LAND SUITABILITY ANALYSIS FOR URBAN DEVELOPMENT IN A SECONDARY TOWN IN BANGLADESH

BY

M. MAHMUD ALI

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DHAKA

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THESIS APPROVED AS TO THE STYLE AND CONTENT BY:

03 Dec. 2000

(DR. MOHAMMAD A. MOHIT)
Professor, Department of URP
BUET, Dhaka — Chairman of The Committee (Supervisor)

Head , Department of URP
BUET, Dhaka — Member (Ex-Officio)

3/12/2000

(DR. SARWAR JAHAN)
Professor, Department of URP
BUET, Dhaka — Member

3/12/2000

(DR. KHANDOKER MD. MONIRUZZAMAN)
Assistant Professor, Department of URP
BUET, Dhaka — Member (Internal)

(PROFESSOR DARA SHAMSUDDIN)
Chairman, Department of URP
Jahangirnagar University, Dhaka — Member (External)

DEPARTMENT OF URBAN & REGIONAL PLANNING

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY (BUET)

ABSTRACT

Site selection for urban development requires consideration of a comprehensive set of factors and balancing of multiple objectives in determining the suitability of a particular area for a defined land use. The selection of an industrial site involves a complex array of critical factors drawing from economic, social, technical, and environmental disciplines.

Spatial decision making problems, such as site selection for any particular use, require proper means to handle the multiple socio-economic factors while considering physical suitability conditions. GIS that have been recognized as useful decision support technology but it does not provide means to deal with multiple decision factors. With these issues in mind, this study developed a framework for integrating the strengths of GIS and the AHP to incorporate the decision-maker's preferences on a range of factors in finding optimally suitable sites. This study illustrates how land suitability analysis can be applied to an urban development site selection problem.

The aim of this research is to gain a better understanding of the concept of Land suitability analysis related to urban development in a secondary city of Bangladesh. This is undertaken by means of Analytical Hierarchy Process (AHP) methodology. This study provides a methodology for site selection process in the presence of multiple and diverse decision criteria using AHP. The use of the AHP in the field of property development/estimating the value of a residential real estate/house selection is very promising.

In this study, Pabna municipality has been chosen for developing the concept of Land Suitability Analysis for Urban Development. The model known as AHP has been utilized to developing the concept of Land Suitability Analysis for Urban Development. Data was collected from Experts and field survey (Inter-Grid-cell Survey).

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CHAPTER-ONE

INTRODUCTION

1.1. BACKGROUND OF THE STUDY:

Urbanization is one of the global social transformations of the present century. From an overwhelmingly rural dominance in 1920, with only around one-fifth of urban population, the world is rapidly transforming into a predominantly urban-based society. By 1995, more than half (2.58 billion) of the world's population lived in urban areas and around 46 percent of this urban population lived in Asia compared to around one-tenth in 1920. Asia's demographic situation is dominated by five highly populated developing countries, viz. China, India, Indonesia, Pakistan and Bangladesh. Together they hold nearly three-quarters of Asia's total population, two-thirds of Asia's urban population and 30 percent of the world's urban population. Of these five countries, Bangladesh has the lowest level of urbanization (only about one-fifth) but it also has the highest growth rate of urban population in the region. The rate of urbanization in Bangladesh is over 5%, one of the highest in the world. Rapid population increase with a highly skewed land man ratio is putting continuous pressure on land and other natural resources of Bangladesh. The ratio of land to population has already gone far beyond acceptable levels. Land in Bangladesh, specifically in the crowded urban centers, therefore deserves most attention with regards to its utilization.

Land suitability analysis is an important part of land-use and environmental planning. It was developed to allow planners to use various physical criteria for potential site selection for different urban uses. It is applied to interpret how suitable for a specific use. The results of land suitability analysis serve as a foundation for the formulation and evaluation of land-use plans (Xiang and Whitley, 1994).

Land use suitability mapping is a technique which can help find to the best location for a variety of developmental actions given a set of goals and other criteria. The

mapping technique is based on natural and human processes and analyses the interactions among three sets of factors: location, development actions, and environmental effects (McDonald and Brown, 1984).

This study employed a method for assigning priorities to conflicting decision criteria called the analytic hierarchy process (AHP) developed by Thomas Saaty. The AHP is a multi-criteria decision method that uses hierarchical structures to represent a problem and then develops priorities for alternatives based on the judgment of the user (Saaty 1987a). Saaty has shown that weighing activities in multi-criteria decision making can be effectively dealt with via hierarchical structuring and pairwise comparisons. Pairwise comparisons are based on forming judgments between two particular elements rather than attempting to prioritize an entire list of elements (Saaty 1980). Adding the prioritization module for setting priorities enhances existing GIS analyses and visualization capabilities. This study illustrates a method for constructing an integrated system of these two decision support tools (GIS and AHP module), and applies it to an urban development site selection problem. The role of the GIS is to generate a set of feasible solutions representing the relative land suitability with respect to any given map layers and to display it.

The present study is intended to find out the suitable/potential areas for urban development through the application of Land use suitability Model to ensure planned urban growth in a secondary town of Bangladesh.

1.2. RATIONALE OF THE STUDY

Land is a scare resource in Bangladesh. Where land is relatively abundant, compared with the needs of the people dependent on it, land use can be planned informally or, if by formal methods, relatively simply, by sequentially deciding on the best locations for different uses.

The tremendous number of inhabitants has been absorbed by increasing residential densities within the existing neighborhoods or by converting the rural land uses to urban

land uses from surrounding agricultural land. These planned changes from rural to urban will not only affect production structure, but also it will affect the present deltaic biological process. This transformation of land should not conflict directly with the existing ecological process. Otherwise, it will create devastative ecological hazards.

Therefore, for smooth transformation of rural land to cultural urban land and to minimize the future ecological adverse impact, there is a need for a land suitability analysis technique to analyze the existing land use pattern for better use.

1.3. OBJECTIVES OF THE STUDY:

The main objective of this research was to identify potential urban land for future urban expansion of Pabna municipality by using Urban Land suitability analysis technique.

The specific objectives of the study were:

- To study existing land use of Pabna city
- To locate/identify the suitable/potential areas for urban development.
- To develop land use planning policies for a balanced development of the city.

1.4. METHODOLOGY OF THE STUDY:

The study was mainly carried out based on primary data. To achieve the objectives of the study the following methodological steps were adopted (Figure-1.1):

- Literature review
- Identification of Land Suitability factors to be included in the planning exercise.
- Defining nominal types and determination of scores for nominal types.
- Acquisition of preferences through questionnaire
- Determination of weights for each factor and preparation of inventory maps for each factors by weighting various categories in terms of suitability.

- Division of study area into grid cells and convention for labeling cells.
- Computation of the sum of weighted factor scores for each grid cell.

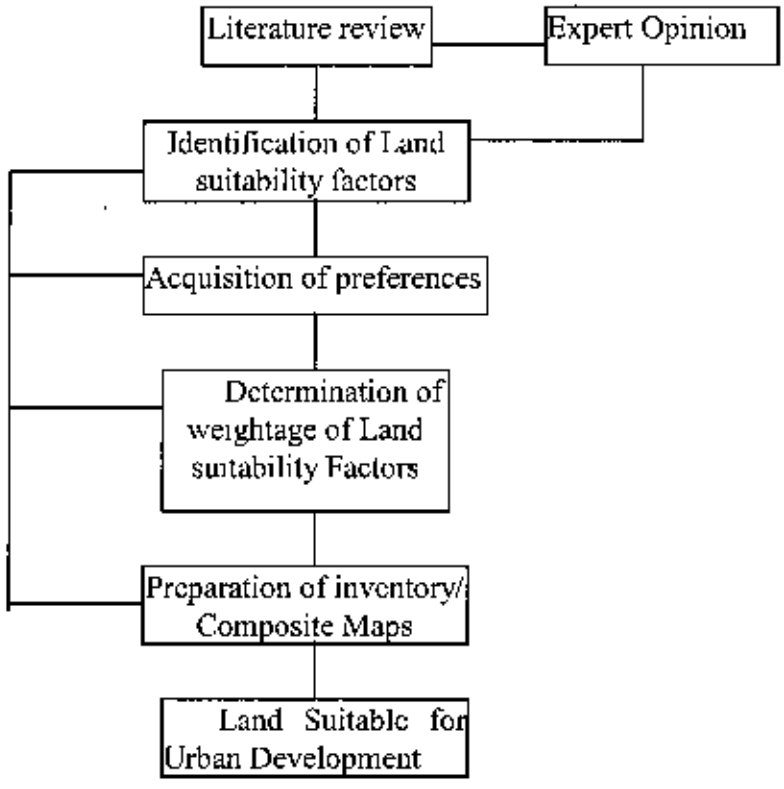


Figure-1.1: Research Design

1.4.1. LITERATURE REVIEW:

To identify possible land suitability factors and other information related to the research were collected from all available existing relevant books/journals, books, unpublished thesis, seminar paper, magazine, newspaper. The study was also used recommendations of different study reports related with the research. It was useful to collect opinions of different researchers in this matter. Some literatures on land suitability analysis and AHP are as follows:

Campbell et.al. (1992) and Chuvieco (1993) presented the application of linear programming (LP) in combination with GIS in planning land use strategies. The LP model is a mathematical model that maximizes or minimizes some objective function

subject to a set of constraints. Chuvieco (1993) designed a test application of the LP-GIS to maximize the most labor-intensive organization of land use. The objective was constrained by limited resources and the GIS were used for demarcating resource availability by means of overlay map analysis.

A similar study by Xiang (1993) employed a multi-objective LP technique. In many practical situations, it would be desirable to achieve a solution that is "best" with respect to multiple criteria rather than one criterion as in Chuvieco (1993) (i.e., maximizing labor productivity). In multi-objective LP, all objectives are assigned target levels for achievement and a relative priority on achieving these levels. It then attempts to find an optimal solution that is "as close as possible" to the targets in the order of specified priorities. However, the major drawback of multi-objective LP is that it requires the user to formulate the model by specifying constraints and variables and to quantify the priorities in advance, which is difficult in reality.

By contrast, preference-oriented methods generally interact with the user for preference setting during the analysis. The multiple criteria decision making (MCDM) techniques have proved useful in situations that require the selection of the best alternative from the number of feasible choices in the presence of multiple decision criteria and diverse criterion priorities. Some applications coupled with the GIS are found in recent research approaches (e.g., Carver 1991, Eastman et.al. 1993, Jankowski and Richard 1994, Jankowski 1995, Hickey and Jankowski 1997). Jankowski and Richard (1994) illustrated how a land suitability problem can be solved using the MCDM-GIS by enabling the procedure to select a site and set priorities in a systematic manner, taking into account spatial and nonspatial information. A study by Hickey and Jankowski (1997) was notable in terms of the level of coupling. In this, the contribution of the GIS was considered not only as a method for data gathering but also as the tool for mapping the result. A composite overlay map was visualized in the GIS that reflects the weights for criteria obtained from the MCDM module.

Other MCDM techniques include a method called the analytic hierarchy process (AHP), which has recently gained attention in GIS applications due to its ability for dealing with the multiple factors required in most GIS site suitability analyses. The primary popularity of this method can be found in the fact that users with a non-mathematical background are provided with steps to handle complex criteria through forming a hierarchical structure and performing pairwise comparisons.

Banai (1993) used this technique in combination with GIS. Banai (1993) had the search for landfill area guided by the relative weights of the suitability factors obtained in the AHP. Notably, the fuzzy set theory by Zadeh (1990) was also employed in assigning shadings with the union of various polygon buffers generated by GIS overlay operations. Although the approach by Zadeh (1990) is viewed to be notable for addressing the trade-off problem among conflicting criteria, it leaves some room for improvement as a land evaluation technique as follows. First, decision-making processes such as site suitability analysis not only require numerical weighting of criteria as in Zahch's approach but also involve steps using judgment. Such qualitative processes can be effectively manipulated using the expert systems as described in the previous section. Second, as Zadeh (1990) included in the final remark for future improvements, instead of performing the AHP operations outside the GIS environment, the applications can be linked 'tightly' by developing user-interface, which has been dealt with in this study.

1.4.2. SELECTION OF THE STUDY AREA:

Pabna municipality was selected as study area. Pabna is one of the oldest districts of Bangladesh. The geographical location of the Pabna district and its regional setting are shown on the location map. Pabna is one of the oldest urban centers in Bangladesh. Pabna municipality is a district headquarters, which is also considered as a secondary town in Bangladesh. It is located in the northwest corner of Bangladesh in Rajshahi division. It is a 'A' category municipality. It has a total population of 1,03,277 of which 53,698 are males and 49,579 are females with a density of 5,547 persons per sq. km. The total

household number is 17,649. The literacy (7+) is 60.1% for both sexes. The present municipality area is about 18.26 sq. km consisting of 15 wards (BBS, 1998).

It has got no industry based economic activity except three Pharmaceuticals and some small manufacturing like weaving, furniture making, metalworking and personal services. The importance of Pabna has been due to its unique location as a communication center and also Pabna serves as the gateway between the north and south particularly from Dhaka to other important cities of the country. Secondary Town Infrastructure Development Project (STIDP) of LGED has upgraded the status of Pabna in the urban hierarchy. Therefore, there is a need for proper policy for guiding future land use.

1.4.3. OPINION SURVEY:

To acquisition preferences from expert about land suitability factors, an opinion survey was conducted in the month of December '1999. It was an open ended questionnaire and comments could be added if experts found them necessary. 3 experts have given their opinion in the questionnaire of opinion survey. In the AHP model, the individual expert's preference weights were considered.

1.4.4. FIELD WORK/GRID-CELL SURVEY:

For the purpose of Grid-cell Survey, the study area was divided into 220 grid cells. A total of 220 grid-cells were surveyed with the help of structured questionnaire by considering 27 influential land suitability factors in January-February '2000.

1.4.5. DATA PROCESSING AND ANALYSIS

The major steps of data processing and analysis were as follows:
Firstly, land use maps of Pabna city was produced by using PC Arc/Info 3.5 and Arcview GIS software. The map of Pabna municipality was taken as base map. Secondly, the different attribute data from field survey was inserted using EXCEL, which was compatible for analysis in Arcview. Thirdly, a composite map was then produced taking account of sums of weighted scores for each land use. The cells with higher scores were indicated more suitable land/area for urban development. The Arcview Package was used to produce the final land suitability map, which identified areas suitable for urban development.

1.4.6. DATA SOURCE:

The use of expert judgments in weighting land suitability factors was an important part of the study. For each land-use type, a human expert was identified as a source of value judgments. This was done by the researcher in conjunction with the City's planning staff, Professionals, private developers etc.

Data for 3 major Urban Land uses (residential, commercial, industrial) and 27 influential land suitability factors affecting urban development were collected from Geological Survey of Bangladesh (GSB), Bangladesh Water Development Board (BWDB), Pabna Municipality, Land Record Office, Local Government Engineering Department (LGED). Bangladesh Bureau of Statistics (BBS), Survey of Bangladesh (SOB), Meteorological Department, SPARRSO, Soil Research Development Institute (SRDI). Data for each land-use groups were collected from field survey (Table-1.1).

Table- 1.1: Sources of Data

Parameter/Factors	Measurement	Sources
Environmental / ecological		
Ground Water Condition	Hydrogeological Map	BWDB/GSB
Quietness of the area	Observation	Field Survey
Distance to land fill sites	Base Map	Field Survey
Quality of view(Good view)	Perception	Field Survey
Air Pollution	-	Field Survey
Physical & Geological		
Soil quality (Foundation condition)	Geological Map	Geological Survey of Bang.
Land slope	Contour maps	BWDB/SOB/LGED
Natural drainage system	Topographic maps	BWDB/SOB/LGED
Vulnerable to flood /Elevation	Topographic maps	BWDB/SOB/LGED
Possibility of Earthquake	Tectonic/Seismic Map	Geological Survey of Bang
Socio-economic & demographic		
Population density/Sq. Km (Gross)	-	Pourasava/ BBS
Existing land use (on-site)	Pourasava Base Map	Field Survey
Land value/price	Market Value	Field Survey
Social Standing of the area	-	Field Survey
Social facilities & transportation		
Distance to School	Pourasava Base map	Field Survey
Distance to Medical facilities	Pourasava Base map	Field Survey
Distance to Recreation facilities	Pourasava Base map	Field Survey
Distance to Highway	Pourasava Base map	Field Survey
Distance to Waterway	Pourasava Base map	Field Survey
Distance to Local bus stop	-	Field Survey
Distance to Commercial facilities	Pourasava Base map	Field Survey
Distance to CBD	Pourasava Base map	Field Survey
Utility/ Urban services		
Distance to Sewer lines/ drainage	Utility Maps	Municipality/ Field Survey
Availability of Fresh water supply	Utility Maps	Municipality/ Field Survey
Distance to Power lines	Utility Maps	PDB / Field Survey
Distance to Tele comm. lines	Utility Maps	T&T Dept/ Field Survey
Available Vacant land	Pourasava Base map	Land record off / Field Survey

1.5. LIMITATIONS OF THE STUDY:

Land suitability analysis for urban development in a secondary town is a new type of study. The some limitations of the study were as follows:

- ✓ It was expected that necessary digital thematic maps and essential data would be collected from LGED, SOB and other organization. Unfortunately, it was not possible to collect all maps/data due to absence of Spatial & Attribute data. & Digital Thematic Maps.

- ✓ The Grid-cell survey of large area (surrounding of Pabna municipality) was not possible due to limited fund.

1.6. ORGANIZATION PLAN OF THE STUDY:

The present study has been divided into seven chapters. The first chapter discusses background of the study, rationale of the study, objectives of the study, scope of the study, methodology of the study, limitations of the study, organization plan of the study. Chapter-2 describes location of the study area, topography, climate, geological and hydro-geological conditions, temperature, rainfall, humidity, winds. Chapter-3 discusses past and present population, projected population, density of population, occupational pattern and employment, income levels, housing sector, source of drinking water, sanitation facilities, industrial activity, storage and warehouse facilities, commercial activities, roads, public health, social services and infrastructure. Chapter-4 presents the existing land use of Pabna municipality. Chapter-5 describes AHP and its application in land suitability analysis, mathematical description of AHP, procedures of survey. Chapter-6 presents the detail analysis and findings of the study. Lastly, Chapter-7 provides a summary of research and the need for further research direction.

CHAPTER-TWO

DESCRIPTION OF STUDY AREA

2.1. BACKGROUND OF PABNA MUNICIPALITY:

Pabna municipality was first constituted in 1876 (Pabna District Gazetteers). The area of Pabna municipality was 5-sq. km. and divided into 4 wards. The Pabna municipality was reconstituted as a Municipal Committee as per provision of the Municipal Administration Ordinance, 1960. In 1972, it was reconstituted as a Pourshava.

There are fifteen wards in municipality. The mauzas belong to the municipality are Chhatiani, Shadhupara, and Shibrampur, Gopalpur, Atua, Chak Gabinda, Pailanpur, Jotnarayan, Salgaria, Lakshanpur, Dilalpur, Dakshin Raghabpur, Arippur, Gangkala, Hemayetpur and part of Dakshin Ramchandapur and Radhanagar. Pabna municipality is responsible for sanitation and conservancy of the town and the maintenance of the roads.

2.2 LOCATION:

Pabna municipality is located between 23° 53' and 24° 05' north latitudes and between 89° 09' and 89° 25' east longitudes (*Figure-2.1)*. It is situated on the bank of Ichamoti. The total area of Pabna municipality is 18.62 sq. km. But the study area extends to approximately 19.8 sq. km (220 Grid-cells- each Grid cell equals to 300 m X 300 m).

2.3. TOPOGRAPHY:

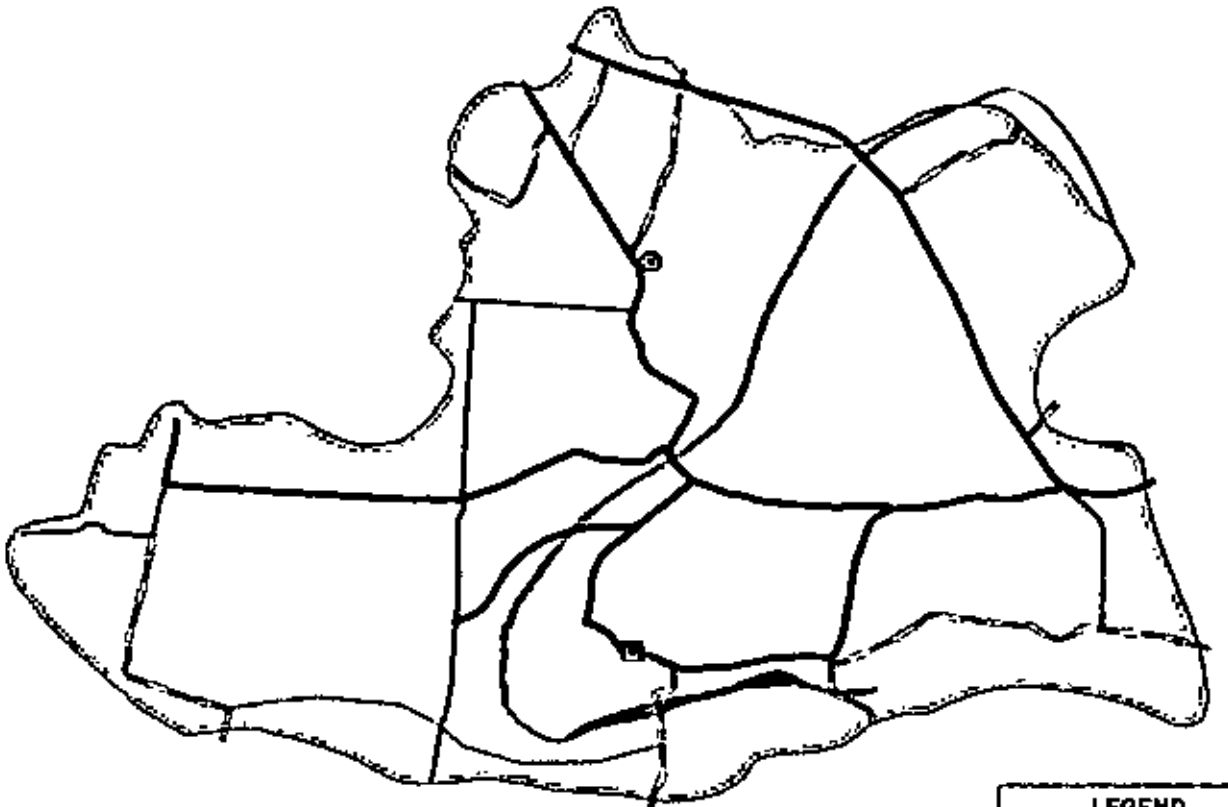
The land of Pabna district including Pabna municipality is a wide alluvial plain presenting a low and flat topography. The district may be divided into two major physiographic units. They are the Ganges flood plain and the Jamuna flood plain. The food plains occupy more than 90% of the total area and are characterized by a gentle slope.

Figure : 1.1

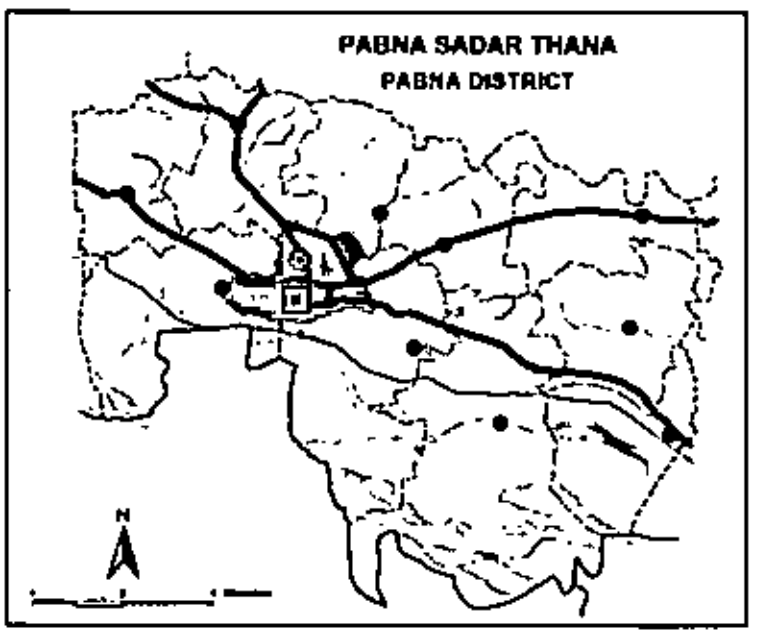
LOCATION MAP

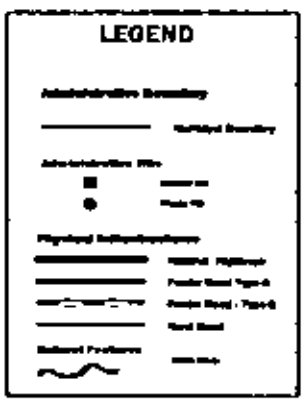
PABNA MUNICIPALITY

PABNA SADAR UPAZILA



INDEX TO ADJOINING MUNICIPALITY





Source : LGED,2000

The rivers of varying magnitude intersect this district. But in fact, the Padma and the Jamuna with their tributaries constitute the river system. The Padma river forms the whole of the southern boundary of the district for a distance of about 90 miles. The bed of Padma is wide and the river is split up into several channels.

