Count (All Sheets- only Arpita Banerjee's Section) | 2015 | https://drive.google.com/open?id=1QW9PtNdGrCmzvDdIPxUDP2WYyuOnExNG |
| 10. | Area Appreciation of Mayur Vihar Phase I: Quality of Life, History of the Area and Social Infrastructure (Education) (All Sheets- only Arpita Banerjee's Section) | 2015 | https://drive.google.com/open?id=1Ib9mEWyJ0asQRLY-vqDdkkyvyEyVPCj3 |
| 11. | Internship Report: Office of the Chief Town Planner, East Delhi Municipal Corporation | 2016 | https://drive.google.com/open?id=1vzW3wtBlZ4klmFSJwqjzjGG220uk1XAi |
| 12. | Internship Report: Design Innovation Centre Project, Ministry of Human Resource Development, Govt. of India | 2017 | https://drive.google.com/open?id=1DHtJguz195V6b_1orFVHk2AHoOYa0zFU |
| 13. | Academic Assignment: Professional Practices: Technical Scrutiny of an Issue | 2018 | https://drive.google.com/open?id=1wrr60HjtJSZeXZoxJuWSn9Zw6PgJ_UJT |
| 14. | Academic Assignment: Professional Practices: Solving an Ethical Dilemma | 2018 | https://drive.google.com/open?id=1qD1YOE1TzKVsA2bIshswsJ69yOf4rGTb |

ALL THE WORK ACCESSIBLE THROUGH THE LINKS SPECIFICALLY REPRESENT THE AUTHOR'S CONTRIBUTION ONLY ( IN BOTH GROUP & INDIVIDUAL PROJECTS).

# INVENTORY OF LINKS

| S. No. | Name of the Project | Year | Link to the Project |
|---|---|---|---|
| 15. | Academic Assignment: Rural and Resource Planning: Critical Appreciation of my Hometown | 2017 | https://drive.google.com/open?id=1dh2d6St98aeAGIkO_OcEniC9kgBrzTJq |
| 16. | Academic Assignment: Urban Design and Conservation: Social Fabric and Demographic analysis of Connaught Place | 2017 | https://drive.google.com/open?id=1MjD_PACd7Y-PQ4CVrNvdsIWbDvIIKDut |
| 17. | Selected Research Work: Colonial and Post-Independence Planning in India<br>Guide - Prof. Dr. Ashok Kumar (All write-ups) | 2017 | https://drive.google.com/drive/folders/1L2esJYg5YNxIFJ3LOJwT56II0blRN9ZS |
| 18. | Selected Publications: "A Geospatial Model for Rurban Planning" in *24th International Conference on Urban Planning and Regional Development in the Information Society*, REAL CORP (2019) at Karlsruhe, Germany | 2019 | https://archive.corp.at/cdrom2019/papers2019/CORP2019_92.pdf |
| 19. | Selected Publications: "Examining the Role of Urban Planning with respect to Smart Cities in India: Case Study of Surat" in *International Conference: Smart Cities (2019)* at Jamia Millia Islamia, New Delhi | 2019 | https://drive.google.com/file/d/0B5DuGZLXCkLfd1VGbDlfSWFhc0xWRzZ3UmtfN1V4VG1iRDlN/view?usp=sharing |
| 20. | Selected Publications: "Spatial Strategies for Rurban Clusters: Case Study of Kurukshetra" at *International Conference on Future Cities*, Indian Institute of Technology (IIT) Roorkee (2019), Uttar Pradesh | 2019 | https://drive.google.com/file/d/1xL5J1GweVsScC5M1QQLbgm4F3g-O6Ebw/view?usp=sharing |
| 21. | Selected Publications: "Unpacking a Geospatial Model for Rurban Planning: Inputs from Computer Science" in *16th International Conference on Computers in Urban Planning and Urban Management (2019)* at Wuhan, China | 2019 | https://drive.google.com/file/d/0B5DuGZLXCkLfSU5ULVlXRE1IZ1FuTi1CM3BiLUFWc2E4M2sw/view?usp=sharing |
| 22. | Selected Publications: "Geo-Spatial Information Approach to Planning for Rurban Clusters" in *Coordinates* Volume XIV, Issue 9 (2018) | 2019 | https://mycoordinates.org/geo-spatial-information-approach-to-planning-for-rurban-clusters/ |
| 23. | Selected Publications: "A Literary Outlook on Informal Urban Settlements" in S*PACE (the Official Journal of SPA Delhi)*, Vol. 20 No.-3-4 (Special Mention, Editorial) (2018) | 2019 | https://drive.google.com/file/d/1I2UCCCyNHPv8VZqjLLS-WOmMLKOPCM_n/view?usp=sharing |

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