The Jamuna is a very wide river and has lot of influence on the topography of this district. During the rainy season it is about 7 to 8 miles from bank to bank. The Baral river flows through the northern part of district, passing by the larger village of Chatmohar and continues its course to southeast. In the later part of its course, it forms the boundary between the districts of Pahna and Serajganj. Its length within the district is about 35 miles. The Ichamoti, a branch of the Padma passes through the Pabna City and finally falls into Bera thana/municipality. The length of its course from its origin to Bera is about 52 miles.

2.4. GEOLOGICAL AND HYDROGEOLOGICAL CONDITIONS:

Bangladesh is part of the largest alluvial basins in the world formed by the vigorous actions of the ancestral and present Ganges, Brahmaputra and Meghna river systems, which eventually falls into the Bay of Bengal. The streams, starting deep in the Himalayas, continue to transport and deposit along their courses tremendous volume of alluvial materials. The thickness of the material, including the earlier one deposit in the Pleistocene time and the younger one in the recent epock, varies from a thin film near the mountainous area in the northern most area upto 10,000 ft. in the southern part of the Bengal basin. It is at least 2,00 ft. thick near Dhaka and is less in the northwestern part of the country. The Tertiary sediments of mostly sandstone underlie the alluvial deposits or shale, part of which is marine nature. These sediments are reported based on complex geology comprised of rocks ranging from the Mesozoic to the Precambrian time.

Throughout the country for ages, ground water in the alluvial deposit, particularly younger ones occurring at a shallower depth has been sources of supply immediately

available in quality. With a relatively high precipitation and a closely interconnected network of surface water as recharge sources, the whole country depends upon the ground water with monitoring system of the water table fluctuation throughout the country. This also the case with the district of Pabna includes the study area. The central low-lands where Pabna hes are thickly masked with recent flood deposit, consisting of clayed soil of about 60 to 70 ft. in thickness, sand, medium to coarse in grains, makes a good water table acquire varying from 100 to 200 ft. in thickness. Although especially sizeable in scale, this aquifer shows the characteristic features of unconfined aquifer with no interfeds of confining layers through its whole thickness subject to direct rainfall or regional rainfall. Although there may be slight variation in the nature of the material or thickness, the shallow aquifer is estimated to extend over most part of the region as is testified by the existing drilling records.

The hydro-geologic structure of the region is quite simple with a single water table aquifer underlain by a thick confining bed of solid clay. The structure prevails all over this northwestern part of the country except in highland areas where earlier clay deposits are left uncovered with recent flood plains deposits. Ground line rising up north and the northeast, therefore, takes their courses southerly through this permeable formation, with its drainage on a large scale occurring perhaps in the downstream of the Ganges and the Jamuna. This ground water flow north to south appears quite regular and constant, judging from the record of the nation-wide water level fluctuation monitoring, which shows the average annual water level during the past 10 years marked no significant change. It indicates at the same time the influent and the effluent of groundwater flow are well balanced on the annual basis.

2.5. TEMPERATURE:

From mid-November to February, the weather is dry and relatively cool. The average temperature for this period is 66.7 F with the extreme minima and maxima ranging a little over 45 ° F and 91 ° F respectively. The moderating influence of cool breezes from the

Bay in the south and mountains in the north keep the changes of the day temperature within narrower limits. The period March-May is one of the hot and increasingly violent thundershowers. The average temperature is about 84 ° F with extreme minima and maxima ranging between 60 ° F and 106 ° F. June to September is the period of true monsoon, but humid conditions continue upto early November. In these months, the average temperature ranges between 83 ° F and the extreme minima and maxima range between 72 ° F and 97 ° F. The statistics of monthly and annual temperatures together with relative humidity, wind velocity and day light per day hours at Pabna City is shown in the following table:

Table-2.1: Annual Maximum, Minimum and Mean Temperature of Pabna City

Records	Maximum (° F)	Mean daily maximum (° F)	Mean (° F)	Mean daily minimum(° F)	Minimum (° F)
January	85	78.5	66.2	53.6	39
February	97	82.8	69.7	57.3	46
March	104	88.5	78.8	65.2	54
April	109	98.7	86.4	70.1	60
May	109	95.8	86.5	77.2	67
June	103	91.5	84.8	78.1	70
July	97	89.3	84.1	79.1	73
August	96	88.7	84.3	80.0	74
September	97	89.1	84.1	79.2	73
October	97	88.1	81.8	75.0	64
November	97	83.8	73.8	63.6	51
December	90	78.7	67.1	55.6	43
Annual	109	88.7	79.0	69.5	39

Source: B B S. 1999. Bangladesh Statistics Year Book, 1998, pp 116

2.6. RAINFALL:

The average annual rainfall of the district for the period ending 1997-98 was 1397 mm. There being no marked difference in elevation. The distribution of rainfall at different places of the district in different season is remarkably even but the eastern part of the district receives more rainfall than the western. The average monthly rainfall from December to January was a little over 6 mm. The monsoon bursts over the district in June when the highest 290 mm rainfall is obtained. This standard is not maintained in the succeeding months: July yielding 267 mm, August 275 mm, and September 224 mm. The

rainfall in October and November amounts to 145 mm and 13 mm respectively (average for the year 1991 for Pabna municipality).

The statistics of the mean and extreme monthly and annual rainfall in inches, for the following long-term stations of Pabna City for the period 1981-91 are given below:

Table-2.2: Annual Maximum, Minimum and Mean Rainfall of Pabna municipality

Records	Mean (m.m)	Maximum (m.m)	Minimum (m.m)
January	000	000	000
February	25	33	17
March	17	22	12
April	105	110	100
May	67	70	64
June	294	305	293
July	155	170	140
August	271	290	252
September	269	300	238
October	189	220	158
November	000	000	000
December	000	000	000

Source: B.B.S. 1999 Bangladesh Statistics Year Book, 1998, pp 118

2.7. HUMIDITY:

The humidity of atmosphere is lowest in March (64.3%) and April (65.7%). After this, there is a gradual increase, but although cloud is thickest and rainfall heaviest in June, the maximum is not reached till July or August when the saturation amounts to 88 and 87 per cent. During the monsoon period (16'June- 16 August) the humidity is always above 85 per cent.

Table-2.3: Annual Maximum, Minimum and Mean Humidity of Pabna City (in Percent)

Records	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
January	67	65	67	69	70	74	70	70	72	71	70	76	77
February	67	62	61	66	61	70	64	61	62	58	63	70	71
March	47	52	53	43	56	65	63	54	50	53	56	61	70
April	49	69	61	54	52	73	68	58	60	54	69	62	65
May	72	77	75	49	76	77	66	77	75	71	72	69	80
June	80	85	83	71	83	81	80	77	83	79	81	80	86
July	83	84	82	82	86	86	80	82	83	83	88	89	89
August	84	82	-	82	84	83	83	83	83	82	84	84	88
September	82	81	81	82	83	84	80	84	81	81	87	84	85
October	78	80	79	78	82	74	74	81	79	81	84	82	80
November	71	76	71	74	73	69	73	73	69	73	82	78	76
December	67	70	67	74	70	72	70	73	70	71	79	79	79

Source: B.B.S. 1999. Bangladesh Statistics Year Book, 1998, pp 122

2.8. WINDS:

From October to may, the prevailing wind direction is northeast or east. On the same day, the wind may blow from the north in the early morning. During the monsoon months, the wind blows consistent from the east or southeast and the atmosphere receives a sudden ascension of moisture in June which is maintained throughout the season. Hot and dry west winds occasionally blow for a few days during the months of February, March and April. Storms are frequent in the months of April and may and sometimes in September and October. The district is not ordinarily liable to cyclones, probably on account of its distance from the sea.

Table-2.4: Wind Direction. Ave. Wind Velocity and Ave. Wind Force (Pabna City)

Season	Wind Direction	Ave. Wind Velocity	Month	Ave. Wind Force
Winter	Generally North-west/West Sometimes North/North-east	0.8 -2.5 mile	December, January, February	1012.4 mile bar
Pre- monsoon	Generally South-east/ South Sometimes South-west/ East	1.6-7.9 mile	March-May	1004.1 mile bar
Monsoon	Generally South-east/ East Sometimes South/ South-west	3.4 -7.0 mile	June-September	999.0 mile bar
Post-monsoon	Generally North/North-east Sometimes West/west-east	0.8 -3.0 mile	October-November	1011.5 mile bar

Source: B.B.S. 1999. Bangladesh Statistics Year Book, 1998, pp 132

Table-2.5: Annual Maximum and Average Wind Velocity of Pabna City

Records	AverageWind Velocity (Knot)	Maximum Wind Velocity
January	0.87	10
February	1.9	15
March	1.77	20
April	6.13	20
May	8.27	30
June	8.3	25
July	8.63	25
August	4.5	18
September	3.63	24
October	1.47	15
November	0.57	15
December	1.00	10
Annual	3.63	30

Source: B.B.S. 1999 Bangladesh Statistics Year Book, 1998, pp. 132

- Mile Bar: Unit of Wind Pressure/Force (1,00,000 Mili Bar = 1 Bar)
- Nott: Unit of Wind Velocity (1.2 mile = 1 Knot.)

2.9. SUMMARY:

The study area is Pabna municipality. In this chapter, location, description, Physical, Geological and meteorological situation of Pabna municipality have been discussed. Pabna is a neat and compact city. The climate of the district including Pabna municipality is generally moderate, as it is not influenced by conditions that give rise to rapid variation in temperature because of the geographical location and the topographical feature of the district. The district usually remains under cold weather from December to February. Hot weather prevails during the months of March and April. The average lowest temperature is 19.30° C in January and the highest average are 28.90 ° C in April. The level of humidity is the lowest in March (around 64%) and the highest during monsoon and is always above 85%. The average annual rainfall of the district for the period 1998-99 was 1397 mm.

CHAPTER-THREE

DEMOGRAPHIC & SOCIO-ECONOMIC ASPECTS

3.1. PAST AND PRESENT POPULATION:

Pabna is fast growing and has now a population of 1,03,277 according to the 1991 Census as against 78,371 in 1981. During the decade 1981-1991, it had increased by 3.48 percent per year. The city had 62,254 persons in 1974. The study area of Pabna Municipality had an area of 10.5 sq. km with a population of 78,371 in 1981. The density of population was 7,464 per sq. km. In fact a significant fraction of the urban population within the city came from rural areas.

Table-3.1: Area, population, density and variation of population of the municipality area during 1901-91

Year	Area in Sq. Km	Population	Density per sq. km.	Growth Rate per Year	Variation in 1981 over 1974	Variation in 1991 over 1981
1901	N.A	18424	N.A	-		
1911	N.A	19274	N.A	0.46		
1921	N.A	19343	N.A	0.03		
1931	N.A	21904	N.A	1.32		
1841	N.A	32299	N.A	4.74	25.89 %	31.77 %
1951	N.A	32240	N.A	- 0.02		
1961	N.A	40792	N.A	2.65		
1974	N.A	62,242	N.A	4.04		
1981	10.50	78,371	7,464	3.70		
1991	18.26	1,03,277	5,656	3.18		

Source: B.B S. 1999. Bangladesh Statistics Year Book, 1998, pp. 172

3.2. PROJECTED POPULATION:

Urban population growth rate is higher than the rate of natural increase of population. The growth of urban population is dependent on factors like natural growth rate, emigration from rural areas,

Changes in urban boundary and changes in the definition of area. The population of 1991 census has been treated as the base population (1,03,277) for the purpose of projection. Three levels of projection are made in the land use plan, with growth rate 2.25 %, 3.25 % and 4.25 % as low, medium and high projections respectively. The three levels of projections for the years 1996, 2001 and 2006 AD in the study area is shown in Table-3.2.

Table-3.2: Projected population from 1991 to 2006 AD in the study area

Year	High	Medium	Low
	Population growth rate: 4.25 %	Population growth rate: 3.25 %	Population growth rate as assumed 2.25 %
1991	1,03,277		
1996	1,27,170	1,21,186	1,15,430
2001	1,56.590	1,42,201	1,29,013
2006	1,92,816	1,66,861	1,44,195

The present population (2000) in the study area with growth rate of 3.25 in estimated as 1,37,725 and with growth rate 2.25 % is estimated as 1,26,175.

3.3. OCCUPATIONAL PATTERN AND EMPLOYMENT:

Occupational involvement of the population gives a picture of the nature, type, distribution of the economic activities carried out in the area. Information on occupational pattern helps in determining the current trend of employment and the prospective economic activity that may become dominant for the future development of the area. It has been found that the people are usually divided into a number of occupational activities. The main occupation of a household is defined as the main occupation of the head of a household. Table-3.3 shows the distribution of households according to the category of occupation.

Table-3.3: Distribution of Households according to Category of Occupation, Pabna City

Types of occupation	No. of Household	% of total household
Service	5535	31.36
Agriculture	748	4.24
Industry	1045	5.92
Business	5515	31.25
Construction	520	2.95
Transport	1594	9.03
Day Labor	588	3.33
Others	2104	11.91
Total	17,649	100.00

B.B.S. 1995. "Bangladesh Population Census: Community Series, Pabna, 1991" pp. 175

The table shows that the principal occupation of the municipality is service (31.36% of the total households) followed by business that is 31.25 % of the total households. About 9.03% of the households are engaged in transport sector and 5.92 % of the households is industrial worker.

3.4. INCOME LEVELS:

The average household income in Pabna municipality in 1991 is estimated to Tk.4000 Per month. 44.98 % of the households are in the middle income group. 55.95 % of the households are in low income group and 3.07 % of the households are in the high-income group. The detail of the income group distribution is shown in Table-3.4.

Table-3.4: Monthly Income according to Head of Household, Pabna City

Monthly income in Tk.	No. of Household	% of total household
0-1500	2947	16.70
1501-2500	2323	13.16
2501-3500	3899	22.09
3501-4500	3396	19.24
4501-5500	2970	16.83
5501-6500	1572	8.91
6500+	542	3.07
Total	17,649	100.00

B.B.S, 1995. "Bangladesh Population Census: Community Series, Pabna, 1991" pp. 240

3.5. HOUSING SECTOR:

About 30.86 % of the residential buildings in Pabna municipality are found to be permanent, 60.17 % as semi-permanent and 8.97 % as temporary. The classification of houses according to building materials used is shown in Table-3.5.

Table-3.5: Category distribution of households according to wall and roof materials used

Category of house	No. of Houschold	% of total household
Permanent	5446	30.86
Semi- permanent	10620	60.17
Temporary	1583	8.97
Total	17,649	100.00

B.B.S, 1995. "Bangladesh Population Census: Community Series, Pabna, 1991" pp 254

Most of the permanent buildings are located within the core area of Pabna municipality, while majority of the houses of semi-permanent and temporary in nature are located in the fringe areas of the municipality. Type and structure of dwelling units may also be considered as indicator of income levels in the municipality.

3.6. SOURCE OF DRINKING WATER:

About 79.91 % of the population use tube well water and 15.82 % population use tap water. About 0.28 % use pond water and 0.31 % use river water (Table-3.6).

Table-3.6: Source of Drinking Water according to Head of Household, Pabna City

Source	No. of Houschold	% of total household
Tap	2792	15.82
Tube Well	14103	79.91
Well	649	3.68
Pond	49	0.28
River	56	0.31
Total	17,649	100.00

B.B.S. 1995. "Bangladesh Population Census: Community Series, Pabna, 1991" pp 197-8

3.7. SANITATION FACILITIES:

About 56.61 % of the Household use sanitary latrine and 36.82 % household use unhygienic latrine. 6.77 % Household has no latrine facilities (Table-3.7).

Table-3.7: Sanitation Facilities according to Head of Household, Pabna City

Type	No. of Household	% of total household
Sanitary latrine	9991	56.61
Unhygienic latrine	6498	36.82
No latrine	1160	6.77
Total	17,649	100.00

B.B.S. 1995. "Bangladesh Population Census: Community Series, Pabna, 1991" pp 197-8

3.8. SUMMARY:

In this chapter, Socio-economic, Demographic, Water supply and Sanitation situation of Pabna municipality have been discussed.

CHAPTER-FOUR

LAND USE ASPECTS

4.1. EXISTING LAND USE:

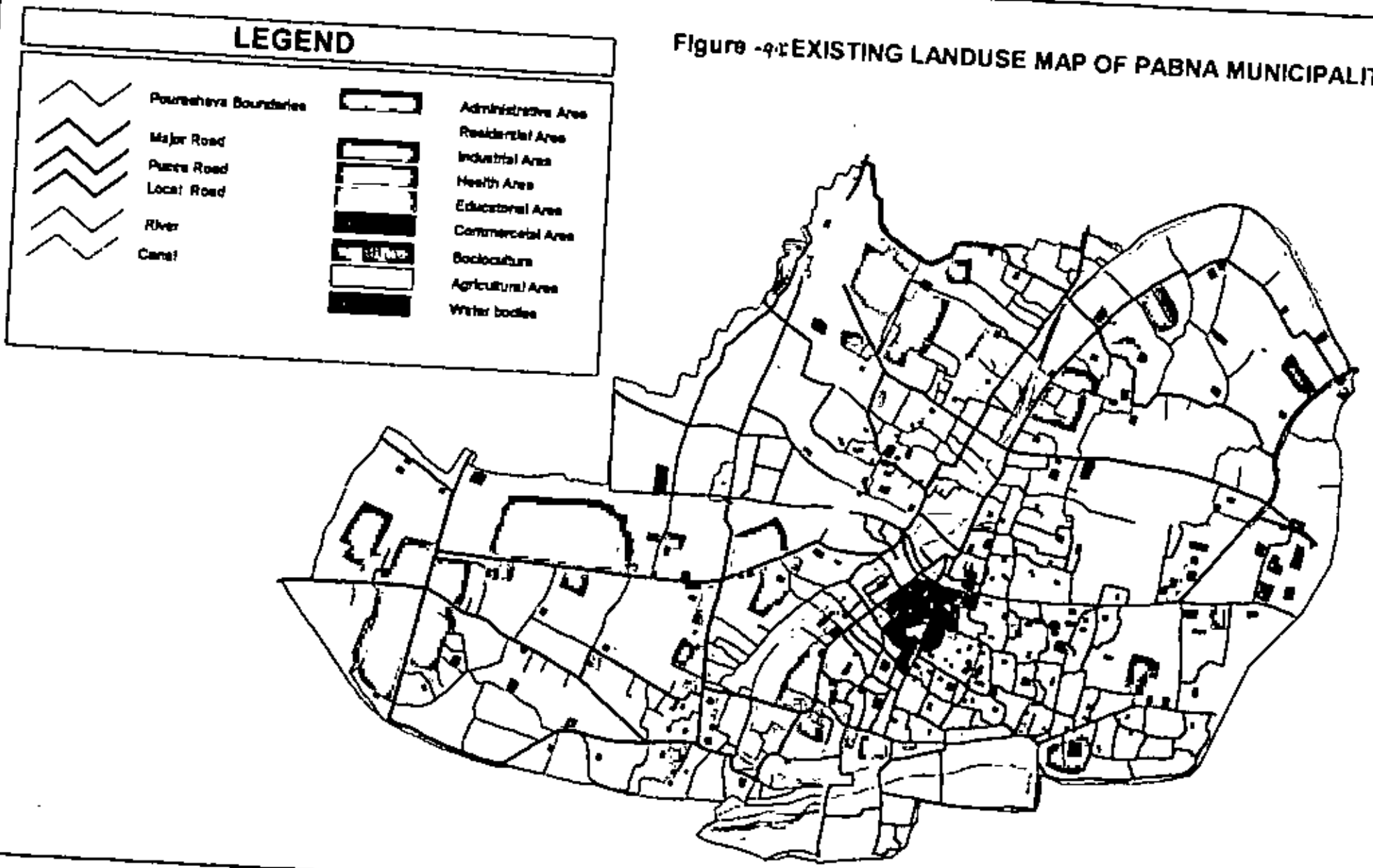
The following Table and the existing land use map depict the general land use pattern of the designated municipality area (*Figure-4.1*). The non-agricultural land covers an area 4052.26 acres that is 89.77 percent of the total municipality area and the agricultural land covers an area of 461.74 acres that is 10.23 percent of the total area.

Table-4.1: Existing Land uses Pattern of Pabna Municipality

Sl. No	Types of Land use	Area in acres	% of the total Study Area
1.	Agriculture	461.74	10.23
2.	Commerce	95.16	2.11
3.	Industry	198.20	4.39
4.	Education	129.40	2.87
5.	Health	128.00	2.83
6.	Administration, Govt. & Autonomous Dept. etc	231.70	5.13
7.	Recreation: a) Open : 14.42 b) Closed: 4.93	19.35	0.43
8.	Socio-culture	54.31	1.20
9.	Urban services	31.39	0.69
10.	Roads: a) Major Roads: 106.9 b) Secondary Roads : 140.69 c) Local Road: 205.03	452.62	10.02
11.	Residential	2418.54	53.58
12.	Water bodies	172.98	3.83
13.	Reserves & Special uses	120.61	2.67
	Total	4514	100.00

Source: Field Survey, 1999 and UDD,1988.

Figure -৭:EXISTING LANDUSE MAP OF PABNA MUNICIPALITY



Source : LGED 2000

4.2. COMMERCIAL LAND USE:

Pabna has some shopping and one commercial center or Central Business District (C.B.D). Abdul Hamid Road is the Central Business District of Pabna. The important business center is known as Pabna Bazar. Branches of several banks, the booking office for good traffic and passenger traffic of the Bangladesh Railway out-agency are located close to this Bazar. Pabna New market and 7 super markets are located in this area. Daily temporary bazar or vegetable markets and fish markets are located in Pabna bazar. Some small-scale daily bazars and five weekly hats are also located in the municipality area. Pabna is an important trading center. The main articles of trade in the city are handloom cloth, the hosiery products, locally manufactured pharmaceutical goods, bread and biscuits and some other consumer articles. There are 20 residential hotels with an average capacity of 24 beds and 70 nos. of registered restaurants mostly located in and around the city center. There are five cinema halls with capacity ranging between 300 to 500 seats each.

Commercial use covers an area of 95.16 acres that is 2.11 % of the municipality area. The detail of the uses under commercial purposes is shown in the following Table-4.2.

Table-4.2: Commercial land use

Sl. No.	Types	Areas in acres	% of Total	Location
1.	Whole sale market	10.18	10.70	Dilalpur & Atua
2.	New market & some Super market	30.03	31.56	Dilalpur, Gopalpur & Atua
3.	Daily/Weekly market	26.52	27.87	Dilalpur, Atua & Hemayetpur
4.	Banks	2.50	2.63	Gopalpur, Shibrampur & Atua
5.	Other	25.93	27.25	Salgaria, Chhatiani etc.
Total		95.16	100.00	

Source: Field Survey, 1999 and UDD,1988.

The above Table shows that the whole sale market covers an area of 10.18 acres and located at Dilalpur and Atua mauza. Pabna New Market and some super market cover an area of 30.03 acres of land. Daily bazar covers an area of 26.52 acres of land.

4.3. INDUSTRIAL LAND USE:

The geographical location of the Pabna town has greatly favored for flourishing industrial establishments of different nature. Significant progress in the field of industry was started in the district shahar from 1951. Bangladesh Small and Cottage Industries Corporation (BSCIC) set up an industrial estate at Chhatiani on the north-west part of Pabna municipality for providing incentives and infrastructure facilities to private industrial units.

Manufacture of medicine is also important industry of Pabna. There are 3 Pharmaceuticals, namely, Square Pharmaceutical Ltd, EDRUC Works and Universal Pharmaceutical Ltd. Of these, the Square Pharmaceutical Ltd. Is the largest and most important. It is one of the leading pharmaceutical industries of Bangladesh.

Hosiery is a very important cottage industry of Pabna City. In this particular cottage industry, Pabna is only second to Narayanganj. About 327 power-driven hosiery factories are working in Pabna providing an employment to about 5,000 persons in different industries. In fact, most of the houses of this town serve the dual purpose of residence-cum factory. It is almost a common sight to see scaffold like contrivances on the top of the buildings for drying hosiery knitting.

There are also other industrial units of bakery, confectionery, rice and flour mills, saw mills and timber products, pottery, printing presses, general engineering and metal products and soap factories. Considering the importance of Pabna as a seat of cottage industry, an industrial estate has been established at Hemayetpur in the neighborhood of the city.

Industrial use covers an area of 198.20 acres that is 4.39 % of the municipality area. The detail of the uses under different industrial purposes is shown in the following Table-4.3.

Table-4.3: Industrial land use

Sl. No.	Types	Areas in acres	% of Total	Location
1.	BSCIC Industrial estate	94.50	47.68	Chhatiani.
2.	Small Industries	18.85	9.51	Pailanpur, Chhatiani, Atua, Shadhupara, Shibrampur.
3.	Brick Fields	58.95	29.74	D. Raghabpur.
4.	Pharmaceuticals	20.90	10.54	Salgaria, Shibrampur.
5.	Engg. Workshop/ Go-down	5.00	2.52	Salgaria.
Total		198.20	100.00	

Source: Field Survey, 1999 and UDD,1988.

The BSIC Industrial Estate is the biggest industrial area in Pabna municipality which covers an area of 94.5 acres of land and located at Chhatiani mauza. Small-scale industries cover an area of 18.85 acres of land. Brickfields cover an area of 58.95acres of land. Pharmaceuticals cover an area of 10.18 acres and located at Salgaria and Shibrampur mauza.

4.4. EDUCATIONAL LAND USE:

Pabna has five degree/intermediate colleges, one University college, one Polytechnic institute, one Law College, two Govt. Vocational and Commercial institutes, one district textile institute, 12 high schools for boys, 5 high schools for girls and 40 primary/K.G schools. Among these, the most prominent is the Pabna Edward University College, situated on the Pabna-Ishurdi road. Established in 1898, it is one of the oldest colleges of Bangladesh and a great seat of learning. There are three more colleges in Pabna which teach upto higher secondary stage. One is exclusively for girls and is named Pabna Mahila College, one is Shaheed Bulbul College and the other is known as Pabna Night College.

The educational land covers an area of 129.0 acres that is 2.87 % of the municipality area. The detail of the uses under different categories educational institutions is shown in the following Table-4.4.

Table-4.4: Educational land use

Sl. No.	Types	No. of units	Areas in acres	% of Total	Location
1.	Pabna Edward College	1	23.30	18.00	Radhanagar
2.	Pabna Degree College	1	20.10	15.53	Radhanagar
3.	Pabna Polytechnic Institute	1	23.00	17.78	Singa
4.	Shaheed Bulbul College	1	3.90	3.01	Dilalpur
5.	Govt. Women's College	1	1.50	1.16	Dilalpur
6.	Aminuddin Law College	1	0.60	0.46	Dilalpur
7.	Pabna Night College	1	0.40	0.31	Dilalpur
8.	Govt. Vocational and Commercial Institute	2	6.90	5.33	Gopalpur
9.	District Textile Institute	1	4.00	3.09	Salgaria
10.	Primary Training Institute	1	2.00	1.54	Atua
11.	Pabna Automobile Training Center	1	0.50	0.39	Shibrampur
12.	Pabna Alia Madrasa	1	1.50	1.16	Radhanagar
13.	Madrasa	8	7.20	5.56	Shibrampur, Salgaria
14.	Pabna Homeo College	1	3.50	2.70	Shibrampur
15.	Boys High School	12	10.50	8.11	Chhatiani,
16.	Girls High School	7	5.50	4.25	Radhanagar, Dilalpur
17.	Primary/K.G. School	40	15.0	11.59	Dilalpur, Atua & Gopalpur
Total			129.40	100.00	

Source: Field Survey, 1999 and UDD,1988.

Pabna Edward College and Pabna Degree College covers an area of 43.40 acres of land. Pabna Polytechnic Institute covers an area of 43.40 acres of land and located at Singa mauza Govt. Vocational and Commercial Institute cover an area of 6.90 acres of land.

4.5. HEALTH FACILITIES:

Pabna occupies a unique position in Bangladesh having the only Mental Hospital of the country. This institution is located at Hemayetpur, only 4 k.m away from the municipal area. There are a 100-bed sadar Hospital, a 40-bed T.B hospital, a diabetic center, five Family Planning centers and a Maternity and Child Welfare Center. There are two more hospitals, one belonging to the police and the other is attached to the District Jail. Both these hospitals have 20 beds each.

The land under Health facilities covers an area of 128.20 acres that is 2.83 % of the municipality area. The detail of the uses under different health facilities is shown in the following Table-4.5.

Table-4.5: Land under Health facilities

Sl. No.	Types	Areas in acres	% of Total	Location
1.	Pabna Sadar hospital	20.00	15.62	Salgaria
2.	TB Hospital & Clinic	5.70	4.45	Salgaria
3.	Pabna Mental Hospital	100.25	78.32	Hemayetpur
4.	Pabna Maternity Center	0.30	0.23	Chak Godinda
5.	Private Clinic	1.75	1.37	Atua, Salgaria, Raghabpur
Total		128.00	100.00	

Source: Field Survey, 1999 and UDD,1988.

About 100.25 acres of land covered by Pabna Mental Hospital and located at Hemayetpur mauza. Pabna Sadar hospital covers an area of 20 acres of land and located at Salgaria mauza. Pabna TB Hospital covers an area of 5.7 acres of land and located at Salgaria mauza.

4.6. LANDUSE FOR ADMINISTRATION, GOVT. & AUTONOMOUS BODIES:

Different administrative, government agencies & autonomous bodies cover an area of 231.70 acres i.e. 5.13 percent of the municipality area. Power Development Board has the highest percentage of land in this category that is 28.40 acres and located at Radhanagor mauza. Bangladesh Agriculture Development Corporation covers an area of 26.6 acres of land and located at Atua mauza.

Bangladesh Water Development Board has 12.35 acres of land and located at Atua mauza. Upazila Parishad covers an area of 23.10 acres of land and located at Radhanagor mauza. Bangladesh Agriculture Research Institute covers an area of 17.50 acres of land and located at Chak Gobindapur

Pabna Jail covers an area of 10.20 acres of land and located at Gopalpur mauza. Pabna Judge court covers an area of 3.30 acres of land and located at Gopalpur mauza.

The detail uses in this category are given in the following Table-4.6:

Table-4.6: Land use for Administration, Govt. & Autonomous Bodies

Sl.	Name of Govt. Department	Areas in acres	% of Total	Location
1.	District Commissioner's Office	1.60	0.69	Atua
2.	Judge Court	3.30	1.42	Gopalpur
3.	Superintendent of Police	3.70	1.59	Atua
4.	Pabna Municipality	0.90	0.39	Gopalpur
5.	Police Line	8.40	3.62	Gopalpur
6.	Police Station	2.10	0.90	Radhanagar
7.	Pabna Jail	10.20	4.40	Gopalpur
8.	Roads & Highways Office	3.00	1.29	Atua
9.	Bangladesh Water Development Board	12.35	5.33	Atua
10.	Public Works Department	6.70	2.89	Chhatiani
11.	Power Development Board	28.40	12.26	Radhanagar
12.	Civil Surgeon Office	1.30	0.56	Gopalpur
13.	District Parishad	5.20	2.24	Gopalpur
14.	Thana Parishad	23.10	9.97	Radhanagar
15.	District Education Office	0.85	0.37	Atua
16.	Thana Education Office	0.45	0.19	Atua
17.	Family Planning Department	0.40	0.17	Atua
18.	Bangladesh Agriculture Research Institute	17.50	7.55	Chak Gobindapur
19.	Public Health Engineering	1.90	0.82	Radhanagar
20.	Forest Extension Department	10.20	4.40	Salgaria
21.	Ansar & Village Defense Party	3.30	1.42	Chhatiani
22.	Registry Office	0.80	0.34	Gopalpur
23.	Food Go-down/Office	1.40	0.60	Salgaria
24.	Bangladesh Agriculture Development Corporation	26.60	1.15	Shibrampur, Atua
25.	District Animal Husbandry Office	0.85	0.37	Atua
26.	Thana Revenue Office	0.40	0.17	Gopalpur
27.	Social Welfare Office	0.35	0.15	Gopalpur
28.	Govt. Alcohol Wholesale Department	0.40	0.17	Atua
29.	Government Housing	18.05	7.79	Chhatiani
30.	Fisheries Office	6.00	2.59	Radhanagar
31.	Circuit Office	2.00	0.86	Atua
32.	Other	60.0	12.94	Different Places
Total		231.70	100.00	

Source: Field Survey, 1999 and UDD,1988.

4.7. RECREATIONAL SPACES:

Recreational spaces cover an area of 19.35 acres that is 0.43 % of the municipality area. Out of which 14.42 acres of the total land in this category covered by recreational open spaces (Stadium, Playground etc.) The detail of the uses under different categories recreational spaces is shown in the following Table-4.7.

Table-4.7: Recreational spaces

Sl. No.	Types	No. of units	Areas in acres	% of Total	Location
1.	*Recreational Open spaces*		*14.42*	*74.52*	
a.	Stadium	1	8.72	45.06	Chak Gobindapur
b.	Swimming Pool	2	0.75	3.87	Chak Gobindapur
c.	Children Park	1	0.20	1.03	Gopalpur
d.	Play Ground	5	4.75	24.55	Atua
2.	*Recreational Closed spaces*		*4.93*	*25.48*	
a.	Cinema Hall	5	2.05	10.59	Dilalpur, Raghabpur
b.	Auditorium	1	0.45	2.32	Gopalpur
c.	Town Hall	1	0.40	2.07	Gopalpur
d.	Public Library	1	0.28	1.45	Gopalpur
e.	Gymnasium	1	0.75	3.87	Chak Gobindapur
f.	Other		0.50	2.58	
Total			19.35	100.00	

Source: Field Survey, 1999 and UDD,1988.

4.8. LAND USE FOR SOCIO-CULTURAL PURPOSE:

There are 16 mosques, several Hindu temples and one Baptist Mission Church. Among the mosques the most notable is the Jami-I-Mosque which is situated near the Collectorate.

Socio-cultural centers cover an area of 54.31 acres, that is 1.20 percent of the municipal area. Mosque covers an area of 13.76 acres of land. Eidgahs cover an area of 6.0 acres of land and located at Atua, Chhatiani, Salgaria mauza. Graveyards cover an area of 30.65 acres of land and located at Chhatiani and Raghabpur mauuza. The following Table shows the distribution of the same:

Table-4.8: Land use for Socio-cultural Purposes

Sl. No.	Types	No. of units	Areas in acres	% of Total	Location
1.	Mosque	90	13.76	25.34	In all mouzas & Wards
2.	Eidgah	7	6.00	11.04	Atua, Chhatiani, Salgaria
3.	Graveyard	12	30.65	56.43	Chhatiani, Raghabpur
4.	Mondir	6	1.35	2.48	Radhanagar
5.	Church	1	0.15	0.27	Dilalpur
6.	Crematorium	1	2.40	4.42	Salgaria
Total			54.31	100.00	

Source: Field Survey, 1999 and UDD,1988.

4.9. URBAN SERVICES:

Pabna City offers the usual civic amenities. The city has two telephone exchanges with 4000 telephone line, 10 post offices within the city including the general post office. The City is fully electrified and power by PDB through three 11-KV sub-stations. . A fire-service station is also located here. The municipality constructed water works and drainage system (Pucca-40.5 Km + Kutcha-20 km) in the city. There are four Graveyards and one cemetery on the bank of Padma. There is no public sewerage system in Pabna municipality. There are four cinema halls, one community center, three parks, and a town hall with an auditorium and a stage for theatrical performances and other cultural functions. The town has a circuit house, maintained by PWD.

Urban Services cover an area of 31.39 acres, that is 0.69 percent of the municipal area. About 35 percent (11.20 acres) of the total area in this category is covered by Pabna Bus Terminal which is located in Shibrampur mauza. Water supply and Pump houses cover an area of 2.60 acres, that is 8.28 percent of the total land in this category. Telephone and Telegraph offices cover an area of 0.50 acres, that is 1.6 percent of the total land in this category and Fire Service Station cover an area of 1.00 acres, that is 3.18 percent of the total land in this category. The other detailed uses in this category are shown in the following Table-4.9.

Table-4.9: Urban Services in the Municipality Area

Sl. No.	Types	No. of units	Areas in acres	% of Total	Location
1.	Telephone and Telegraph office	2	1.50	4.78	Gopalpur
2.	Post office	4	0.40	1.27	Gopalpur
3.	Pabna Bus Terminal	2	11.20	35.68	Dilalpur, Shibrampur
4.	BRTC Terminal	1	2.10	6.69	Shibrampur
5.	Police Outpost	2	0.60	1.91	Radhanagar
6.	Water supply and Pump house	3	2.60	8.28	Dilalpur, Atua
7.	Fire Service Station	1	1.00	3.18	Dilalpur
8.	Town Tahsil Office	1	0.30	0.95	Gopalpur
9.	Waste Disposal Office	1	1.39	4.43	Salgaria
10.	Electric Supply Office	2	0.30	0.95	Radhanagar
11.	Others		10.0	31.39	
Total			31.39	100.00	

Source: Field Survey, 1999 and UDD,1988.

4.10. LAND UNDER ROADS:

Within the municipal area of the town there are about 93.50 km of roads of which 60 km are paved (permanent) and the rest 33.5 km are unpaved (temporary). Out of the paved roads, 6 km of roads are maintained by RHD. The municipality maintains the remaining 87.5 km of roads. Among the important thoroughfares the following are notable: Pabna-Pakshy Road, Abdul Hamid Road, Stand Road etc. Abdul Hamid Road is permanent road and runs through the heart of the town and connects the Pabna-Ishurdi road with Pabna-Nagarbari road. Almost all important Government offices, public institutions and banking and commercial concerns are located either sides of Abdul Hamid Road.

Dhaka-Rajshahi national highway passes through Pabna municipality. A by-pass has been constructed, a part of which has passed through the northern part of the municipality. This has reduced the town-center free from inter district traffic congestion and also increase the efficiency of the national highway. Pabna municipality has two bus terminals, one truck terminal and five baby taxi/tempo stands and a number of rickshaw stands.

Roads cover a total area of 452.62 acres which is 10.02 percent of the municipal area. The total mileage comes to 155 miles, that includes all kinds of roads. The roads are classified into three categories according to their right of way:

1. Local Road : Up to 24 ft. wide
2. Secondary Road: 25 ft. to 39 ft. wide
3. Major Road: 40 ft. wide and above

The existing crest width or the pavement widths of the road, however, have not been considered in the above classifications.

Again, according to their surface conditions the roads have been classified into two categories viz.

1. Temporary Road : only soil, no surface treatment
2. Permanent Road: rigid (concrete) or flexible (bitumen) pavements or herring bone bond brick soling.

Table-4.10: Land under roads

Land use	Permanent		Temporary		Total		
	Length in mile	Area in acres	Length in mile	Area in acres	Length in mile	Area in acres	% of Total
Major Road. (40 ft. and above)	20.0	106.90	0.00	0.0	20.0	106.9	2.36
Secondary Road: (25 ft. to 39 ft.)	25.00	90.05	15.0	50.64	40.0	140.69	31.08
Local Road : (Up to 24 ft. wide)	50.0	118.39	45.0	86.64	95.0	205.03	45.30
Total	95.0	315.34	48 05	137.28	155.0	452.62	100.00

Source: Field Survey, 1999 and UDD,1988.

4.11. RESIDENTIAL LAND USE:

Residential Land use covers an area of 2418.54 acres that is 53.58 % of the municipality area. Permanent structures cover an area of 1023.77 acres or 22.68 % of the municipality area. Semi-permanent structures cover an area of 868.56 acres or 19.24 % of the municipality area and 35.91 percent of total area used in this category. Temporary

houses/temporary structures cover an area of 526.21 acres or 11.66 % of the municipality area and 21.76 percent of total area used for residential purpose.

4.12. LAND UNDER WATER BODIES:

A considerable amount of land have been used as domestic ponds, ditches and depression, canal and river, which is amounted 172.98 acres or 3.83 percent of municipality area. Ponds and ditches cover an area of 88.03 acres that is 1.95 % of the municipality area and 50.89 percent of total area in this category. Canals cover an area of 28.20 acres that is 0.62 % of the municipality area and 50.89 percent of total area under water bodies. The Ichamoti river covers an area of 56.75 acres that is 1.25 % of the municipality area and 32.81 percent of total area in this category.

4.13. RESERVES AND SPECIAL USES:

Reserve lands and special uses have been classified as those lands, which are to be retained permanently and do no fall in any categories. This category covers an area of 120.61 acres that is 2.67 % of the municipality area. More than 58 percent of this category is earmarked for proposed park. Proposed municipality office covers an area of 2.20 acres that is 1.82 percent of total area in this category. The table below shows the detail uses in this category.

Table-4.11: Reserve Land and Special Uses

Sl. No.	Types	No. of units	Areas in acres	% of Total	Location
1.	Brick Field (PWD)	1	4.60	3.81	Chhatiani
2.	Proposed Municipality office	1	2.20	1.82	D. Ramchandrapur
3.	Proposed park	1	10.36	8.59	D. Ramchandrapur
4.	Deep Tube well	4	0.45	0.37	Chhatiani
5.	Vacant land (Urban deferred)	-	103.00	10.78	
Total			120.61		

Source: Field Survey, 1999 and UDD,1988.

4.14. SUMMARY:

From the land use study, it is clear that Pabna municipality has grown haphazardly. No planned development is found in Pabna municipality. Three Pharmaceuticals and some industries have developed in residential area that creates an environmental problem in Pabna municipality. And, there is acute shortage of housing and recreational facilities in Pabna municipality.

CHAPTER-FIVE

APPLICATION OF AHP IN LAND SUITABILITY ANALYSIS

5.1. INTRODUCTION:

Thomas L. Saaty developed AHP in 1977 for military contingency planning to allocate scare resources, and for political participation in negotiated disarmament agreement. Vargas referred that it is a multiple criterion methodology. In 1990, Saaty explained the AHP as a structured process consisting of a goal, criteria, sub-criteria, and alternative (options) and a set of judgements to establish a relationship amongst them. The ultimate objective is to obtain a scale of relative importance for the alternatives.

Land use suitability mapping is a technique which can help find to the best location for a variety of developmental actions given a set of goals and other criteria. The mapping technique is based on natural and human processes and analyses the interactions among three sets of factors: location, development actions, and environmental effects. The weighting of land suitability factors by human experts is integral to land suitability analysis.

A suitability map assesses the ability of each increment of land under study to support a given use. The urban suitability map can provide a basis for urban growth policies and infrastructure locations and other long-range planning decisions,

5.2. ANALYTICAL HIERARCHY PROCESS (AHP)

The analytical hierarchy process (AHP) is a multi-attribute modeling methodology which was developed and applied by Saaty. AHP has become a popular tool for problems of multi-attribute decision modeling.

The principal idea of AHP is based on pairwise comparisons at the different hierarchical levels of a problem which is concerned with evaluating the relative importance of a set of

criteria. Pair-wise comparisons of the criteria are represented in a matrix form from which the relative weights may then be calculated by special procedure. The basic observation is that it is easier to compare the importance of two different criteria than to make an overall comparison in one sweep. For the sake of assessment, a hierarchy of the weightings of the land suitability factor is structured. Such a hierarchical structure helps to clarify the relationships among various suitability factors. It, in fact, conforms to the way in which human beings view things.

After defining the problem parameters, the first step in AHP is to decompose the decision-making process into hierarchical criteria levels. For each hierarchy level, the criteria are examined through pair-wise comparison matrix. The weights to be attributed to the different criteria are then calculated as the components of the normalized Eigen vector for the maximum eigen-value of this matrix. This process is repeated for each hierarchical level of the decision tree. The hierarchy is constructed so that the lower levels of hierarchy are refinements of its upper levels. The decision alternatives are placed on the lowest level of the hierarchy.

5.3. MATHEMATICAL DESCRIPTION OF AHP:

The logic of pair-wise comparison of n elements (different criteria) is carried out in a matrix $A = (a_{ij})$.

$$A = \begin{vmatrix} W1/W1 & W1/W2 & W1/W3 & . & W1/Wn \\ W2/W1 & W2/W2 & W2/W3 & . & W2/Wn \\ W3/W1 & W3/W2 & W3/W3 & . & W3/Wn \\ . & & & & \\ Wn/W1 & Wn/W2 & Wn/W3 & ... & Wn/Wn \end{vmatrix}$$

Where the elements of the matrix are the pair-wise comparison ratios of the weights W_i.

The pair-wise comparisons are done so that one compares the column unit to the row unit. Thus a matrix ratio is formed with $a_{ij} = w_i / w_j$. The matrix A is reciprocal $a_{ji} = 1/ a_{ij}$ and all its diagonal entities are unity (aii = 1). For such a study, a total of n*(n-1)/2

comparative judgements are thus required, where n is the number of criteria used to evaluate the considered hierarchical level.

The matrix rank of A is one and the following equation holds: $A*W = n/W$

Where $W= (w1, w2, ... wn)'$.

W is the relative weight vector and n is the number of elements.

The problem of finding W has thus been recast in terms of a matrix algebra eigen- value equation with n as the eigen- value and W as right eigen vector of the matrix A.

5.4. STRUCTURE OF AHP MODEL:

AHP organizes the various factors of a problem into a hierarchy similar to a tree type structure (Figure-5.1). The top level contains the Goal. Intermediate levels represent the factors and criteria of the problem. At the bottom of the tree are the leaves, which represent the choice. A complex model may have additional level to represent further breakdowns of the main criteria into sub-criteria.

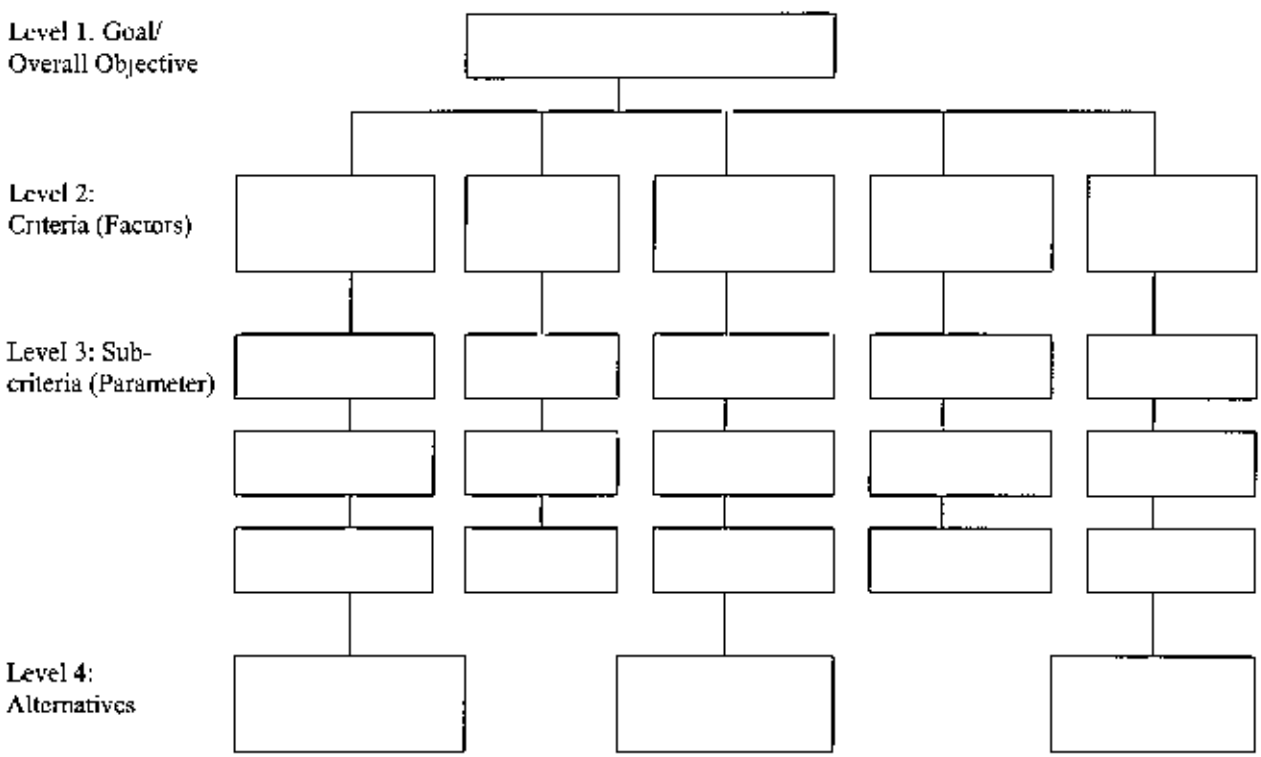


Figure-5.1: Structure of AHP Model

5.5. AHP MODEL AND LAND SUITABILITY ANALYSIS:

According to AHP model choice process is to be structured in a hierarchical order, in different levels such that the factors in each level is related to at least one factor of each preceding and the succeeding levels. Here in the best policy choice method, the selection process has been divided into four levels as follows:

Level-1: Goal of the structure is to find out a Suitable Community for Urban Development

Level-2: Criteria- the factors of Land Suitability Analysis

However, based on the human capability in comparing the factors in the paired comparison method, only five most important factors have been considered in this analysis.

Level-3: Sub-criteria- sets of parameter have been considered in this analysis.

Level-4: Alternatives- 3 alternatives have been considered in this analysis.

The process begins by preparing the decision factors and constructing a hierarchical structure that will serve as the input data in the AHP module. The AHP involves prioritizing the decision factors based on the hierarchical framework, descending from a goal of the task, to group criteria, down to subcriteria (and further to their children criteria if they exist), and finally to the alternatives (i.e., communities to be compared). Figure-5.2 shows an example of how the hierarchical structure of decision factors can be established, in which Environmental /Ecological factor is one criteria, while Ground Water Condition, Quietness of the area, and Quality of view are sub-criteria, and three sites are presented as final alternatives.

Once the necessary information is prepared using the GIS, the AHP can begin. In the AHP, it is possible to attach a relative preference measure to each criterion selected in the previous step. The hierarchy of the decision criteria that has been established facilitates this process by permitting the focus to be on comparing a small number of criteria at a time. Setting priorities is aided by the pair-wise comparison aspect of the AHP, which allows a comparison of only two criteria at once, eliminating the potential confusion of

having to estimate multiple criteria simultaneously. The acquired relative weights of the criteria in different stages of comparisons are synthesized, yielding the composite priorities of all criteria and eventually the relative weights of the alternatives (i.e., the communities).

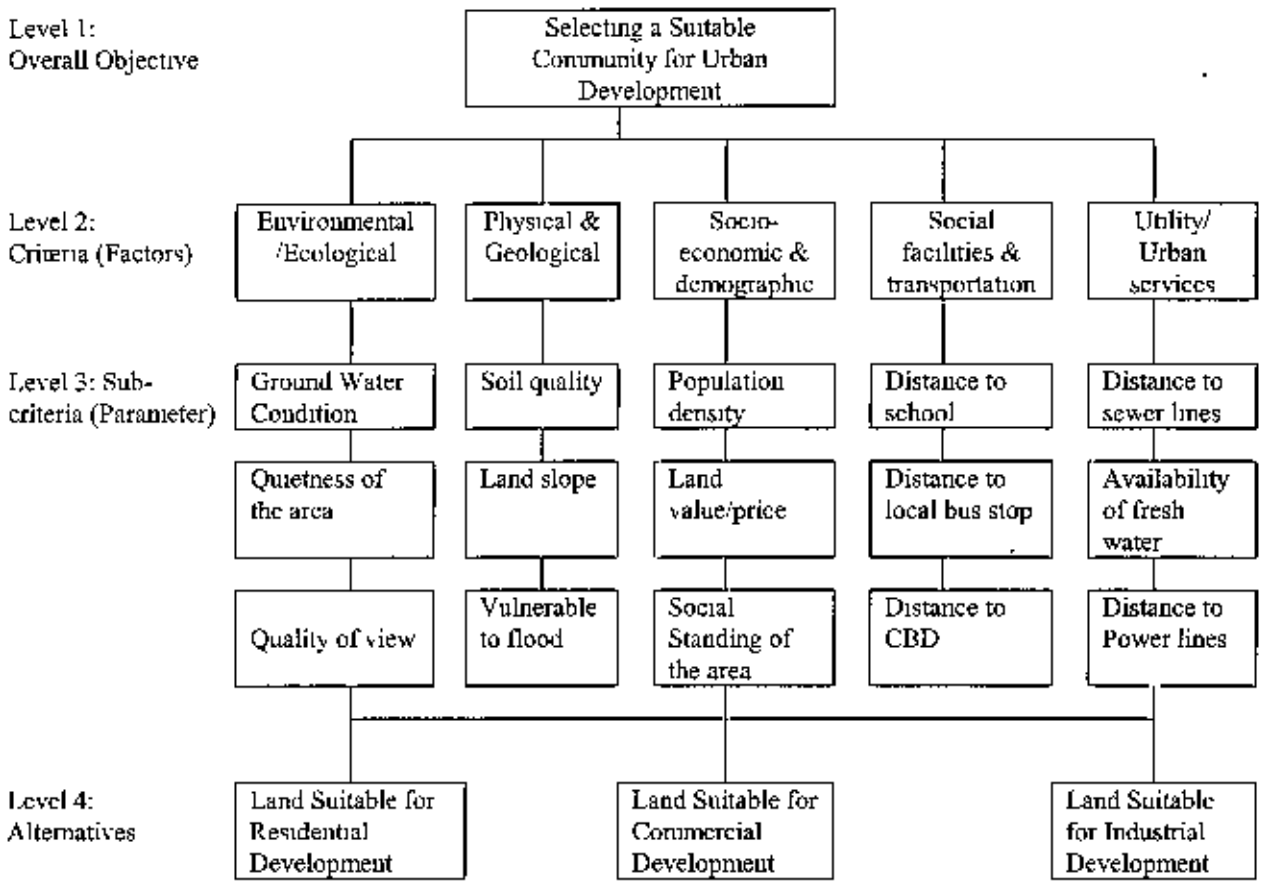


Figure-5.2: Hierarchy for selecting a site for Urban Development

5.6. INTEGRATION OF THE AHP WITH THE GIS:

Some applications that incorporate GIS data and operating capabilities into an expert system to form a geographic decision support system for resource management, territorial planning, or land suitability analysis. Djokic (1991) linked the Arc/Info GIS with an expert system to create a drainage network assessment system that checks for completeness and connectivity of network elements of GIS data. Evans et.al. (1993) stated in their study that the improved version of SITE CODE (Shaw et.al. 1993) can

provide regulatory information to the user by linking regulatory facts stored in a database to sites located in a GIS through an expert system query interface. A study by Miller (1994) illustrated an increased utility of integrated decision tools by showing how the GIS can be coupled not only to the knowledge base but also to the environmental model to address vegetation change problems.

Once the hierarchy for a problem is established, the same prototypical methodology can be applied level by level, regardless of the complexity of the hierarchy. Basically, the process seeks to assess the weights of the lower hierarchy level with respect to the level of criteria immediately above. Locally obtained weight values are used to generate the composite weights of the next lower hierarchy level and, ultimately, to produce the global weights of the alternatives with respect to the overall objectives of the problem.

5.7. PROCEDURES OF LAND SUITABILITY ANALYSIS:

The procedure of land suitability analysis for urban development (a total of three possible land-use types such as residential, commercial and industrial land uses) involved the following steps:

- Identification of Land Suitability factors to be included in the planning exercise.
- Defining nominal types and determination of scores for nominal types. (Higher scores indicate greater suitability for development).
- Acquisition of preferences through questionnaire
- Determination of weights for each factor and preparation of inventory maps for each factors by weighting various categories in terms of suitability.
- Division of study area into grid cells and convention for labeling cells.
- Computation of the sum of weighted factor scores for each grid cell.
- Producing composite maps by overlaying two or more inventory and sums of weighted scores for each land use.

5.7.1. Identifying Land suitability factors and Parameters:

First the factors relevant to assessing the suitability of land for urban development has been selected. Based upon literature survey and discussion with experts five types of land suitability factors have been identified. The factors have been again subdivided into 27 parameters.

5.7.2. Defining/Specifying Degree of Impact:

For each parameter, Degree of Impact with scores has been defined. A Six-point scale: 5 (High), 4 (Moderately High), 3 (Moderate), 2 (Moderately Low), 1 (Low), and 0 (Excluded) scale was used to measure degree of impact (Vi) of surveyed parameters. For land slope, the Degree of Impact are high, medium and low and corresponding ratings are 1, 3 and 5, respectively. The highest numerical score is associated with the flattest ground and indicates land with slopes most suitable for urban development. For quality of views factor, the Degree of Impact are also good, fair and poor. In this case, the highest ratings go to cells with the highest quality views, since these areas are judged more suitable for urban development. The Degree of Impact and corresponding scores are shown in Table-5.1:

Table-5.1: Degree of Impact of Land suitability Parameter's (Vi)

Factors	Parameter	Degree of Impact with Score		
		5	3	1
Environmental	Ground Water Condition	Good	Fair	Poor
	Quietness of the area	No	Moderate	High
/ecological	Distance to Green area	<2000m	1000-2000m	>2000m
	Air Pollution	No risk	Moderate risk	High risk
	Quality of view(Good View)	Good	Fair	Poor
Physical &	Soil quality (Foundation condition)	Good	Fair	Poor
	Land slope	<10% (5%)	10-20%	20> (22.5%)
Geological	Natural/Soil drainage system	Good	Moderate	Poor
	Vulnerable to flood /Elevation	No risk (High land)	Moderate risk	High risk (Low land)
	Possibility of Earthquake	No risk	Moderate risk	High risk
Socio-	Population density/Sq. Km. (Gross)	< 4000	4000-5000	>5000
Economic &	Existing land use (on-site)	Parent	Mixed	Conflicting
Demographic	Land value/price (Per Acre)	Low	Medium	High
Factors	Social standing of the area	Good	Fair	Poor
Social	Distance to School	< 500m	500-1000m	> 1000m
Facilities	Distance to Medical facilities	< 500m	500-1000m	> 1000m
&	Distance to Recreation facilities	< 1000m	1000-2000m	> 2000m
Transportation	Distance to Highway	< 1000m	1000-2000m	> 2000m
	Distance to Waterway	< 500m	500-1000m	> 1000m
	Distance to Local bus stop	< 500m	500-1000m	> 1000m
	Distance to Commercial facilities	< 1000m	1000-2000m	> 2000m
	Distance to CBD	< 1000m	1000-2000m	> 2000m
Utility/	Distance to Sewer lines/ drainage	< 500m	500-1000m	> 1000m
Urban	Availability of Fresh water supply	< 500m	500-1000m	> 1000m
Services	Distance to Power lines	< 500m	500-1000m	> 1000m
	Distance to Tele comm. Lines	< 500m	500-1000m	> 1000m
	Available Vacant land	Vast	Fair	Limited

5.7.3. Elicitation of experts' preferences:

It is a process by which to elicit the value judgments of human experts on the relative importance of land suitability factors in respect to a land-use type. The experts' preferences or value judgments are 'raw data' for the weighting of land suitability factors. There are five steps of acquisition of experts' preference (Figure-5.3).

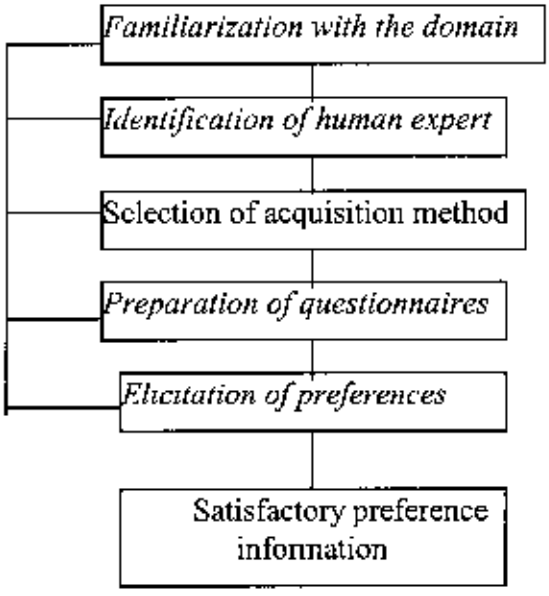


Figure-5.3: Elicitation of experts' preferences

a). Familiarization with the domain:

The first task in preference acquisition is to determine precisely the objects or attributes on which preferences were elicited. To this end, a knowledge worker (the analyst who elicits experts' value judgments) needs to become familiar with the work accomplished in the two previous stages of problem definition and hierarchy construction. The outcomes of these steps include a detailed list of potential land-use types, the influencing land suitability factors with their groupings, and a hierarchy of suitability factor weightings.

b). Identification of expert:

For each land-use type, a human expert was identified as a source of value judgments. The researcher in conjunction with the experts accomplished this. Table-26 listed the specialties of these experts in relation to land suitability factor weightings.

Table-5.2: Identity and specialty of human experts and their roles in weighting of the land suitability factor.

Identity	*Specialty*	*Land-use type assessed*
Investor	Investment analysis	Commercial
Investor/Industrialist	Economic developer	Industrial
Private developer/ Govt. authority	Residential development	Residential

(c). Selection of acquisition method:

The knowledge worker then needs to find out, for each of the experts, what method should be used to elicit preferences. There are various methods to collect data. Among these methods, interviews (either structured or unstructured) are the most commonly used and widely accepted approach to preference acquisition. Pair wise comparisons provide a useful and efficient tool for preference acquisition. This is because it is psychologically easier for most individuals to form pair wise judgments between two particular elements than to compare among the 'n' objects at one time (Saaty, 1992).

(d*). Preparation of questionnaires:*

The questionnaire is prepared for its simplicity and flexibility characterizes a structured interview. The requests for pair-wise comparisons are made through tables rather than questions or matrices. These tables contain seven columns. The first and last columns are land suitability factors for comparison; the remaining columns are for preference added. All that an interviewee needs to do is to simply tick to mark with his or her value judgments on which of the two factors is more important and how many times. The interviewee can choose either a numerical or a linguistic scale for pair-wise comparisons. The level/degree of preferences for each pair-wise comparison and the corresponding definitions are contained in Table-5.3. A level of 1 means that both characteristics are equally important. A level of 2 implies that one factor is slightly more important than the other is; whereas a level of 5 means that one factor is absolute dominance of one factor over the other.

Table-5.3: AHP Scale for the pair-wise comparisons

Intensity of importance	Definition and explanation
1-	Equal importance (Two factors contribute equally to the objective)
2-	Slight importance (Experience and judgment slightly favor one factor over the another)
3-	Moderate importance (Experience and judgment moderately favor one factor over the another)
4-	Strong importance (Experience and judgment strongly favor one factor over the another)
5-	Extreme or Absolute importance (One is of the highest possible order of affirmation as compared to the other)
0-	One of the factors has absolutely nothing to do with the selection of this particular land use.

An excerpt of the questionnaire is given in Appendix-A.

5.7.4. Determining Factor Weights for land suitability factor groups/factors:

Derivation of relative Factor Weights of land suitability factors is completed in this stage. A pair-wise comparison matrix is constructed in Table-5.4. In the right margin of the table the normalized solution of this pair-wise comparison matrix is shown with the relative of the factors, wi. Saaty states that if A is 'n' time preferred to B, B is 1/n times as preferred as A. The preference information from the experts is entered into matrices and saved as files in a spreadsheet package. A computer program is developed and then it is applied to these matrices to calculate the weighting scores.

Table-5.4: Deriving relative weightage of land suitability factor

Suitability factor	Environmental /ecological	Physical/ Geological	Socio-economic & Demographic	Social facilities & transportation	Utility/Urban Services	Weight (Wi)
Environmental /ecological	1	½	½	½	1/3	0.1
Physical/Geological	2	1	1	1	½	0.2
Socio-economic & Demographic	2	1	1	1	½	0.2
Social facilities & transportation	2	1	1	1	½	0.2
Utility/Urban Services	3	2	2	2	1	0.3
Weight ($\Sigma wi = 1.0$)						1.0

The results of the calculations were then presented to the experts who provided the preference information for approval. Table-5.5 listed the final weighting scores of the twenty-seven land suitability factors with respect to all three land-use types.

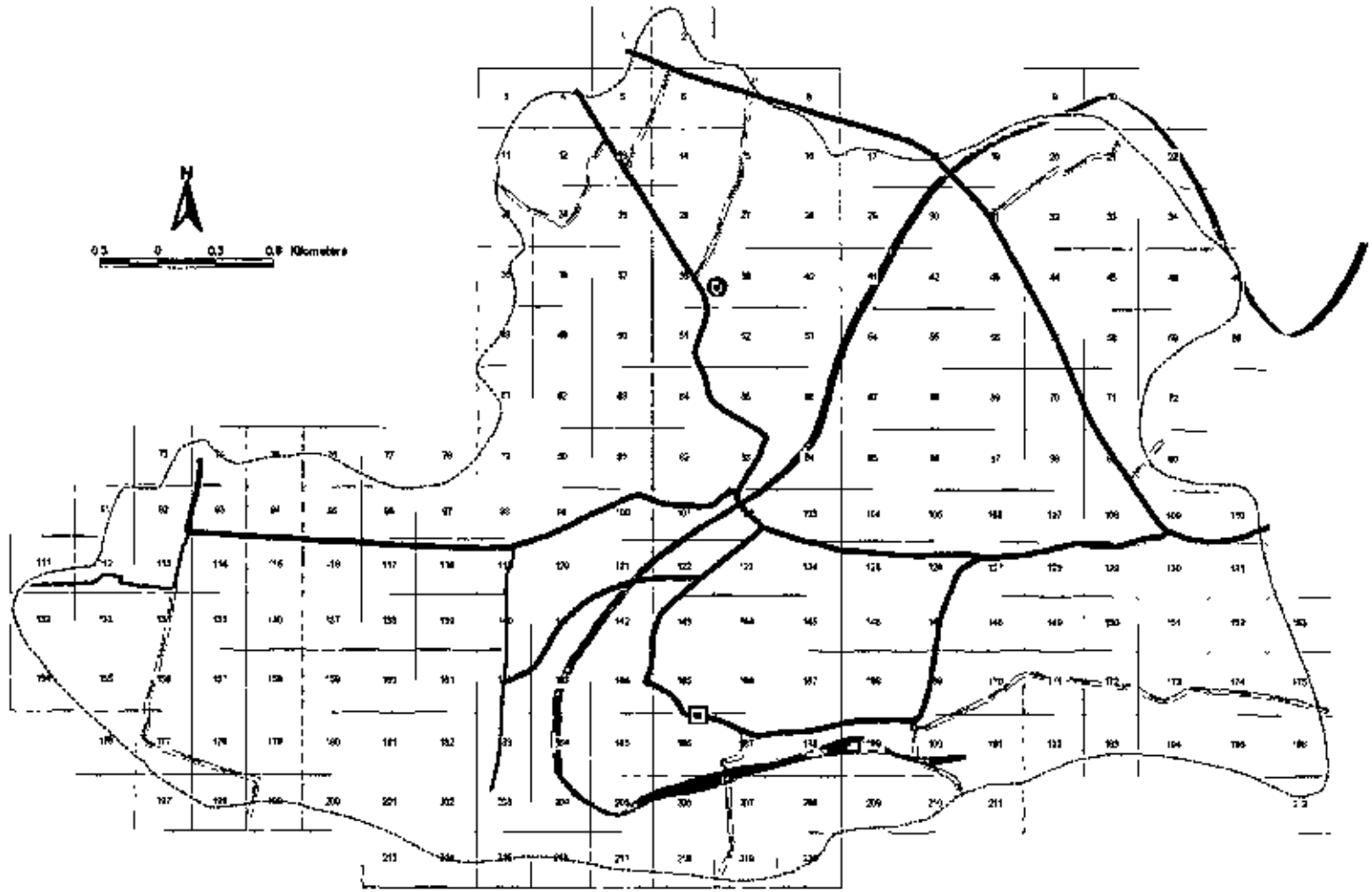
Table-5.5: The Weight of land suitability factors and parameter for each land use type (Wi)

Factors	Parameter	Land-use Types		
		Residential	Commercial	Industrial
Environmental / Ecological	Ground Water Condition	3	2	2
	Quietness of the area	3	2	2
	Distance to green area	1	2	2
	Air Pollution	1	2	2
	Quality of view(Good View)	2	2	2
		10	***10***	***10***
Physical & Geological Factors	Soil quality (Foundation condition)	3	6	4
	Land slope	2	2	1
	Natural/Soil drainage system	2	2	3
	Vulnerable to Flood	10	6	10
	Possibility of Earthquake	3	4	2
		20	***20***	***20***
Socio-economic & Demographic Factors	Population density (Gross)	6	7	7
	Existing Land use	5	7	3
	Land value/price	6	6	10
	Social standing of the area	3	0	0
		20	***20***	***20***
Social Facilities & Transportation	Distance to School	5	0	3
	Distance to Medical facilities	2	1	2
	Distance to Recreation facilities	2	1	-
	Distance to Highway	2	2	4
	Distance to Waterway	0	0	5
	Distance to Local bus stop	2	2	1
	Distance to Commercial facilities	4	10	3
	Distance to CBD	3	4	2
		20	***20***	***20***
Utility/ Urban Services	Distance to Sewer lines/ drainage	4	5	3
	Availability of Fresh water supply	6	5	4
	Distance to Power lines	6	5	5
	Distance to Tele comm. Lines	4	5	3
	Available Vacant land	10	10	15
		30	***30***	***30***
Total weight of land suitability factors		**100**	**100**	**100**

5.7.5. Division of the Study area into Grid Cells:

Next the study area was divided into 220 grid cells (Figure-5.4). The size and shape of the cells was determined using professional judgment, and it was assumed that the areas within the cells are, in some sense, homogeneous. The 300-m square grid cell is accurate enough for land suitability mapping (Ortolano, 1990).

Figure -54: GRID MAP OF PABNA MUNICIPALITY



LEGEND

Administrative Boundary

Municipal Boundary

Grid Line

Grid Line

Physical Infrastructures

National Highways
Feeder Road Type-A
Feeder Road - Type B
Rural Road

Natural Features

Wide River

Source : LGED,2000

5.8. SUMMARY:

The detail concept of AHP model, it's calibration procedure and analysis process of experts' opinion by AHP model has been discussed in this chapter. Land suitability factors, factor rating and factor weight have also been found. From the opinion of experts using AHP technique, these data and factor weight, factor rating have been determined. The result of expert opinion survey was useful to determine composite score of a Grid cell through inter-grid analysis.

CHAPTER – SIX

ANALYSIS AND FINDINGS OF THE STUDY

6.1. COMPOSITE ANALYSIS:

The composite or final analysis identified and evaluated the Grid cells by taking into account the results from weighted factor method. The weighted-factors method provided a procedure where each suitability factor *(Vi)* with a score (Table-5.1) was multiplied by the weight of that factor *(Wi)* (Table-5.5). The results of the multiplication were added and then a composite score (wi x vi) for each suitability factor was determined (Table-5.6). W_i & V_i were found from AHP and survey/other sources, respectively. Total Composite Score (Relative impact) of each cells was calculated by the following equation:

$$E = \sum_{i=1}^{n} W_i * V_i$$

where n = total number of parameter related to the study
W_i = the relative importance or weight of parameter i.

V_i = Relative change in the value of quality of parameter i with respect to existing situation (Degree of impact).

Relative impact = Relative importance (weights)* Degree of impact

6.2. PREPARATION OF FINAL LAND SUITABILITY MAPS:

Total composite score (Relative Impact) for each grid cells were ranked according to their numerical value. The cells with higher scores was indicated more suitable land/area for urban development. The Arcview Package was then used to produce the final composite map that identified areas suitable for urban development. Sums ranged from a maximum of 500, indicating the most suitable location for development, to a minimum of 100. The composite score was compared with a predetermined standard, which was used to select or reject a site. Figures 6.1, 6.2 and 6.3 present least suitable moderate suitable and most suitable for residential, commercial and industrial development, respectively.

Table-5.6: Calculation of Composite Score for a Sample Grid Cell

Grid-Cell No: 146	Land-use Types								
	Residential			Commercial			Industrial		
Parameter/ Factors	Relative importance/ Weight(Wi)	Deg. of. impact(Vi)	Total Composite Score/Relative impact(Wi X Vi)	Relative importance/ Weight(Wi)	Deg. of Impact(Vi)	Total Composite Score/Relative impact(Wi X Vi)	Relative importance/ Weight(Wi)	Deg. of. Impact(Vi)	Total Composite Score/Relative Impact(Wi X Vi)
Ground Water Condition	3	5	15	2	5	10	2	5	10
Quietness of the area	3	5	15	2	5	10	2	5	10
Distance to green area	1	1	1	2	1	2	2	1	2
Air Pollution	1	5	5	2	5	10	2	5	10
Quality of view(Good view)	2	5	10	2	5	10	2	5	10
Soil quality (Foundation condition)	3	5	15	6	5	30	4	5	20
Land slope	2	5	10	2	5	10	1	5	5
Natural/Soil drainage system	2	5	10	2	5	10	3	5	15
Vulnerable to flood	10	5	50	6	5	30	10	5	50
Possibility of Earthquake	3	5	15	4	5	20	2	5	10
Population density (Gross)	6	3	18	7	3	21	7	3	21
Existing land use	5	5	25	7	1	7	3	1	3
Land value/price	6	3	18	6	3	18	10	3	30
Social standing of the area	3	5	15	0	0	0	0	0	0
Distance to school	5	5	25	0	0	0	3	5	15
Distance to medical facilities	2	3	6	1	3	3	2	3	6
Distance to recreation facilities	2	3	6	1	3	3	0	0	0
Distance to highway	2	5	10	2	5	10	4	5	20
Distance to Waterway	0	0	0	0	0	0	5	1	5
Distance to local bus stop	2	3	6	2	3	6	3	3	9
Distance to Commercial facilities	4	5	20	10	5	50	2	5	10
Distance to CBD	3	5	15	4	5	20	1	5	5
Distance to sewer lines/ drainage	4	5	20	5	5	25	3	5	15
Availability of fresh water supply	6	5	30	5	5	25	4	5	20
Distance to Power lines	6	5	30	5	5	25	5	5	25
Distance to Tele comm. Lines	4	5	20	5	5	25	3	5	15
Available vacant land	10	3	30	10	1	10	15	1	15
Total weight/Relative Impact of land suitability factors ($E = \sum Wi*Vi$)	100		440	100		390	100		356

The final results (shown in Figure-6.4) are presented in terms of 3 classes of land ranging from the most to the least suitable (with a total score of 100-300, 301-400 and 401-500) for Urban development. If any grid-cell possesses same composite score (same suitability type) then, the maximum potentiality of the cell/the existing land-use pattern has been considered to treat it (Cell) as a land use type.

6.3. FINDINGS OF COMPOSITE ANALYSIS:

6.3.1. Land Suitable for Residential Development:

Out of 220 Grid cells, 158 Grid cells are most suitable, 36 Grid cell moderate suitable and 26 Grid cell least suitable for Residential Development (Figure-6.1). Thus, out of 19.8 sq. km. (Study area), 14.22 sq. km. are most suitable, 3.24 sq. km. moderate suitable and 2.34 sq. km. least suitable for Residential Development.

Table- 6.1: Land Suitable for Residential Development

No	Type	Grid Cell		Area (Sq. Km)
		No.	%	
1.	Most Suitable	158	71.82	14.22
2.	Moderate Suitable	36	16.36	3.24
3.	Least Suitable	26	11.82	2.34
	Total	220	100.0	19.8

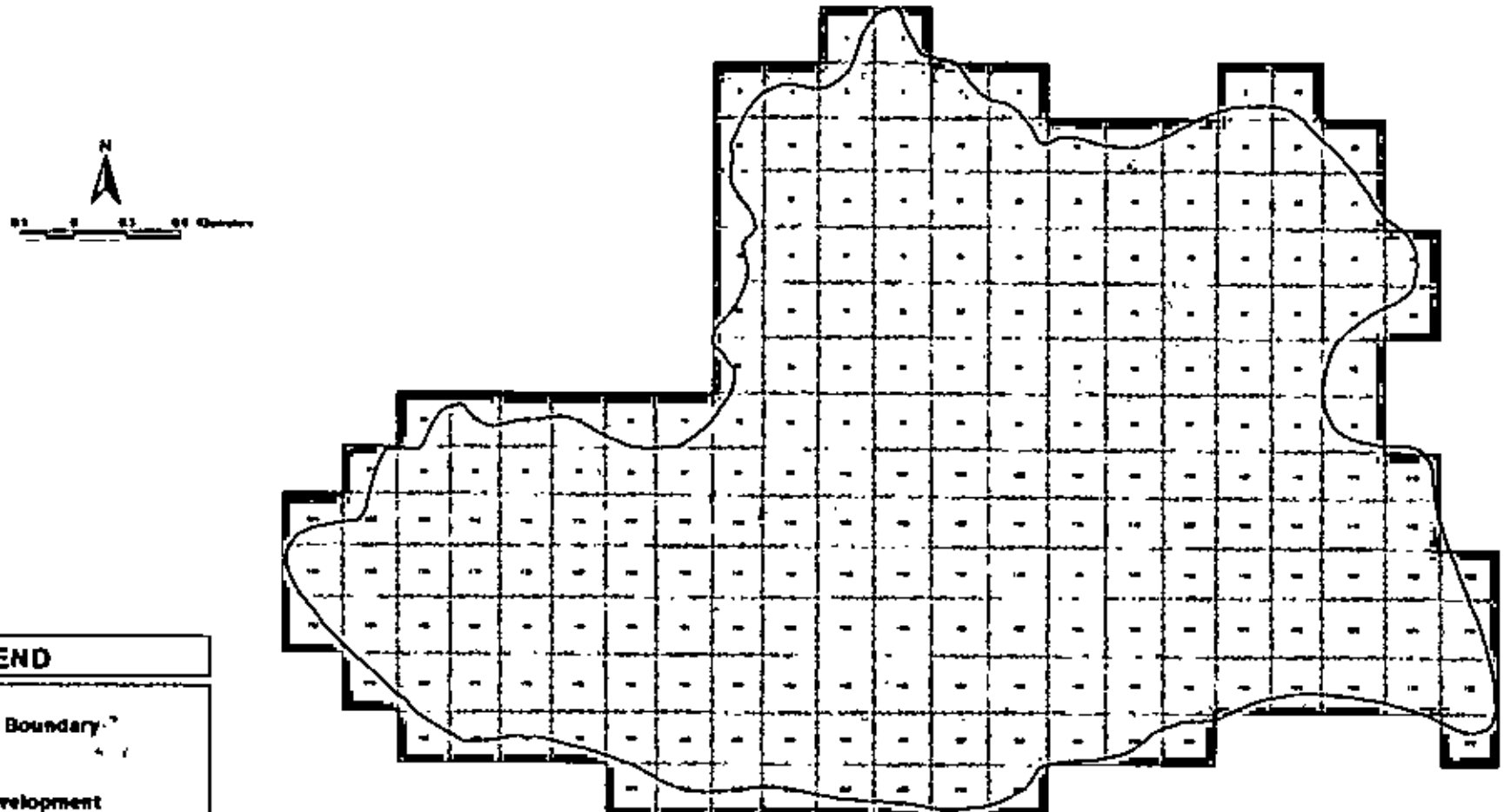
6.3.2. Land Suitable for Commercial Development:

Out of 220 Grid cells, 19 Grid cells are most suitable, 133 Grid cell moderate suitable and 68 Grid cell least suitable for Commercial Development (Figure-6.2). Thus, out of 19.8 sq. km. (Study area), 1.71 sq. km. are most suitable, 11.97 sq. km. moderate suitable and 6.12 sq. km. least suitable for Commercial Development.

Table- 6.2: Land Suitable for Commercial Development

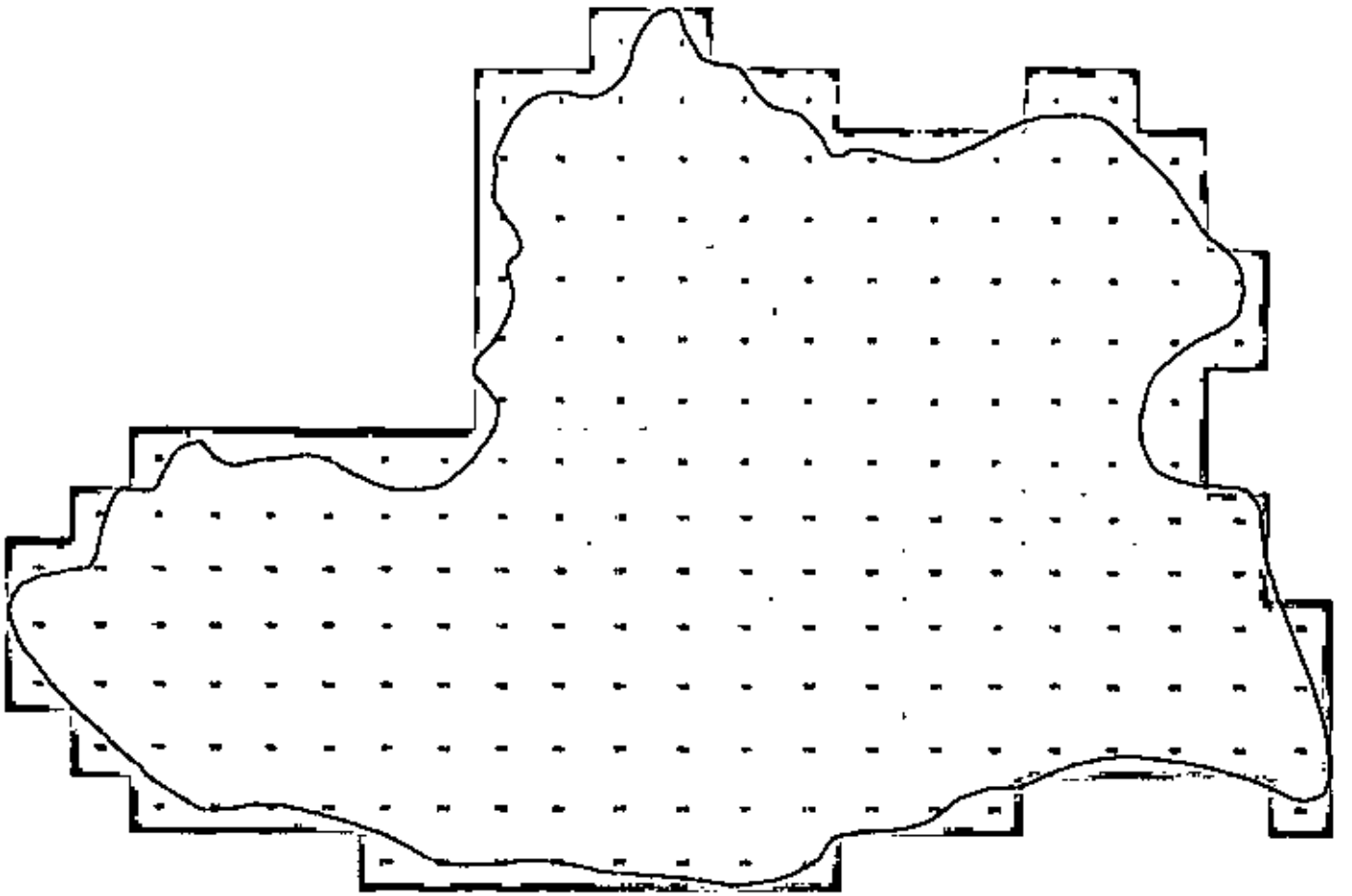
No	Type	Grid Cell		Area (Sq. Km)
		No.	%	
1.	Most Suitable	19	8.64	1.71
2.	Moderate Suitable	133	60.46	11.97
3.	Least Suitable	68	30.90	6.12
	Total	220	100.0	19.8

Figure -6.1 : MAP OF PABNA MUNICIPALITY SHOWING SUITABLE LAND FOR RESIDENTIAL DEVELOPMENT



Source : Field Survey, 2009

Figure -6.2:MAP OF PABNA MUNICIPALITY SHOWING LAND SUITABLE FOR COMMERCIAL DEVELOPMENT



LEGEND

Administrative Boundary

Municipal Boundary

Commercial Development

Most Suitable (401-500)

Moderate Suitable (301- 400)

Least Suitable (<300)

Source : Field Survey, 2000

6.3.3. Land Suitable for Industrial Development:

Out of 220 Grid cells, 67 Grid cells are most suitable, 136 Grid cell moderate suitable and 17 Grid cell least suitable for Industrial Development (Figure-6.3). Thus, out of 19.8 sq. km. (Study area), 6.03 sq. km. are most suitable, sq. km. 12.24 moderate suitable and 1.53 sq. km. least suitable for Industrial Development.

Table- 6.3: Land Suitable for Industrial Development

No	Type	Grid Cell		Area (Sq. Km)
		No.	%	
1.	Most Suitable	67	30.45	6.03
2.	Moderate Suitable	136	61.83	12.24
3.	Least Suitable	17	7.72	1.53
	Total	220	100.0	19.8

Source: Field Survey, 1999

6.3.4. Land Suitable for Urban Development:

Out of 220 Grid cells 139 Grid cell are most suitable for residential development, 18 Grid cell most suitable for commercial development and 63 Grid cell most suitable for industrial Development (Figure-6.4). Thus, out of 19.8 sq. km. (Study area), 12.51 sq. km. are most suitable for residential development, 1.62 sq. km. most suitable for commercial development and 5.67 sq. km. most suitable for industrial Development.

Table- 6.4: Land Suitable for Urban Development

No	Type	Grid Cell		Area (Sq. Km)
		No.	%	
1.	Residential	139	63.19	12.51
2.	Commercial	18	8.18	1.62
3.	Industrial	63	28.63	5.67
	Total	220	100.00	19.8

Source: Field Survey, 1999

Figure -6.3: MAP OF PABNA MUNICIPALITY SHOWING LAND SUITABLE FOR INDUSTRIAL DEVELOPMENT

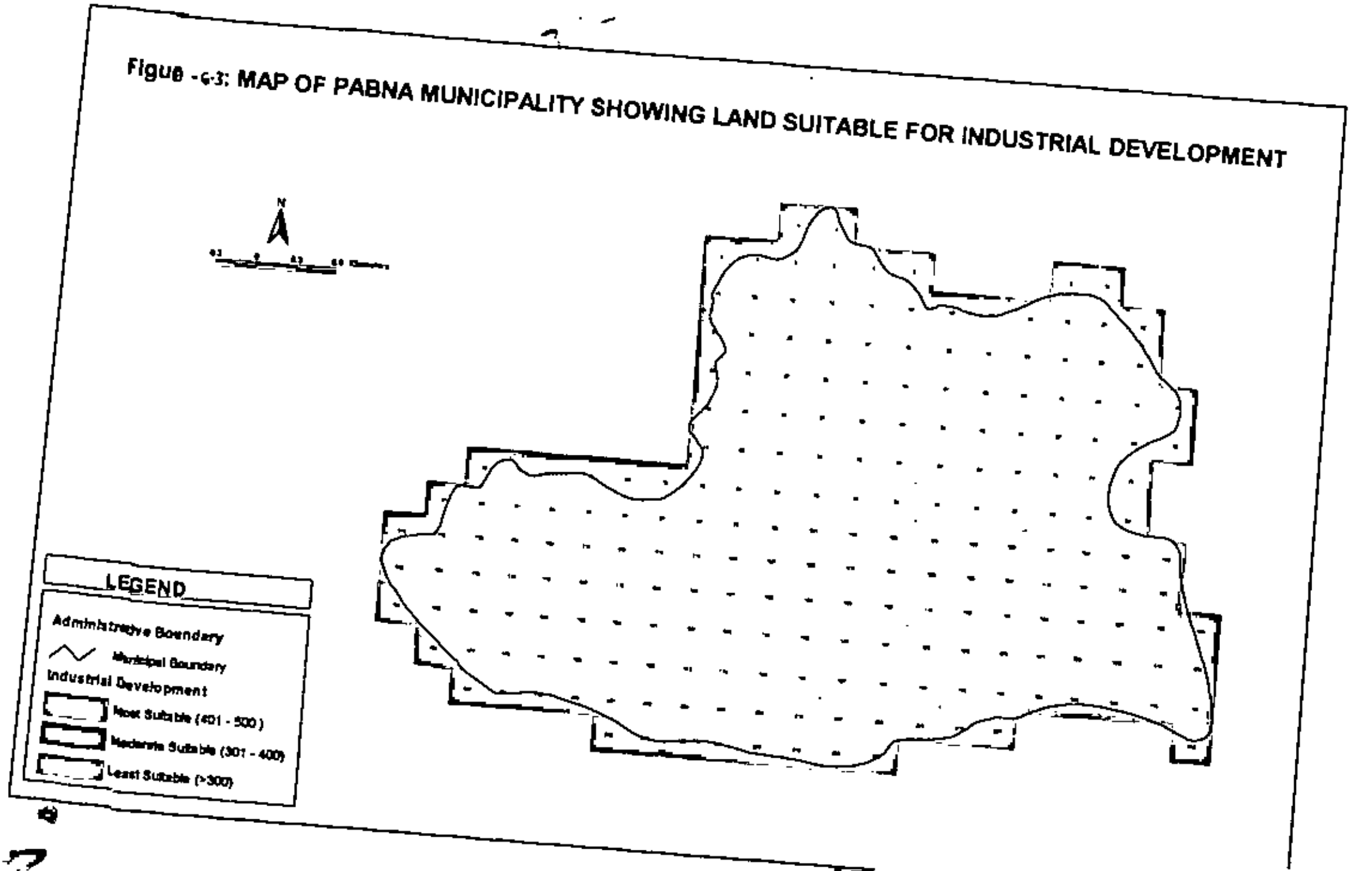
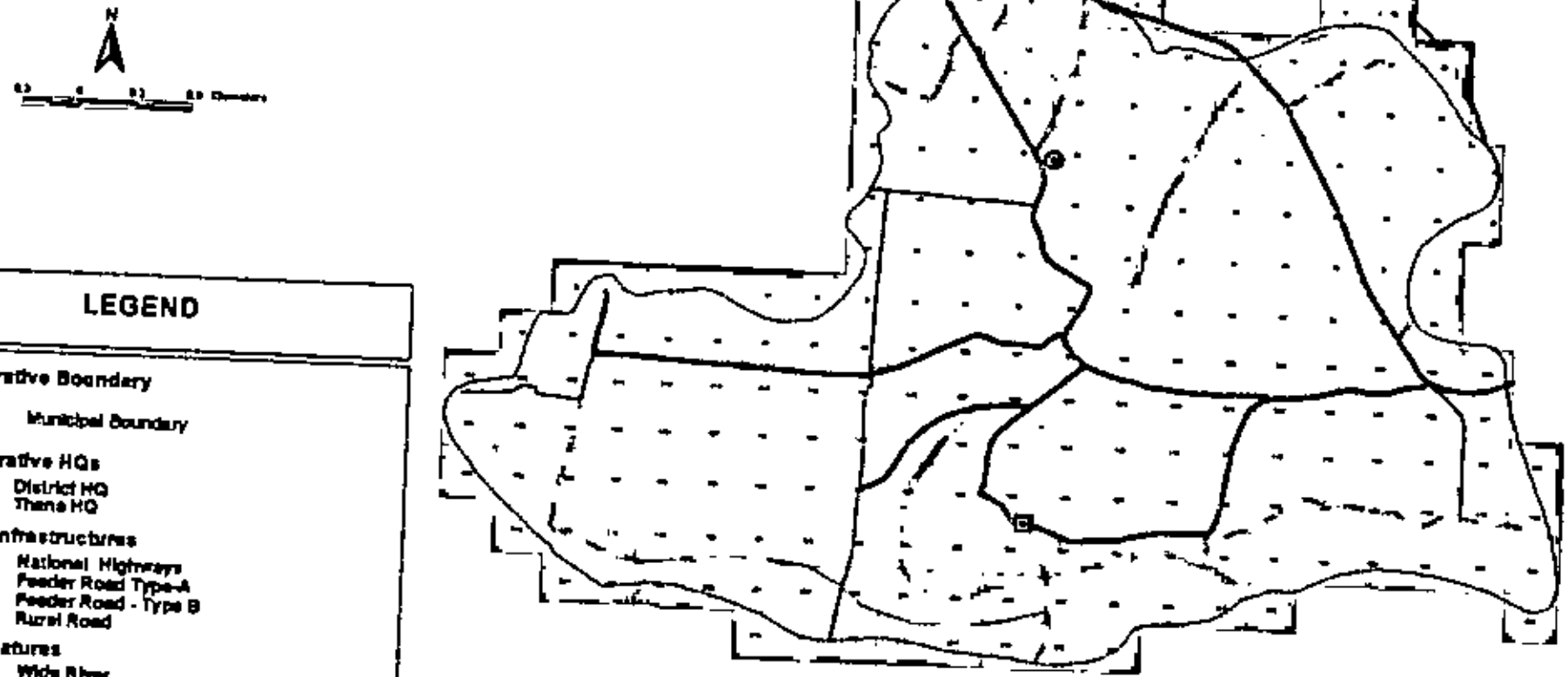


Figure -৫৭: MAP OF PABNA MUNICIPALITY SHOWING LAND SUITABLE FOR URBAN OEVELOPMENT



Source: Field Survey, 2009

6.4. COMPARISON BETWEEN EXISTING LAND-USE & LAND SUITABLE FOR URBAN DEVELOPMENT:

Land-uses in Pabna municipality are very mixed. All flood free area in Pabna municipality has already been developed. The present land-use pattern indicates that residential area is carrying the major share that is around 53.58% of the total area. The comparison between the existing land-uses of Pabna municipality and land suitable for urban development (Identified) are presented in the Figure-6.5.

From Figure-6.5 it is clear that the existing commercial area is developed at the most suitable location of Pabna municipality. Land suitability Analysis has also identified this zone as a most suitable location for commercial area. But the existing residential area and industrial area with three pharmaceutical are developed haphazardly along-with the existing residential area in Pabna municipality. These three pharmaceutical creates environmental hazards in Pabna municipality. Land suitability Analysis does not recommended this location as a land suitable for industrial development.

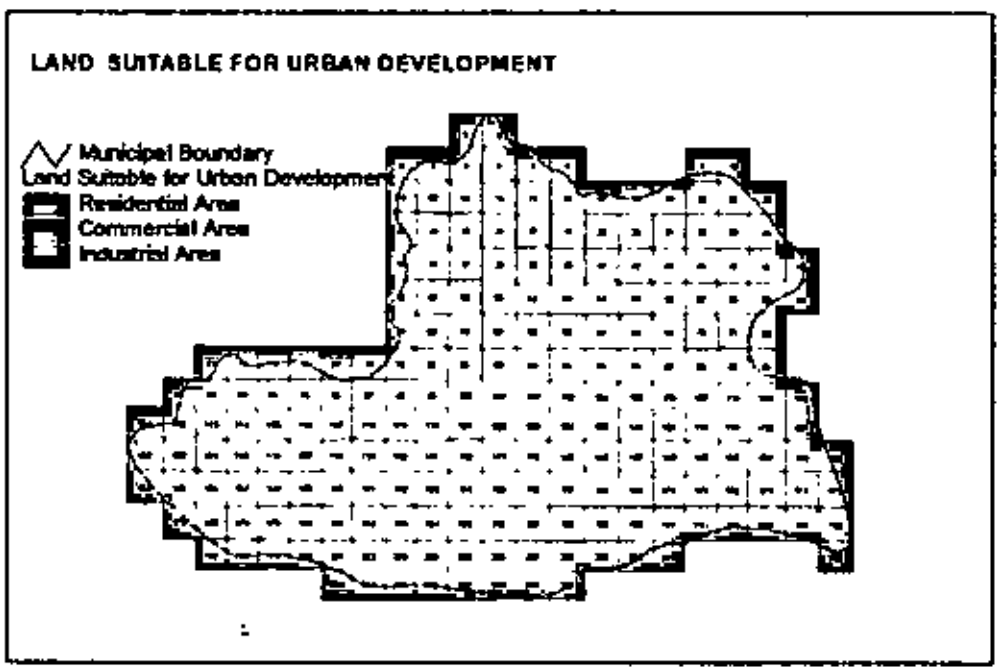
6.5. PROPOSAL FOR FUTURE URBAN DEVELOPMENT:

It is not possible to use the existing developed land for future urban expansion. So, we have to plan based on vacant/agriculture land for future urban expansion. Based on composite analysis and considering the existing land-use and vacant/agriculture land, the following proposals should be consider for future urban expansion (Figure-6.6).

6.5.1. Residential Development:

To accommodate a population of 1,66,861 by the year 2006, there will be a need for more residential area. Southeastern part of Pabna municipality is suitable for residential development. A new residential area should be developed at southeastern part area of Pabna municipality (Grid cell no. 129-131, 150-153, 173-175, 195-196 and 212). Northwestern part of Pabna municipality is considered, as the next suitable for residential development. In addition to the proposed residential area, it recommended that another residential area should be developed at Northwestern part of Pabna municipality (Grid cell no. 11-12, 23-24, 35-36, 48-50, 61-63, 73-81).

Figure -6s COMPARISON BETWEEN EXISTING LANDUSE AND LAND SUITABLE FOR URBAN DEVELOPMENT



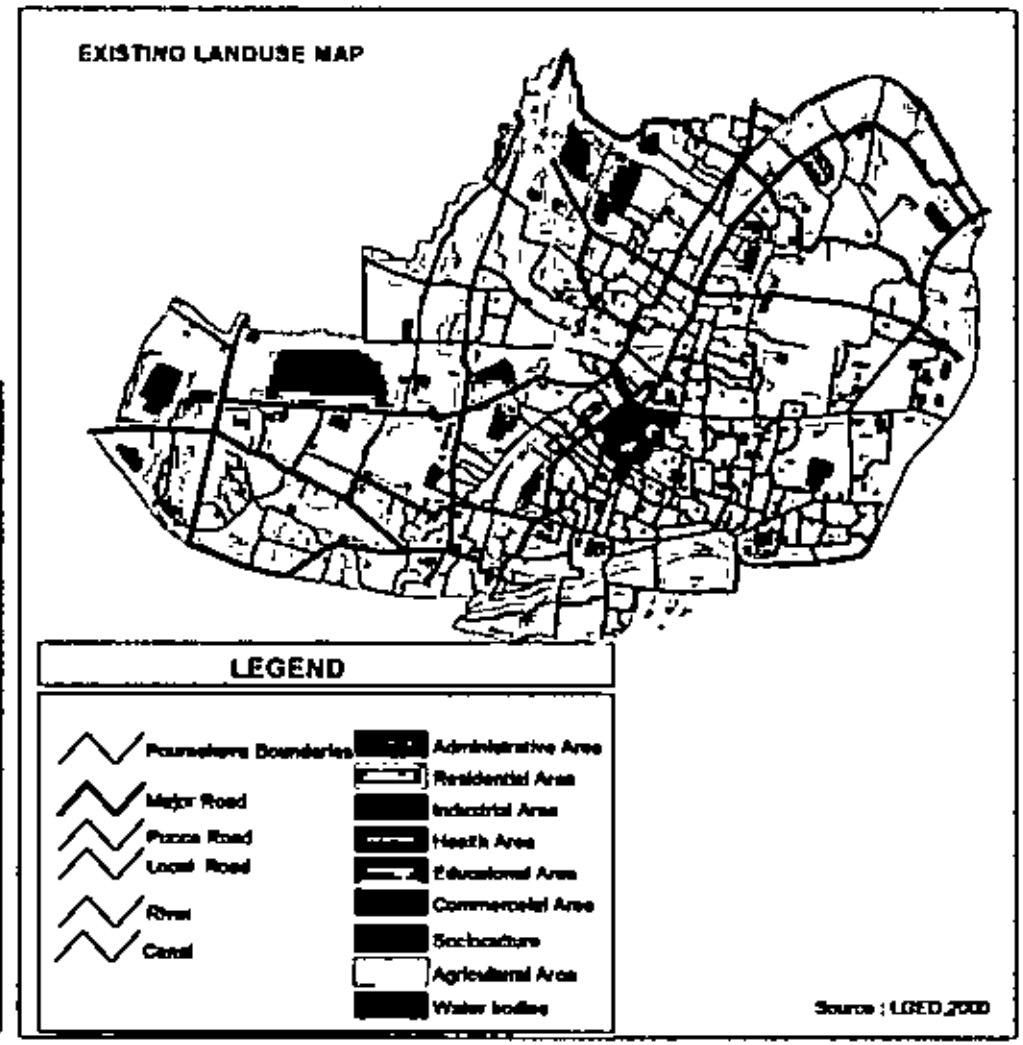
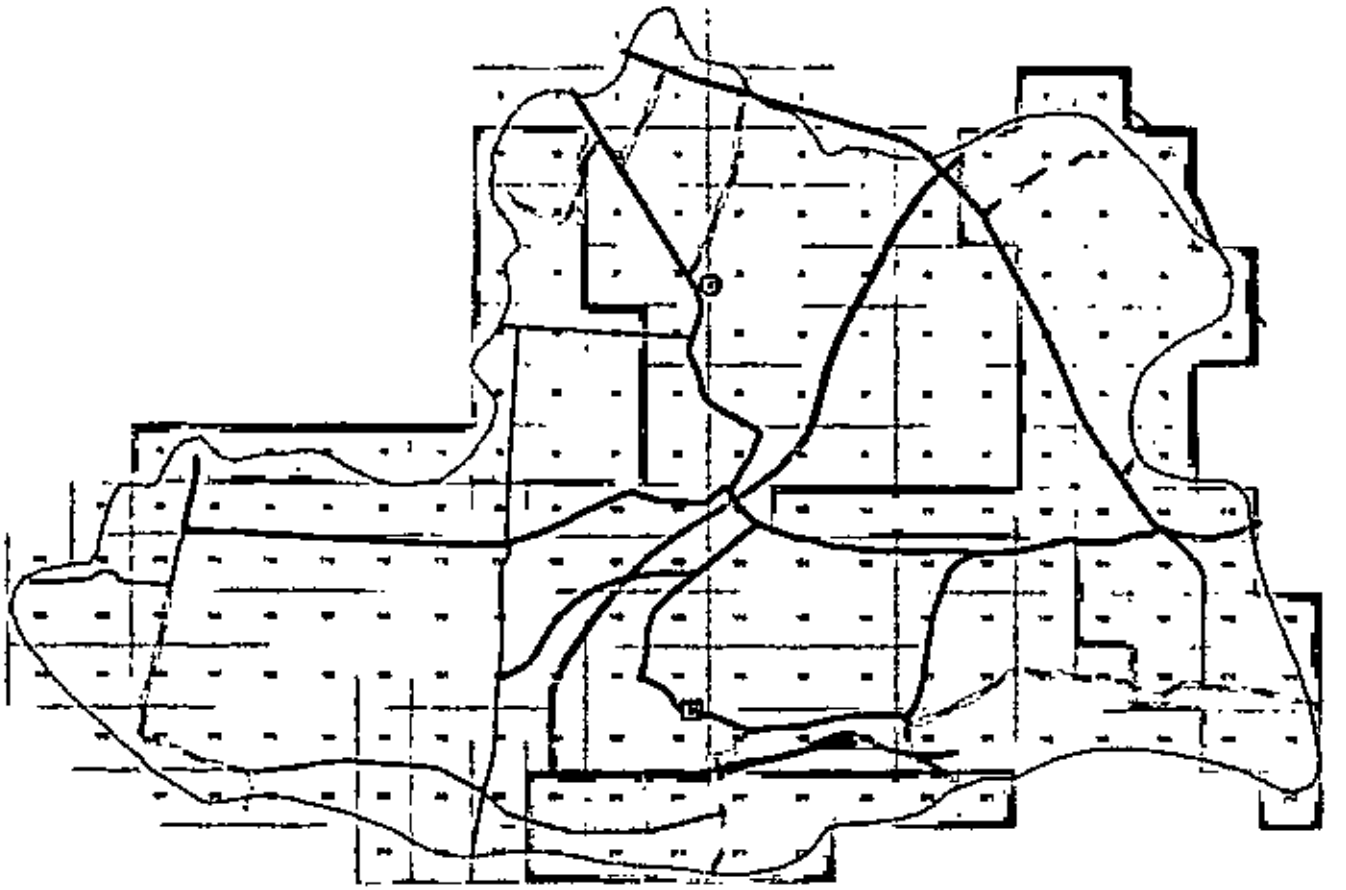


Figure -6.6: MAP OF PABNA MUNICIPALITY SHOWING LAND PROPOSED FOR URBAN DEVELOPMENT



LEGEND

Administrative Boundary

Municipal Boundary

Grid Line

Grid Line

Administrative HQs

District HQ

Thana HQ

Physical Infrastructures

National Highways

Feeder Road Type-A

Feeder Road - Type B

Rural Road

Natural Features

Wide River

Land Proposed for Urban Development

Land Proposed for Residential Development

Land Proposed for Commercial development

Land Proposed for Industrial Development

Source : Field Survey 2000

6.5.2. Commercial Development:

The present Central Business District (CBD) of Pabna municipality is located at Abdul Hamid Road area. This area is suffering from traffic congestion due to narrow road. To safeguard present CBD area, the expansion of CBD should take place outside Abdul Hamid Road area. From composite analysis, it is clear that the proposed extension of the CBD should take place at western side of the Nagarbari-Dhaka highway (Grid cell no. 103-108). It is not far way from the present CBD area. The new CBD area should be developed with bank, insurance offices, market and shops to meet the future needs of the people of Pabna municipality.

6.5.3. Industrial Development:

The existing industrial land use covers an area of 198.20 acres of land. In addition to the existing industrial area (BISIC Industrial estate), it is recommended that a new industrial estate should be developed at north side of the existing Pabna bus terminal (Grid cell no 9-10, 19-22, 31-34, 44-47, 57-60,70-72, 88-90 and 109-110). Another industrial area also should be developed at south of Ichamoti river (Grid cell no 204-211, 216-219). The Ichamoti river should be free from any development. To improve communication system, a new road should be constructed and dredging and widening of Ichamoti river throughout to make it again a broad water way for boats and other water vessels.

6.6. SUMMARY:

The objective of the study is to apply the land suitability analysis technique to Pabna municipality to identify areas suitable for urban development. In this chapter, land suitable for residential, commercial and industrial development has identified from composite analysis (Inter Grid-cell survey). The suitability map displays suitability scores for each land use type into three categories: (1) Most suitable; (2) Moderately suitable; and (3) Least suitable. A default color is provided for each suitability category.

CHAPTER-SEVEN

CONCLUSIONS AND RECOMMENDATIONS

7.1. CONCLUSIONS:

This research is mainly an exploratory type research and adopted in the context of Pabna municipality. It is conducted to test the viability of Land Suitability Analysis Technique in Pabna municipality. The AHP has been applied to deal with land suitability factor. However, the ultimate objective of this research is to assess the replicability of the technique throughout Bangladesh. So, the research can be considered at national level. These guidelines can help to determine practical policies for urban land and for its present and future uses.

7.2. RECOMMENDATION FOR POLICY GUIDELINES:

The findings of the study would be suitable for strategic land use policies. The concept of land suitability analysis would be useful for planning purposes. The ultimate results of the research are a set of maps showing areas, which are suitable for urban development under existing physical environment. In view of the recent increases in population in the area it is expected that urban uses would replace non-urban and agricultural uses in the city which may have important planning implications. It is expected that the study would identify such changes and provide valuable insights for formulating planning policies. For formulating land use policies, we need to identify changes in land use and predict future land use patterns. The output of the research would be used in policy formulation in government level regarding urban development. It is expected to benefit the central authority, local government and different private developers involved in housing, commercial and industrial development. It would also help planners to understand the problems of urban development. It would be replicable for any other geographical area of the country.

Pabna municipality deals Town planning activity of Pabna municipality. But Pabna municipality is not capable of implementing the proposed land-use plan for future urban expansion. Because Pabna municipality is guided by Pourashava Ordinance'77. Acceding to this ordinance, Pabna municipality is not authorized to implement this plan. Urban Development Directorate (UDD) prepared land-use/master plan in 1988. But Pabna municipality does not follow this plan because Pabna municipality has no planner to look after the implementation, interpretation and updating of that plan. The major limitations/drawbacks of Pabna municipality to carry out town-planning activities are (i) Legal constraint, (ii) Lack of Fund, (iii) Lack Institutional Capability and (iv) Lack of Planning staff. There is provision for a post of Urban Planner. But there is no Urban Planner and other Planning staff. Therefore, the following policies should be considered to apply the proposed land-use plan based on Land suitability Analysis:

- Pourashava Ordinance'77 should be revised to carry out urban planning function.
- An Urban Planner should be appointed in Pabna municipality to ensure a balanced city.
- Providing adequate training facilities of all staff should strengthen the institutional capability of Pabna municipality.
- Tax collection of Pabna municipality should be increased.

The above policies would help the Government and Pabna municipality and the other concerned agencies such as City Development authorities, City Corporation, LGED, UDD to ensure a sustainable development in implementing their development projects as well as other land development project in Bangladesh. Depending on the success of selecting the most suitable land for urban development using AHP, other projects may adopt the same technique to arrive at their own development policies.

7.3. RECOMMENDATIONS FOR FURTHER RESEARCH:

Finally, suggestions for improvement and issues for future research are discussed as follows: (i) as in this research, most applications using the AHP method are based on using crisp numbers such as 1 to 5 in the pair-wise judgments. However, to accommodate potential uncertainty associated with one's perception (or judgment) regarding the relative importance of the elements, the use of fuzzy logic is suggested. In this case, the priority among the alternatives may be derived via the use of membership functions to estimate the different degrees involving the evaluation (e.g., of the degree of satisfaction with the judgment); and (ii) the AHP can be used in a multiple user group setting. Although this research assumes a single user in determining the priorities of decision criteria and alternatives, Urban development processes generally involve a range of stakeholders such as informed citizens, industry representatives, elected officials, and professional municipal staff. Very often, individuals differ in the importance of a particular factor in the decision or even the factors that are relevant. Improvements can be suggested using the prototype in such a way that group sessions are imbedded into the integrated system to find a consensus between the participants in a more general and flexible framework. The process will then be focused on determining a compromise to a multi-criteria problem that best coincides with the preference structures of the users. Utilization of AHP and the GIS allows all participants to visualize preferences and consequences during negotiation sessions. The uniform framework and information base represented by this prototype system could play a significant role in developing community consensus regarding proposed urban development.

REFERENCES

1. Anderson, L.T. (1987), **Seven methods for calculating land capability/suitability**, report no. 402, Planning Advisory Service, American Planning Association, Chicago,IL, 1987.
2. Banai, R., (1993), **Fuzziness in geographical information systems: contributions from the analytic hierarchy process.** *International Journal of Geographical Information Systems*, 7(4), 315-329, 1993.
3. Briassoulis, H., (1995), **Environmental criteria in industrial facility siting decisions: an analysis,** *Environmental Management*, 19, pp-297-311, 1995.
4. Bangladesh Bureau of Statistics, (1998), **Statistical Year Book of Bangladesh-1997,** Dhaka,1998.
5. Bangladesh Bureau of Statistics, (1998), **Bangladesh Population Census: Urban Area Report, 1997**, GOB, Dhaka,1998.
6. Bangladesh Bureau of Statistics,(1986), **Bangladesh Population Census: Community Series, Pabna, 1981**, GOB, Dhaka,1986.
7. Bangladesh Bureau of Statistics, (1995), **Bangladesh Population Census: Community Series, Pabna, 1991**, GOB, Dhaka,1995.
8. Carver, S. J., (1991), **Integrating multi-criteria evaluation with geographic information system**, *International Journal of Geographical Information Systems*, 5(3), 321-339, 1991.
9. Cromley, R. G., (1994), **A comparison of suitability mapping and multiobjective programming techniques for performing spatial searches**, *The Pennsylvania Geographer*, 32(1), 37-46,1994.
10. Campbell, J. C., J. Radke, J. T. Gless and R. M. Wirtshafter, (1992), **An application of linear programming and geographic information systems: cropland allocation in Antigua**, *Environment and Planning A*, 24(4), 535-549,1992.
11. Chuvieco, E., (1993), **Integration of linear programming and GIS for land-use modeling,** *International Journal of Geographical Information Systems*, 7(1), 71-83, 1993.

12. Djokic, D., (1991), **Urban stormwater drainage network assessment using an expert geographical information system**, unpublished Ph.D. dissertation, University of Texas at Austin, USA, 1991.

13. Eastman, J. R., P. A. K. Kyem and J. Toledano, (1993), **A procedure for multi-objective decision making in GIS under condition of conflicting objectives**, *Proceedings of EGIS '93, European conference and exhibition on geographic information systems*. Genova, Italy, 438-447, 1993.

14. Evans, T. A., D. Djokic and R. Maidment, (1993), **Development and application of expert geographic information system**, *Journal of Computing in Civil Engineering*, 7(3), 339-353,1993.

15. ESCAP, (1991), **Geology for Land-use Planning in Tropical Deltas: Greater Dhaka City**, Atlas of Urban Geology, Vol-5, United Nations, Thailand,1991.

16. GOB, Cabinet Secretariat, Establishment Division,(1978), **Bangladesh District Gazetteers- Pabna**, B.G Press, Dhaka,1978.

17. Hossain, Hemayet. (1992), **Prospects of Computerized Urban Land Information System in Bangladesh**, Urban Land Management in Bangladesh, Ministry of Land, Government of Bangladesh,Dhaka,1992.

18. Harker, P. T., (1986), **The use of expert judgments in Predicting interregional migration patterns: an analytic hierarchy process approach,** Geographical Analysis, pp 62-80,1986.

19. Hopkins, L. D. (1977), **Methods of generating land suitability maps: a comparative evaluation**, Journal of the American Institute of Planners", pp. 386-400,1977.

20. Hickey, R. and P. Jankowski, (1997), **GIS and environmental decisionmaking to aid smelter reclamation planning**, *Environment and Planning B*, 29(1), 5-19,1997.

21. Islam, A.Z.M Moinul, (1998), **Developing Integrated Environmental Management Policies for Meghna-Dhonagoda Irrigation Project in Bangladesh**, unpublished MURP thesis, Department of Urban and Regional Planning, BUET, Dhaka,1998.

22. Jankowski, P. and L. Richard, (1994), **Integration of GIS-based suitability analysis and multicriteria evaluation in a spatial decision support system for route selection,** *Environment and Planning B,* 21(3), 323-340,1994.

23. Jankowski, P., (1995), **Integrating geographical information systems and multiple criteria decision-making methods,** *International Journal of Geographical Information Systems,* 9, 251-273,1995.

24. Local Government Engineering Department, (1999), **Pourshava Statistical Yearbook of Bangladesh(1997-98),** GOB, Dhaka,1999.

25. McDonald, G .T and Brown, A .L., (1984), **The Land suitability approach to strategic land-use planning in urban fringe areas,** Landscape Planning **11** pp. 125-150.

26. Mohibbullah, S.M., (1989), **Water Supply System Planning for a District Town: A Case Study of Pabna Paurashava,** unpublished MURP thesis, Department of Urban and Regional Planning, BUET, Dhaka,1989.

27. Miller, D., (1994), **Coupling of process-based vegetation models to GIS and knowledge-based systems with reference to vegetation change,** *In Worboys, M. F.* (Ed.), *Innovations in GIS,* Taylor & Francis, London, 241-250, 1994.

28. National Institute of Local Government, (1991), **Bangladesh Pourshava (Municipal) Statistics,** GOB, Dhaka,1991.

29. Ortolano, Leonard., (1990), **Environmental Planning and Decision Making,** John Wiley & Sons, Newyork.

30. Planning Commission, (1999), **Participatory Perspective Plan- Pabna District (2000-2020),** unpublished Document, GOB, Dhaka.

31. Saaty, T. L., (1987), **The analytic hierarchy process—what it is and how it is used,** *Mathematical Modelling,* 9, 161-176,1987.

32. Saaty, T. L., (1990), **How to make a decision: the analytic hierarchy process,** *European Journal of Operational Research,* 48(1), 9-26, 1990.

33. Saaty, T. L., (1980), **The Analytical Hierarchy Process: planning, priority setting, resource allocation.,** McGraw-Hill, New York, 1980.

34. Shaw, D. T., D. R. Maidment and G. N. Arimes, (1993), **SITE CODE: computer-based regulatory information for site development**, *Journal of Urban Planning and Development*, 119(1), 1-14, 1993.

35. Toufiq, K.Z Hossain, (1997), **Urban Infrastructure Planning approach for Dhaka 2006: Land use suitability analysis and Priority area selection**, unpublished MA thesis, Center for Infrastructure Planning, University of Stuttgart, Stuttgart, Germany,1997.

36. Weiss, E. N., (1987), **Using the analytic hierarchy process in a dynamic environment.** ***Mathematical Modelling***, 9, 211-216, 1987.

37. Weiss, E. N., (1987), **Using the analytic hierarchy process in a dynamic environment. Mathematical Modelling**, 9, 211-216, 1987.

38. Xiang, W., (1993), **A GIS/MMP-based coordination model and its application to distributed environmental planning**, *Environment and Planning B*, 20(2), 195-220, 1993.

39. Xiang, W-N and Whitley, D. L. (1994), **Weighting land suitability factors by the PLUS method**, Department of Geography, Environment and Planning B: Planning and Design, vol. 21, University of North Carolina at Charlotte, Charlotte, NC , pp. 273-304, 1994.

40. Zahedi, F., (1986), **The Analytic Hierarchy Process—a survey of the method and its application.** ***Interfaces***, 16, 96-108, 1986.

41. Zadeh, L. A., (1990), **Fuzzy sets and systems.**, International Journal of General Systems, 17, 129-138. 1990.

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY(BUET)
DEPARTMENT OF URBAN & REGIONAL PLANNING

QUESTIONNAIRE FOR PAIR-WISE COMPARISONS OF LAND-USE SUITABILITY FACTORS

Sir/Madam

I, from the Department of Urban and Regional Planning (URP), BUET, am doing a research on " Land Suitability Analysis for Urban Development in a Secondary Town in Bangladesh". In this regard, I am seeking for opinions about a few vital Land-Use Suitability Factors. Your kind co-operation will be very useful for my research.

Nature of Specialty:

Have you any experience of working (or any study) in urban development?

If yes, How long? ... Yrs.

(Please Tick in your Choices)

Factor A						Factor B
	Equally Important	Slightly Important	Moderately Important	Strongly Important	Extremely Important	
Physical & Geological factor	1	2	3	4	5	Environmental / Ecological
Socio-economic & Demographic	1	2	3	4	5	Environmental / Ecological
Socio-economic & Demographic	1	2	3	4	5	Physical & Geological
Social facilities & transportation	1	2	3	4	5	Environmental / Ecological
Social facilities & transportation	1	2	3	4	5	Physical & Geological
Social facilities & transportation	1	2	3	4	5	Socio-economic & Demographic
Utility/Urban Services	1	2	3	4	5	Environmental / Ecological
Utility/Urban Services	1	2	3	4	5	Physical & Geological
Utility/Urban Services	1	2	3	4	5	Socio-economic & Demographic
Utility/Urban Services	1	2	3	4	5	Social facilities & transportation

Directions:

In the following 5-land suitability factor groups are shown in 10 pairs. You have to compare between two different factors. After examining and comparing the two factors in each row, choose the one that is most important to the selection of a particular land use. Reference the scale above to select a weight for the selected factor as compared to the other factor and tick to mark the degree/level of preferences.

Comments (If any):

Name of Surveyor: Date of Survey:

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY (BUET)
DEPARTMENT OF URBAN & REGIONAL PLANNING
Questionnaire For Land Suitability Analysis for Urban Development

Grid-Cell No: 146	*Residential*					*Commercial*					*Industrial*				
Parameter/ Factors	Relative importance/ Weight(Wi)	Deg of impact(Vi)			Total Composite Score/Relative Impact(Wi X Vi)	Relative Importance/ Weight(Wi)	Deg. of. impact(Vi)			Total Composite Score/Relative impact(Wi X Vi)	Relative importance/ Weight(Wi)	Deg. of Impact(Vi)			Total Composite Score/Relative Impact(Wi X Vi)
Ground Water Condition	3	**5**	3	1	15	2	**5**	3	1	10	2	**5**	3	1	10
Quietness of the area	3	**5**	3	1	15	2	**5**	3	1	10	2	**5**	3	1	10
Distance to green area	1	**5**	3	1	1	2	5	3	**1**	2	2	5	3	**1**	2
Air Pollution	1	**5**	3	1	5	2	**5**	3	1	10	2	**5**	3	1	10
Quality of view(Good view)	2	**5**	3	1	10	2	**5**	3	1	10	2	**5**	3	1	10
Soil quality (Foundation condition)	3	**5**	3	1	15	6	**5**	**3**	1	30	4	**5**	3	1	20
Land slope	2	**5**	3	1	10	2	**5**	3	1	10	1	**5**	3	1	5
Natural/Soil drainage system	2	**5**	3	1	10	2	**5**	3	1	10	3	**5**	3	1	15
Vulnerable to flood	10	**5**	3	1	50	6	**5**	3	1	30	10	**5**	3	1	50
Possibility of Earthquake	3	**5**	3	1	15	4	**5**	3	1	20	2	**5**	3	1	10
Population density (Gross)	6	5	**3**	1	18	7	5	**3**	1	21	7	5	**3**	1	21
Existing land use	5	**5**	3	1	25	7	5	3	**1**	7	3	5	3	**1**	3
Land value/price	6	5	**3**	1	18	6	5	**3**	1	18	10	5	**3**	1	30
Social standing of the area	3	**5**	3	1	15	0	5	3	1	0	0	5	3	1	0
Distance to school	5	**5**	3	1	25	0	5	3	1	0	3	**5**	3	1	15
Distance to medical facilities	2	5	**3**	1	6	1	5	**3**	1	3	2	5	**3**	1	6
Distance to recreation facilities	2	5	**3**	1	6	1	5	**3**	1	3	0	5	3	1	0
Distance to highway	2	**5**	3	1	10	2	**5**	3	1	10	4	**5**	3	1	20
Distance to Waterway	0	5	3	1	0	0	5	3	1	0	5	5	3	**1**	5
Distance to local bus stop	2	5	**3**	1	6	2	5	**3**	1	6	3	5	**3**	1	9
Distance to Commercial facilities	4	**5**	3	1	20	10	**5**	3	1	50	2	**5**	3	**1**	10
Distance to CBD	3	**5**	3	1	15	4	5	3	1	20	1	**5**	3	1	5
Distance to sewer lines/ drainage	4	**5**	3	1	20	5	**5**	3	1	25	3	**5**	3	1	15
Availability of fresh water supply	6	**5**	3	1	30	5	**5**	3	1	25	4	**5**	3	1	20
Distance to Power lines	6	**5**	3	1	30	5	**5**	3	1	25	5	**5**	3	1	25
Distance to Tele comm. Lines	4	**5**	3	1	20	**5**	**5**	3	1	25	3	**5**	3	1	15
Available vacant land	10	5	**3**	1	30	10	5	3	**1**	10	15	5	3	**1**	15
Total weight/Relative Impact of land suitability factors ($E = \sum W_i * V_i$)	100				440	100				390	100				356

Name of Surveyor:

Date of Survey:

Appendix -C

C-1: Composite Score of Grid Cells for Residential Development

Grid_No	Value	Grid_No	Value	Grid_No	Value	Grid_No	Value	Grid_No	Value
1	311	45	288	89	290	133	413	177	413
2	311	46	291	90	290	134	415	178	415
3	308	47	290	91	408	135	417	179	415
4	310	48	424	92	412	136	417	180	417
5	313	49	431	93	414	137	419	181	420
6	315	50	433	94	416	138	422	182	427
7	315	51	434	95	420	139	425	183	433
8	316	52	432	96	421	140	430	184	433
9	301	53	430	97	423	141	435	185	440
10	301	54	399	98	430	142	435	186	451
11	418	55	292	99	433	143	438	187	450
12	418	56	292	100	433	144	438	188	448
13	420	57	290	101	435	145	438	189	447
14	420	58	288	102	437	146	440	190	445
15	420	59	291	103	436	147	440	191	443
16	400	60	291	104	428	148	435	192	435
17	391	61	425	105	424	149	434	193	433
18	303	62	432	106	422	150	430	194	431
19	301	63	434	107	420	151	427	195	427
20	303	64	435	108	416	152	424	196	418
21	313	65	435	109	400	153	418	197	410
22	308	66	432	110	398	154	410	198	413
23	421	67	390	111	413	155	412	199	415
24	423	68	291	112	415	156	414	200	415
25	423	69	291	113	416	157	415	201	417
26	425	70	290	114	418	158	415	202	418
27	426	71	291	115	418	159	418	203	420
28	426	72	292	116	421	160	420	204	400
29	426	73	412	117	423	161	428	205	396
30	312	74	414	118	428	162	425	206	396
31	291	75	415	119	435	163	435	207	400
32	291	76	418	120	435	164	441	208	398
33	290	77	418	121	438	165	448	209	398
34	290	78	420	122	439	166	448	210	400
35	422	79	425	123	440	167	445	211	400
36	423	80	432	124	436	168	444	212	403
37	427	81	434	125	435	169	444	213	413
38	438	82	435	126	435	170	440	214	410
39	452	83	436	127	433	171	438	215	412
40	444	84	432	128	432	172	431	216	400
41	400	85	380	129	432	173	434	217	400
42	290	86	290	130	428	174	430	218	400
43	290	87	288	131	425	175	420	219	400
44	288	88	288	132	412	176	412	220	400

Appendix -D

D-1: Composite Score of Grid Cells for Commercial Development

Grid_No	Value	Grid_No	Value	Grid_No	Value	Grid_No	Value	Grid_No	Value
1	203	45	232	89	356	133	315	177	318
2	205	46	228	90	350	134	319	178	326
3	200	47	211	91	315	135	328	179	335
4	203	48	228	92	319	136	338	180	341
5	205	49	236	93	323	137	344	181	349
6	207	50	254	94	325	138	350	182	358
7	210	51	302	95	328	139	362	183	369
8	207	52	301	96	338	140	380	184	378
9	195	53	290	97	351	141	390	185	390
10	190	54	273	98	374	142	400	186	400
11	202	55	250	99	400	143	400	187	400
12	205	56	242	100	435	144	398	188	398
13	272	57	232	101	448	145	394	189	399
14	209	58	240	102	453	146	390	190	447
15	210	59	232	103	448	147	387	191	400
16	208	60	216	104	440	148	384	192	391
17	207	61	233	105	440	149	382	193	383
18	203	62	238	106	436	150	380	194	375
19	200	63	246	107	432	151	378	195	368
20	203	64	258	108	428	152	370	196	360
21	205	65	260	109	400	153	362	197	316
22	200	66	260	110	400	154	310	198	321
23	225	67	258	111	313	155	315	199	325
24	238	68	251	112	319	156	319	200	332
25	269	69	246	113	323	157	325	201	339
26	274	70	248	114	330	158	332	202	348
27	260	71	245	115	336	159	340	203	356
28	209	72	240	116	339	160	349	204	352
29	207	73	310	117	350	161	358	205	350
30	200	74	320	118	380	162	369	206	348
31	205	75	323	119	400	163	375	207	346
32	202	76	325	120	400	164	380	208	342
33	200	77	329	121	451	165	400	209	338
34	200	78	334	122	455	166	400	210	335
35	232	79	340	123	455	167	390	211	331
36	240	80	352	124	400	168	400	212	326
37	259	81	389	125	400	169	446	213	328
38	303	82	441	126	440	170	400	214	330
39	301	83	445	127	400	171	391	215	332
40	285	84	440	128	400	172	383	216	330
41	272	85	403	129	398	173	376	217	326
42	260	86	381	130	399	174	371	218	322
43	260	87	375	131	399	175	368	219	320
44	258	88	368	132	312	176	314	220	318

Appendix -E

E-1: Composite Score of Grid Cells for Industrial Development

Grid_No	Value	Grid_No	Value	Grid_No	Value	Grid_No	Value	Grid_No	Value
1	412	45	420	89	426	133	360	177	360
2	413	46	432	90	426	134	361	178	356
3	412	47	438	91	365	135	352	179	340
4	418	48	395	92	360	136	350	180	329
5	418	49	396	93	353	137	343	181	311
6	421	50	399	94	349	138	338	182	306
7	425	51	400	95	348	139	330	183	300
8	425	52	400	96	343	140	300	184	298
9	415	53	405	97	338	141	290	185	295
10	418	54	432	98	335	142	308	186	286
11	398	55	435	99	331	143	320	187	281
12	398	56	425	100	327	144	328	188	289
13	399	57	428	101	333	145	340	189	296
14	400	58	425	102	333	146	356	190	302
15	400	59	428	103	335	147	300	191	315
16	412	60	438	104	341	148	346	192	323
17	415	61	395	105	349	149	348	193	339
18	430	62	397	106	355	150	350	194	347
19	448	63	397	107	358	151	353	195	356
20	440	64	399	108	367	152	358	196	363
21	440	65	400	109	422	153	362	197	363
22	438	66	401	110	420	154	361	198	365
23	398	67	430	111	362	155	358	199	368
24	398	68	428	112	360	156	350	200	369
25	399	69	425	113	353	157	346	201	373
26	399	70	425	114	351	158	332	202	389
27	400	71	428	115	348	159	327	203	401
28	400	72	425	116	348	160	319	204	418
29	401	73	368	117	345	161	307	205	415
30	430	74	368	118	339	162	300	206	415
31	445	75	365	119	336	163	300	207	413
32	440	76	365	120	332	164	296	208	410
33	438	77	358	121	327	165	290	209	410
34	440	78	352	122	333	166	290	210	408
35	396	79	343	123	338	167	295	211	405
36	398	80	340	124	340	168	300	212	400
37	399	81	328	125	341	169	300	213	400
38	400	82	315	126	340	170	306	214	400
39	400	83	312	127	338	171	318	215	400
40	400	84	309	128	342	172	329	216	414
41	431	85	430	129	345	173	343	217	411
42	435	86	426	130	351	174	358	218	409
43	420	87	425	131	359	175	365	219	412
44	418	88	424	132	360	176	360	220	405

F-1: Grid-cell-wise Suitable Land-use Type

Grid_N	Type	Grid_N	Type	Grid_N	Type	Grid_N	Type	Grid_N	Type
1	Industrial	45	Industrial	89	Industrial	133	Residential	177	Residential
2	Industrial	46	Industrial	90	Industrial	134	Residential	178	Residential
3	Industrial	47	Industrial	91	Residential	135	Residential	179	Residential
4	Industrial	48	Residential	92	Residential	136	Residential	180	Residential
5	Industrial	49	Residential	93	Residential	137	Residential	181	Residential
6	Industrial	50	Residential	94	Residential	138	Residential	182	Residential
7	Industrial	51	Residential	95	Residential	139	Residential	183	Residential
8	Industrial	52	Residential	96	Residential	140	Residential	184	Residential
9	Industrial	53	Residential	97	Residential	141	Residential	185	Residential
10	Industrial	54	Industrial	98	Residential	142	Residential	186	Residential
11	Residential	55	Industrial	99	Residential	143	Residential	187	Residential
12	Residential	56	Industrial	100	Commercial	144	Residential	188	Residential
13	Residential	57	Industrial	101	Commercial	145	Residential	189	Residential
14	Residential	58	Industrial	102	Commercial	146	Residential	190	Commercial
15	Residential	59	Industrial	103	Commercial	147	Residential	191	Residential
16	Industrial	60	Industrial	104	Commercial	148	Residential	192	Residential
17	Industrial	61	Residential	105	Commercial	149	Residential	193	Residential
18	Industrial	62	Residential	106	Commercial	150	Residential	194	Residential
19	Industrial	63	Residential	107	Commercial	151	Residential	195	Residential
20	Industrial	64	Residential	108	Commercial	152	Residential	196	Residential
21	Industrial	65	Residential	109	Industrial	153	Residential	197	Residential
22	Industrial	66	Residential	110	Industrial	154	Residential	198	Residential
23	Residential	67	Industrial	111	Residential	155	Residential	199	Residential
24	Residential	68	Industrial	112	Residential	156	Residential	200	Residential
25	Residential	69	Industrial	113	Residential	157	Residential	201	Residential
26	Residential	70	Industrial	114	Residential	158	Residential	202	Residential
27	Residential	71	Industrial	115	Residential	159	Residential	203	Residential
28	Residential	72	Industrial	116	Residential	160	Residential	204	Industrial
29	Residential	73	Residential	117	Residential	161	Residential	205	Industrial
30	Industrial	74	Residential	118	Residential	162	Residential	206	Industrial
31	Industrial	75	Residential	119	Residential	163	Residential	207	Industrial
32	Industrial	76	Residential	120	Residential	164	Residential	208	Industrial
33	Industrial	77	Residential	121	Commercial	165	Residential	209	Industrial
34	Industrial	78	Residential	122	Commercial	166	Residential	210	Industrial
35	Residential	79	Residential	123	Commercial	167	Residential	211	Industrial
36	Residential	80	Residential	124	Residential	168	Residential	212	Residential
37	Residential	81	Residential	125	Residential	169	Commercial	213	Residential
38	Residential	82	Commercial	126	Commercial	170	Residential	214	Residential
39	Residential	83	Commercial	127	Residential	171	Residential	215	Residential
40	Residential	84	Commercial	128	Residential	172	Residential	216	Industrial
41	Industrial	85	Industrial	129	Residential	173	Residential	217	Industrial
42	Industrial	86	Industrial	130	Residential	174	Residential	218	Industrial
43	Industrial	87	Industrial	131	Residential	175	Residential	219	Industrial
44	Industrial	88	Industrial	132	Residential	176	Residential	220	Industrial

ANNEX-G

Table-G-1 Degree of Impact for Ground Water Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	5	5	5	45	5	5	5	89	5	5	5	133	5	5	5	177	5	5	5
2	5	5	5	46	5	5	5	90	5	5	5	134	5	5	5	178	5	5	5
3	5	5	5	47	5	5	5	91	3	3	3	135	5	5	5	179	5	5	5
4	5	5	5	48	5	5	5	92	5	5	5	136	5	5	5	180	5	5	5
5	5	5	5	49	5	5	5	93	5	5	5	137	5	5	5	181	5	5	5
6	5	5	5	50	5	5	5	94	5	5	5	138	5	5	5	182	5	5	5
7	5	5	5	51	5	5	5	95	3	3	3	139	5	5	5	183	5	5	5
8	5	5	5	52	5	5	5	96	3	3	3	140	5	5	5	184	5	5	5
9	5	5	5	53	5	5	5	97	5	5	5	141	5	5	5	185	5	5	5
10	5	5	5	54	5	5	5	98	5	5	5	142	5	5	5	186	5	5	5
11	5	5	5	55	5	5	5	99	5	5	5	143	5	5	5	187	5	5	5
12	5	5	5	56	5	5	5	100	5	5	5	144	5	5	5	188	5	5	5
13	5	5	5	57	5	5	5	101	5	5	5	145	5	5	5	189	5	5	5
14	5	5	5	58	5	5	5	102	5	5	5	146	5	5	5	190	5	5	5
15	5	5	5	59	5	5	5	103	5	5	5	147	5	5	5	191	5	5	5
16	5	5	5	60	5	5	5	104	5	5	5	148	5	5	5	192	5	5	5
17	5	5	5	61	5	5	5	105	5	5	5	149	5	5	5	193	5	5	5
18	5	5	5	62	5	5	5	106	5	5	5	150	5	5	5	194	5	5	5
19	5	5	5	63	5	5	5	107	5	5	5	151	5	5	5	195	5	5	5
20	5	5	5	64	5	5	5	108	5	5	5	152	5	5	5	196	5	5	5
21	5	5	5	65	5	5	5	109	5	5	5	153	5	5	5	197	5	5	5
22	5	5	5	66	5	5	5	110	5	5	5	154	5	5	5	198	5	5	5
23	5	5	5	67	5	5	5	111	5	5	5	155	5	5	5	199	5	5	5
24	5	5	5	68	5	5	5	112	5	5	5	156	5	5	5	200	5	5	5
25	5	5	5	69	5	5	5	113	5	5	5	157	5	5	5	201	5	5	5
26	5	5	5	70	5	5	5	114	5	5	5	158	5	5	5	202	5	5	5
27	5	5	5	71	5	5	5	115	5	5	5	159	5	5	5	203	5	5	5
28	5	5	5	72	5	5	5	116	5	5	5	160	5	5	5	204	5	5	5
29	5	5	5	73	5	5	5	117	5	5	5	161	5	5	5	205	5	5	5
30	5	5	5	74	5	5	5	118	5	5	5	162	5	5	5	206	5	5	5
31	5	5	5	75	5	5	5	119	5	5	5	163	5	5	5	207	5	5	5
32	5	5	5	76	5	5	5	120	5	5	5	164	5	5	5	208	5	5	5
33	5	5	5	77	5	5	5	121	5	5	5	165	5	5	5	209	5	5	5
34	5	5	5	78	5	5	5	122	5	5	5	166	5	5	5	210	5	5	5
35	5	5	5	79	5	5	5	123	5	5	5	167	5	5	5	211	5	5	5
36	5	5	5	80	5	5	5	124	5	5	5	168	5	5	5	212	5	5	5
37	5	5	5	81	5	5	5	125	5	5	5	169	5	5	5	213	5	5	5
38	5	5	5	82	5	5	5	126	5	5	5	170	5	5	5	214	5	5	5
39	5	5	5	83	5	5	5	127	5	5	5	171	5	5	5	215	5	5	5
40	5	5	5	84	5	5	5	128	5	5	5	172	5	5	5	216	5	5	5
41	5	5	5	85	5	5	5	129	5	5	5	173	5	5	5	217	5	5	5
42	5	5	5	86	5	5	5	130	5	5	5	174	5	5	5	218	5	5	5
43	5	5	5	87	5	5	5	131	5	5	5	175	5	5	5	219	5	5	5
44	5	5	5	88	5	5	5	132	5	5	5	176	5	5	5	220	5	5	5

Source : Field Survey, 2000

Table- G-2: Degree of Impact for Quietness of the area Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	3	3	3	45	5	5	5	89	3	3	3	133	3	3	3	177	5	5	5
2	5	5	5	46	5	5	5	90	5	5	5	134	5	5	5	178	5	5	5
3	5	5	5	47	5	5	5	91	5	5	5	135	5	5	5	179	5	5	5
4	3	3	3	48	5	5	5	92	5	5	5	136	5	5	5	180	5	5	5
5	5	5	5	49	5	5	5	93	5	5	5	137	5	5	5	181	5	5	5
6	3	3	3	50	5	5	5	94	1	1	1	138	5	5	5	182	5	5	5
7	3	3	3	51	3	3	3	95	1	1	1	139	5	5	5	183	5	5	5
8	3	3	3	52	1	1	1	96	1	1	1	140	5	5	5	184	5	5	5
9	5	5	5	53	1	1	1	97	5	5	5	141	5	5	5	185	5	5	5
10	5	5	5	54	5	5	5	98	5	5	5	142	3	3	3	186	1	1	1
11	5	5	5	55	5	5	5	99	5	5	5	143	3	3	3	187	5	5	5
12	3	3	3	56	5	5	5	100	1	1	1	144	5	5	5	188	3	3	3
13	3	3	3	57	3	3	3	101	1	1	1	145	5	5	5	189	3	3	3
14	5	5	5	58	5	5	5	102	1	1	1	146	5	5	5	190	1	1	1
15	5	5	5	59	5	5	5	103	3	3	3	147	5	5	5	191	5	5	5
16	5	5	5	60	5	5	5	104	5	5	5	148	5	5	5	192	5	5	5
17	3	5	5	61	5	5	5	105	5	5	5	149	3	3	5	193	5	5	5
18	3	3	3	62	5	5	5	106	5	5	5	150	5	5	5	194	3	3	5
19	5	5	5	63	5	5	5	107	3	5	5	151	5	5	5	195	5	5	3
20	3	5	5	64	3	3	3	108	5	3	3	152	5	5	5	196	5	5	5
21	5	5	3	65	3	3	3	109	1	1	1	153	5	5	5	197	5	5	5
22	5	5	5	66	3	3	3	110	3	3	3	154	5	5	5	198	5	5	5
23	5	5	5	67	5	5	3	111	5	5	5	155	5	5	5	199	5	5	5
24	5	5	5	68	5	5	5	112	5	5	5	156	5	5	5	200	5	5	5
25	5	5	5	69	5	5	5	113	5	5	5	157	5	5	5	201	5	5	3
26	3	3	5	70	3	3	3	114	5	5	5	158	5	5	3	202	5	5	5
27	5	5	3	71	3	3	5	115	5	5	5	159	5	5	5	203	5	5	5
28	5	5	5	72	5	5	5	116	3	5	5	160	5	5	5	204	3	3	5
29	5	3	5	73	5	5	5	117	5	3	5	161	5	5	5	205	5	5	5
30	5	5	3	74	3	5	5	118	5	5	5	162	3	5	5	206	5	5	5
31	3	3	3	75	5	5	5	119	1	1	1	163	5	5	5	207	5	5	5
32	5	5	5	76	3	3	3	120	5	5	5	164	5	5	5	208	5	5	5
33	5	5	5	77	3	3	3	121	3	3	3	165	1	1	1	209	5	5	5
34	5	5	5	78	5	5	5	122	1	1	1	166	5	5	5	210	5	5	5
35	5	5	5	79	5	5	5	123	1	1	1	167	5	5	5	211	5	5	5
36	5	5	5	80	3	3	5	124	5	5	5	168	3	5	5	212	5	5	5
37	5	5	5	81	5	5	5	125	3	5	5	169	1	1	1	213	3	3	5
38	1	1	1	82	1	1	1	126	5	5	3	170	3	3	3	214	5	5	5
39	3	3	5	83	1	1	1	127	5	5	5	171	5	3	3	215	3	5	5
40	5	5	5	84	2	2	3	128	5	5	5	172	3	3	3	216	5	5	5
41	5	5	5	85	1	1	1	129	5	5	5	173	3	3	3	217	5	5	5
42	5	5	5	86	1	1	1	130	5	5	5	174	3	3	5	218	5	5	5
43	3	3	3	87	5	5	5	131	5	5	5	175	3	3	3	219	5	5	5
44	3	3	3	88	5	5	3	132	3	3	3	176	5	5	5	220	5	5	5

Source : Field Survey, 2000

Table- G-3: Degree of Impact for Distance to Green Area Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resd.	Comm	Indus		Resd	Comm	Indus		Resd	Comm	Indus		Resd	Comm	Indus		Resd	Comm	Indus
1	5	5	5	45	5	5	5	89	5	5	5	133	5	5	5	177	5	5	5
2	5	5	5	46	5	5	5	90	5	5	5	134	5	5	5	178	5	5	5
3	5	5	5	47	5	5	5	91	5	5	5	135	5	5	5	179	5	5	5
4	5	5	5	48	5	5	5	92	5	5	5	136	5	5	5	180	5	5	5
5	5	5	5	49	5	5	5	93	5	5	5	137	5	5	5	181	5	5	5
6	5	5	5	50	5	5	5	94	5	5	5	138	5	5	5	182	5	5	5
7	5	5	5	51	5	5	5	95	5	5	5	139	5	5	5	183	5	5	5
8	5	5	5	52	5	5	5	96	5	5	5	140	5	5	5	184	5	5	5
9	5	5	5	53	5	5	5	97	5	5	5	141	5	5	5	185	5	5	5
10	5	5	5	54	5	5	5	98	5	5	5	142	5	5	5	186	5	5	5
11	5	5	5	55	5	5	5	99	5	5	5	143	5	5	5	187	5	5	5
12	5	5	5	56	5	5	5	100	5	5	5	144	5	5	5	188	5	5	5
13	5	5	5	57	5	5	5	101	5	5	5	145	5	5	5	189	5	5	5
14	5	5	5	58	5	5	5	102	5	5	5	146	5	5	5	190	5	5	5
15	5	5	5	59	5	5	5	103	5	5	5	147	5	5	5	191	5	5	5
16	5	5	5	60	5	5	5	104	5	5	5	148	5	5	5	192	5	5	5
17	5	5	5	61	5	5	5	105	5	5	5	149	5	5	5	193	5	5	5
18	5	5	5	62	5	5	5	106	5	5	5	150	5	5	5	194	5	5	5
19	5	5	5	63	5	5	5	107	5	5	5	151	5	5	5	195	5	5	5
20	5	5	5	64	5	5	5	108	5	5	5	152	5	5	5	196	5	5	5
21	5	5	5	65	5	5	5	109	5	5	5	153	5	5	5	197	5	5	5
22	5	5	5	66	5	5	5	110	5	5	5	154	5	5	5	198	5	5	5
23	5	5	5	67	5	5	5	111	5	5	5	155	5	5	5	199	5	5	5
24	5	5	5	68	5	5	5	112	5	5	5	156	5	5	5	200	5	5	5
25	5	5	5	69	5	5	5	113	5	5	5	157	5	5	5	201	5	5	5
26	5	5	5	70	5	5	5	114	5	5	5	158	5	5	5	202	5	5	5
27	5	5	5	71	5	5	5	115	5	5	5	159	5	5	5	203	5	5	5
28	5	5	5	72	5	5	5	116	5	5	5	160	5	5	5	204	5	5	5
29	5	5	5	73	5	5	5	117	5	5	5	161	5	5	5	205	5	5	5
30	5	5	5	74	5	5	5	118	5	5	5	162	5	5	5	206	5	5	5
31	5	5	5	75	5	5	5	119	5	5	5	163	5	5	5	207	5	5	5
32	5	5	5	76	5	5	5	120	5	5	5	164	5	5	5	208	5	5	5
33	5	5	5	77	5	5	5	121	5	5	5	165	5	5	5	209	5	5	5
34	5	5	5	78	5	5	5	122	5	5	5	166	5	5	5	210	5	5	5
35	5	5	5	79	5	5	5	123	5	5	5	167	5	5	5	211	5	5	5
36	5	5	5	80	5	5	5	124	5	5	5	168	5	5	5	212	5	5	5
37	5	5	5	81	5	5	5	125	5	5	5	169	5	5	5	213	5	5	5
38	5	5	5	82	5	5	5	126	5	5	5	170	5	5	5	214	5	5	5
39	5	5	5	83	5	5	5	127	5	5	5	171	5	5	5	215	5	5	5
40	5	5	5	84	5	5	5	128	5	5	5	172	5	5	5	216	5	5	5
41	5	5	5	85	5	5	5	129	5	5	5	173	5	5	5	217	5	5	5
42	5	5	5	86	5	5	5	130	5	5	5	174	5	5	5	218	5	5	5
43	5	5	5	87	5	5	5	131	5	5	5	175	5	5	5	219	5	5	5
44	5	5	5	88	5	5	5	132	5	5	5	176	5	5	5	220	5	5	5

Source : Field Survey, 2000

Table- G-4 Degree of Impact for Air Pollution Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	5	5	5	45	5	5	5	89	5	5	5	133	5	5	5	177	5	5	5
2	5	5	5	46	5	5	5	90	5	5	5	134	5	5	5	178	5	5	5
3	5	5	5	47	5	5	5	91	5	5	5	135	5	5	5	179	5	5	5
4	5	5	5	48	5	5	5	92	5	5	5	136	5	5	5	180	5	5	5
5	5	5	5	49	5	5	5	93	5	5	5	137	5	5	5	181	5	5	5
6	5	5	5	50	5	5	5	94	5	5	5	138	5	5	5	182	5	5	5
7	5	5	5	51	5	5	5	95	5	5	5	139	5	5	5	183	5	5	5
8	5	5	5	52	5	5	5	96	5	5	5	140	5	5	5	184	5	5	5
9	5	5	5	53	5	5	5	97	5	5	5	141	5	5	5	185	5	5	5
10	5	5	5	54	5	5	5	98	5	5	5	142	5	5	5	186	5	5	5
11	5	5	5	55	5	5	5	99	5	5	5	143	5	5	5	187	5	5	5
12	5	5	5	56	5	5	5	100	5	5	5	144	5	5	5	188	5	5	5
13	5	5	5	57	5	5	5	101	5	5	5	145	5	5	5	189	5	5	5
14	5	5	5	58	5	5	5	102	5	5	5	146	5	5	5	190	5	5	5
15	5	5	5	59	5	5	5	103	5	5	5	147	5	5	5	191	5	5	5
16	5	5	5	60	5	5	5	104	5	5	5	148	5	5	5	192	5	5	5
17	5	5	5	61	5	5	5	105	5	5	5	149	5	5	5	193	5	5	5
18	5	5	5	62	5	5	5	106	5	5	5	150	5	5	5	194	5	5	5
19	5	5	5	63	5	5	5	107	5	5	5	151	5	5	5	195	5	5	5
20	5	5	5	64	5	5	5	108	5	5	5	152	5	5	5	196	5	5	5
21	5	5	5	65	5	5	5	109	5	5	5	153	5	5	5	197	5	5	5
22	5	5	5	66	5	5	5	110	5	5	5	154	5	5	5	198	5	5	5
23	5	5	5	67	5	5	5	111	5	5	5	155	5	5	5	199	5	5	5
24	5	5	5	68	5	5	5	112	5	5	5	156	5	5	5	200	5	5	5
25	5	5	5	69	5	5	5	113	5	5	5	157	5	5	5	201	5	5	5
26	5	5	5	70	5	5	5	114	5	5	5	158	5	5	5	202	5	5	5
27	5	5	5	71	5	5	5	115	5	5	5	159	5	5	5	203	5	5	5
28	5	5	5	72	5	5	5	116	5	5	5	160	5	5	5	204	5	5	5
29	5	5	5	73	5	5	5	117	5	5	5	161	5	5	5	205	5	5	5
30	5	5	5	74	5	5	5	118	5	5	5	162	5	5	5	206	5	5	5
31	5	5	5	75	5	5	5	119	5	5	5	163	5	5	5	207	5	5	5
32	5	5	5	76	5	5	5	120	5	5	5	164	5	5	5	208	5	5	5
33	5	5	5	77	5	5	5	121	5	5	5	165	5	5	5	209	5	5	5
34	5	5	5	78	5	5	5	122	5	5	5	166	5	5	5	210	5	5	5
35	5	5	5	79	5	5	5	123	5	5	5	167	5	5	5	211	5	5	5
36	5	5	5	80	5	5	5	124	5	5	5	168	5	5	5	212	5	5	5
37	5	5	5	81	5	5	5	125	5	5	5	169	5	5	5	213	5	5	5
38	5	5	5	82	5	5	5	126	5	5	5	170	5	5	5	214	5	5	5
39	5	5	5	83	5	5	5	127	5	5	5	171	5	5	5	215	5	5	5
40	5	5	5	84	5	5	5	128	5	5	5	172	5	5	5	216	5	5	5
41	5	5	5	85	5	5	5	129	5	5	5	173	5	5	5	217	5	5	5
42	5	5	5	86	5	5	5	130	5	5	5	174	5	5	5	218	5	5	5
43	5	5	5	87	5	5	5	131	5	5	5	175	5	5	5	219	5	5	5
44	5	5	5	88	5	5	5	132	5	5	5	176	5	5	5	220	5	5	5

Source : Field Survey, 2000

Table- G-5:Degree of Impact for Quality of View Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	3	3	3	45	5	5	5	89	3	2	3	133	3	3	3	177	5	5	5
2	5	5	5	46	5	5	5	90	5	5	5	134	5	5	5	178	5	5	5
3	5	5	5	47	5	5	5	91	5	5	5	135	5	5	5	179	5	5	5
4	5	3	3	48	5	5	5	92	5	5	5	136	5	5	5	180	5	5	5
5	5	5	5	49	5	5	5	93	5	5	5	137	5	5	5	181	5	5	5
6	3	3	3	50	5	5	5	94	1	1	1	138	5	5	5	182	5	5	5
7	3	5	5	51	3	5	5	95	1	1	1	139	5	5	5	183	5	5	5
8	3	5	3	52	1	1	1	96	1	1	1	140	5	5	5	184	5	5	5
9	5	5	5	53	1	1	1	97	5	5	5	141	5	5	5	185	5	5	5
10	5	5	5	54	5	5	5	98	5	5	5	142	3	3	5	186	1	1	1
11	5	5	5	55	5	5	5	99	5	5	5	143	3	3	3	187	5	5	5
12	5	5	5	56	5	5	5	100	1	1	1	144	5	5	5	188	2	2	2
13	3	3	3	57	3	3	3	101	1	1	1	145	5	5	5	189	3	3	3
14	5	5	5	58	5	5	5	102	1	1	1	146	5	5	5	190	1	1	1
15	5	5	5	59	5	5	5	103	3	3	5	147	5	5	5	191	5	5	5
16	5	5	5	60	5	5	5	104	5	5	5	148	5	5	5	192	5	5	5
17	5	5	5	61	5	5	5	105	5	5	5	149	5	5	5	193	5	5	5
18	3	5	3	62	5	5	5	106	5	5	5	150	5	5	5	194	5	5	5
19	5	5	5	63	5	5	5	107	5	5	5	151	5	5	5	195	5	5	5
20	5	5	5	64	3	3	2	108	3	3	3	152	5	5	5	196	5	5	5
21	5	5	5	65	3	3	3	109	1	1	1	153	5	5	5	197	5	5	5
22	5	5	5	66	3	5	5	110	3	3	3	154	5	5	5	198	5	5	5
23	5	5	5	67	5	5	5	111	5	5	5	155	5	5	5	199	5	5	5
24	5	5	5	68	5	5	5	112	5	5	5	156	5	5	5	200	5	5	5
25	5	5	5	69	5	5	5	113	5	5	5	157	5	5	5	201	5	5	5
26	5	5	5	70	3	3	3	114	5	5	5	158	5	5	5	202	5	5	5
27	5	5	5	71	5	5	5	115	5	5	5	159	5	5	5	203	5	5	5
28	5	5	5	72	5	5	5	116	5	5	5	160	5	5	5	204	5	5	5
29	5	5	5	73	5	5	5	117	5	5	5	161	5	5	5	205	5	5	5
30	5	5	5	74	5	5	5	118	5	5	5	162	5	5	5	206	5	5	5
31	3	5	5	75	5	5	5	119	1	1	1	163	5	5	5	207	5	5	5
32	5	5	5	76	5	5	5	120	5	5	5	164	5	5	5	208	5	5	5
33	5	5	5	77	2	3	3	121	5	5	5	165	1	1	1	209	5	5	5
34	5	5	5	78	5	5	5	122	1	1	1	166	5	5	5	210	5	5	5
35	5	5	5	79	5	5	5	123	1	1	1	167	5	5	5	211	5	5	5
36	5	5	5	80	5	5	5	124	5	5	5	168	5	5	5	212	5	5	5
37	5	5	5	81	5	5	5	125	5	5	5	169	1	1	1	213	5	5	5
38	1	1	1	82	1	1	1	126	5	5	5	170	5	5	2	214	5	5	5
39	3	3	3	83	1	1	1	127	5	5	5	171	3	3	3	215	5	5	5
40	5	5	5	84	3	3	3	128	5	5	5	172	3	3	3	216	5	5	5
41	5	5	5	85	1	1	1	129	5	5	5	173	5	5	3	217	5	5	5
42	5	5	5	86	1	1	1	130	5	5	5	174	5	2	3	218	5	5	5
43	3	3	5	87	5	5	5	131	5	5	5	175	3	3	3	219	5	5	5
44	3	5	5	88	5	5	5	132	5	5	3	176	5	5	5	220	5	5	5

Source : Field Survey, 2000

Table- G-6: Degree of Impact for Soil Quality Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	5	5	5	45	1	1	1	89	1	1	1	133	5	5	5	177	5	5	5
2	5	5	5	46	1	1	1	90	1	1	1	134	5	5	5	178	5	5	5
3	5	5	5	47	1	1	1	91	1	1	1	135	5	5	5	179	5	5	5
4	5	5	5	48	3	3	3	92	3	5	3	136	5	5	5	180	5	5	5
5	5	5	5	49	5	5	5	93	5	5	5	137	5	5	5	181	5	5	5
6	5	5	5	50	5	5	5	94	2	5	5	138	5	5	5	182	5	5	5
7	5	5	5	51	5	5	5	95	2	5	5	139	5	5	5	183	5	5	5
8	5	5	5	52	5	5	5	96	5	5	5	140	5	5	5	184	5	5	5
9	1	1	1	53	5	5	5	97	5	5	5	141	5	5	5	185	5	5	5
10	1	1	1	54	3	3	3	98	5	5	5	142	5	5	5	186	5	5	5
11	5	5	5	55	5	5	5	99	5	5	5	143	5	5	5	187	5	5	5
12	5	5	5	56	1	1	1	100	5	5	5	144	5	5	5	188	3	3	3
13	5	5	5	57	1	1	1	101	5	5	5	145	5	5	5	189	3	3	3
14	5	5	5	58	1	1	1	102	5	5	5	146	5	5	5	190	3	3	3
15	5	5	5	59	1	1	1	103	5	5	5	147	5	5	5	191	3	3	3
16	5	5	5	60	1	1	1	104	5	5	5	148	5	5	5	192	3	3	3
17	5	5	5	61	3	3	3	105	5	5	5	149	5	5	5	193	5	5	5
18	5	5	5	62	3	3	3	106	5	5	5	150	5	5	5	194	1	1	1
19	1	1	1	63	5	5	5	107	5	5	5	151	5	5	5	195	1	1	1
20	1	1	1	64	5	5	5	108	5	5	5	152	5	5	5	196	1	1	1
21	1	1	1	65	5	5	5	109	5	5	5	153	3	3	3	197	3	3	3
22	1	1	1	66	3	3	3	110	5	5	5	154	3	3	3	198	3	3	3
23	5	5	5	67	3	3	2	111	5	5	5	155	5	5	2	199	3	3	3
24	5	5	5	68	1	1	1	112	5	5	5	156	5	5	5	200	3	3	3
25	5	5	5	69	1	1	1	113	5	5	5	157	5	5	5	201	5	5	5
26	5	5	5	70	1	1	1	114	5	5	5	158	5	5	5	202	5	5	5
27	5	5	5	71	1	1	1	115	5	5	5	159	5	5	5	203	3	3	3
28	5	5	5	72	1	1	1	116	5	5	5	160	5	5	5	204	3	3	3
29	5	5	5	73	1	1	1	117	5	5	5	161	5	5	5	205	3	5	5
30	5	5	5	74	1	1	1	118	5	5	5	162	5	5	5	206	5	5	5
31	1	1	1	75	1	1	1	119	5	5	5	163	5	5	5	207	3	3	3
32	1	1	1	76	1	1	1	120	5	5	5	164	5	5	5	208	3	3	3
33	1	1	1	77	1	1	1	121	5	5	5	165	5	5	5	209	3	5	5
34	1	1	1	78	1	1	1	122	3	3	2	166	5	5	5	210	3	3	3
35	5	5	5	79	5	5	5	123	5	5	5	167	5	5	5	211	5	5	5
36	5	5	5	80	3	3	2	124	5	5	5	168	5	5	5	212	5	5	5
37	5	5	5	81	5	5	5	125	5	5	5	169	5	5	5	213	1	1	1
38	5	5	5	82	5	5	5	126	5	5	5	170	5	5	5	214	1	1	1
39	5	5	5	83	5	5	5	127	5	5	5	171	5	5	5	215	1	1	1
40	5	5	5	84	2	2	3	128	5	5	5	172	5	5	5	216	1	1	1
41	2	2	3	85	1	1	1	129	5	5	5	173	5	5	5	217	1	1	1
42	3	3	5	86	1	1	1	130	5	5	5	174	5	5	5	218	5	5	5
43	1	1	1	87	1	1	1	131	5	5	5	175	5	5	5	219	1	1	1
44	1	1	1	88	1	1	1	132	5	5	2	176	5	5	5	220	1	1	1

Source : Field Survey, 2000

Table- G-7: Degree of Impact for Land Slope Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	5	5	5	45	1	1	1	89	1	1	1	133	5	5	5	177	5	5	5
2	5	5	5	46	1	1	1	91	1	1	1	134	5	5	5	178	5	5	5
3	5	5	5	47	1	1	1	91	1	1	1	135	5	5	5	179	5	5	5
4	5	5	5	48	3	3	3	92	3	3	3	136	5	5	5	180	5	5	5
5	5	5	5	49	5	5	5	93	5	5	5	137	5	5	5	181	5	5	5
6	5	5	5	50	5	5	5	94	5	5	3	138	5	5	5	182	5	5	5
7	5	5	5	51	5	5	5	95	5	3	3	139	5	5	5	183	5	5	5
8	5	5	5	52	5	5	5	96	3	3	3	140	5	5	5	184	5	5	5
9	1	1	1	53	5	5	5	97	5	5	5	141	5	5	5	185	5	5	5
10	1	1	1	54	3	3	3	98	5	5	5	142	3	2	3	186	5	5	5
11	5	5	5	55	3	3	3	99	5	5	5	143	5	5	5	187	5	5	5
12	5	5	5	56	1	1	1	100	5	5	5	144	5	5	5	188	5	5	5
13	5	5	5	57	1	1	1	101	5	5	5	145	5	5	5	189	3	3	3
14	5	5	5	58	1	1	1	102	5	5	5	146	5	5	5	190	3	3	3
15	5	5	5	59	1	1	1	103	5	5	5	147	5	5	5	191	3	3	3
16	5	5	5	60	1	1	1	104	5	5	5	148	5	5	5	192	3	3	3
17	3	3	3	61	3	3	3	105	5	5	5	149	5	5	5	193	5	5	5
18	3	3	3	62	3	3	3	106	5	5	5	150	5	5	5	194	1	1	1
19	1	1	1	63	5	5	5	107	5	5	5	151	5	5	5	195	1	1	1
20	1	1	1	64	5	5	5	108	5	5	5	152	5	5	5	196	1	1	1
21	1	1	1	65	5	5	5	109	5	5	5	153	3	3	3	197	3	3	3
22	1	1	1	66	3	3	3	110	5	5	5	154	3	3	3	198	3	3	3
23	5	5	5	67	3	3	3	111	5	5	5	155	2	2	3	199	3	3	3
24	5	5	5	68	1	1	1	112	5	5	5	156	5	5	5	200	3	3	3
25	5	5	5	69	1	1	1	113	5	5	5	157	5	5	5	201	3	3	3
26	5	5	5	70	1	1	1	114	5	5	5	158	5	5	5	202	5	5	5
27	5	5	5	71	1	1	1	115	5	5	5	159	5	5	5	203	3	3	3
28	5	5	5	72	1	1	1	116	5	5	5	160	5	5	5	204	3	3	3
29	3	3	3	73	1	1	1	117	5	5	5	161	5	5	5	205	3	3	3
30	3	3	3	74	1	1	1	118	5	5	5	162	5	5	5	206	3	3	3
31	1	1	1	75	1	1	1	119	5	5	5	163	3	3	2	207	3	3	3
32	1	1	1	76	1	1	1	120	5	5	5	164	5	5	5	208	3	3	3
33	1	1	1	77	1	1	1	121	5	5	5	165	5	5	5	209	3	3	3
34	1	1	1	78	1	1	1	122	3	3	3	166	5	5	5	210	3	3	3
35	5	5	5	79	3	3	3	123	5	5	5	167	5	5	5	211	3	3	3
36	5	5	5	80	5	5	5	124	5	5	5	168	5	5	5	212	5	5	5
37	5	5	5	81	5	5	5	125	5	5	5	169	5	5	5	213	1	1	1
38	5	5	5	82	5	5	5	126	5	5	5	170	5	5	5	214	1	1	1
39	5	5	5	83	5	5	5	127	5	5	5	171	5	5	5	215	1	1	1
40	5	5	5	84	5	5	5	128	5	5	5	172	5	5	5	216	1	1	1
41	3	3	3	85	1	1	1	129	5	5	5	173	5	5	5	217	1	1	1
42	3	3	3	86	1	1	1	130	5	5	5	174	5	5	5	218	3	3	3
43	1	1	1	87	1	1	1	131	5	5	5	175	3	3	3	219	1	1	1
44	1	1	1	88	1	1	1	132	5	3	3	176	5	5	5	220	1	1	1

Source : Field Survey, 2000

Table- G- 8: Degree of Impact for Natural Drainage Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	5	5	5	45	1	1	1	89	1	1	1	133	5	5	5	177	5	5	5
2	5	5	5	46	1	1	1	90	1	1	1	134	5	5	5	178	5	5	5
3	5	5	5	47	1	1	1	91	1	1	1	135	5	5	5	179	5	5	5
4	5	5	5	48	3	3	3	92	3	3	3	136	5	5	5	180	5	5	5
5	5	5	5	49	5	5	5	93	3	3	3	137	5	5	5	181	5	5	5
6	5	5	5	50	5	5	5	94	3	3	3	138	5	5	5	182	5	5	5
7	5	5	5	51	5	5	5	95	3	3	5	139	5	5	5	183	5	5	5
8	5	5	5	52	5	5	5	96	3	5	5	140	5	5	5	184	5	5	5
9	1	1	1	53	5	5	5	97	5	5	5	141	5	5	5	185	5	5	5
10	1	1	1	54	3	3	5	98	5	5	5	142	5	5	5	186	5	5	5
11	5	5	5	55	3	3	3	99	5	5	5	143	5	5	5	187	5	5	5
12	5	5	5	56	1	1	1	100	5	5	5	144	5	5	5	188	3	3	3
13	5	5	5	57	1	1	1	101	5	5	5	145	5	5	5	189	3	3	3
14	5	5	5	58	1	1	1	102	5	5	5	146	5	5	5	190	3	3	3
15	5	5	5	59	1	1	1	103	5	5	5	147	5	5	5	191	3	3	3
16	5	5	5	60	1	1	1	104	5	5	5	148	5	5	5	192	3	3	3
17	3	3	5	61	3	3	3	105	5	5	5	149	5	5	5	193	5	5	5
18	3	5	5	62	3	3	3	106	5	5	5	150	5	5	5	194	1	1	1
19	1	1	1	63	5	5	5	107	5	5	5	151	5	5	5	195	1	1	1
20	1	1	1	64	5	5	5	108	5	5	5	152	5	5	5	196	1	1	1
21	1	1	1	65	5	5	5	109	5	5	5	153	3	3	3	197	5	3	3
22	1	1	1	66	3	3	3	110	5	5	5	154	3	3	3	198	5	3	3
23	5	5	5	67	5	5	5	111	5	5	5	155	3	5	3	199	3	3	3
24	5	5	5	68	1	1	1	112	5	5	5	156	5	5	5	200	5	5	5
25	5	5	5	69	1	1	1	113	5	5	5	157	5	5	5	201	5	5	5
26	5	5	5	70	1	1	1	114	5	5	5	158	5	5	5	202	5	5	5
27	5	5	5	71	1	1	1	115	5	5	5	159	5	5	5	203	3	3	3
28	5	5	5	72	1	1	1	116	5	5	5	160	5	5	5	204	3	3	5
29	3	3	3	73	1	1	1	117	5	5	5	161	5	5	5	205	3	5	5
30	5	5	5	74	1	1	1	118	5	5	5	162	5	5	5	206	5	5	5
31	1	1	1	75	1	1	1	119	5	5	5	163	3	3	3	207	3	3	3
32	1	1	1	76	1	1	1	120	5	5	5	164	5	5	5	208	3	3	3
33	1	1	1	77	1	1	1	121	5	5	5	165	5	5	5	209	5	5	5
34	1	1	1	78	1	1	1	122	3	5	5	166	3	3	3	210	3	3	3
35	5	5	5	79	3	3	3	123	5	5	5	167	5	5	5	211	5	3	3
36	5	5	5	80	3	3	3	124	5	5	5	168	5	5	5	212	5	5	5
37	5	5	5	81	5	5	5	125	5	5	5	169	5	5	5	213	1	1	1
38	5	5	5	82	5	5	5	126	5	5	5	170	5	5	5	214	1	1	1
39	5	5	5	83	5	5	5	127	5	5	5	171	5	5	5	215	1	1	1
40	5	5	5	84	3	3	5	128	5	5	5	172	5	5	5	216	1	1	1
41	3	3	3	85	1	1	1	129	5	5	5	173	5	5	5	217	1	1	1
42	3	5	5	86	1	1	1	130	5	5	5	174	5	5	5	218	3	3	3
43	1	1	1	87	1	1	1	131	5	5	5	175	3	5	5	219	1	1	1
44	1	1	1	88	1	1	1	132	3	3	3	176	3	3	5	220	1	1	1

Source : Field Survey, 2000

Table- G-9: Degree of Impact for Vulnerable to Flood Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	5	5	5	45	1	1	1	89	1	1	1	133	5	5	5	177	5	5	5
2	5	5	5	46	1	1	1	90	1	1	1	134	5	5	5	178	5	5	5
3	5	5	5	47	1	1	1	91	1	1	1	135	5	5	5	179	5	5	5
4	5	5	5	48	3	3	3	92	3	3	3	136	5	5	5	180	5	5	5
5	5	5	5	49	5	5	5	93	3	3	3	137	5	5	5	181	5	5	5
6	5	5	5	50	5	5	5	94	3	3	3	138	5	5	5	182	5	5	5
7	5	5	5	51	5	5	5	95	3	3	3	139	5	5	5	183	5	5	5
8	5	5	5	52	5	5	5	96	3	3	3	140	5	5	5	184	5	5	5
9	1	1	1	53	5	5	5	97	5	5	5	141	5	5	5	185	5	5	5
10	1	1	1	54	3	3	3	98	5	5	5	142	3	3	3	186	5	5	5
11	3	5	5	55	3	3	3	99	5	5	5	143	5	5	5	187	5	5	5
12	5	5	5	56	1	1	1	100	5	5	5	144	5	5	5	188	3	3	3
13	5	5	5	57	1	1	1	101	5	5	5	145	5	5	5	189	5	5	5
14	5	5	5	58	1	1	1	102	5	5	5	146	5	5	5	190	3	3	3
15	5	5	5	59	1	1	1	103	5	5	5	147	5	5	5	191	3	3	3
16	5	5	5	60	1	1	1	104	5	5	5	148	5	5	5	192	3	3	3
17	3	3	3	61	3	3	3	105	5	5	5	149	5	5	5	193	5	5	5
18	3	3	3	62	5	5	3	106	5	5	5	150	5	5	5	194	1	1	1
19	1	1	1	63	5	5	5	107	5	5	5	151	5	5	5	195	1	1	1
20	1	1	1	64	5	5	5	108	5	5	5	152	5	5	5	196	1	1	1
21	1	1	1	65	5	5	5	109	5	5	5	153	3	3	3	197	3	3	3
22	1	1	1	66	3	3	3	110	5	5	5	154	5	5	5	198	5	5	5
23	5	5	5	67	5	5	5	111	5	5	5	155	5	5	5	199	5	5	5
24	5	5	5	68	1	1	1	112	5	5	5	156	5	5	5	200	3	3	3
25	5	5	5	69	1	1	1	113	5	5	5	157	5	5	5	201	3	3	3
26	5	5	5	70	1	1	1	114	5	5	5	158	5	5	5	202	5	5	5
27	5	5	5	71	1	1	1	115	5	5	5	159	5	5	5	203	5	5	5
28	5	5	5	72	1	1	1	116	5	5	5	160	5	5	5	204	3	3	3
29	3	3	3	73	1	1	1	117	5	5	5	161	5	5	5	205	3	3	3
30	5	5	5	74	1	1	1	118	5	5	5	162	5	5	5	206	5	5	5
31	1	1	1	75	1	1	1	119	5	5	5	163	3	3	3	207	2	2	2
32	1	1	1	76	1	1	1	120	5	5	5	164	5	5	5	208	2	3	3
33	1	1	1	77	1	1	1	121	5	5	5	165	5	5	5	209	3	3	3
34	1	1	1	78	1	1	1	122	5	5	5	166	5	5	5	210	3	3	3
35	5	5	5	79	3	3	3	123	5	5	5	167	5	5	5	211	3	3	3
36	5	5	5	80	5	5	5	124	5	5	5	168	5	5	5	212	5	5	5
37	5	5	5	81	5	5	5	125	5	5	5	169	5	5	5	213	1	1	1
38	5	5	5	82	5	5	5	126	5	5	5	170	5	5	5	214	1	1	1
39	5	5	5	83	5	5	5	127	5	5	5	171	5	5	5	215	1	1	1
40	5	5	5	84	3	3	3	128	5	5	5	172	5	5	5	216	1	1	1
41	3	3	3	85	1	1	1	129	5	5	5	173	5	5	5	217	1	1	1
42	3	3	3	86	1	1	1	130	5	5	5	174	5	5	5	218	3	3	3
43	1	1	1	87	1	1	1	131	5	5	5	175	2	3	3	219	1	1	1
44	1	1	1	88	1	1	1	132	3	3	3	176	2	3	3	220	1	1	1

Source : Field Survey, 2000

Table- G-10: Degree of Impact for Population Density Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	5	5	5	45	5	5	5	89	5	5	5	133	5	5	5	177	5	5	5
2	5	5	5	46	5	5	5	90	5	5	5	134	5	5	5	178	5	5	5
3	5	5	5	47	5	5	5	91	5	5	5	135	5	5	5	179	5	5	5
4	5	5	5	48	5	5	5	92	5	5	5	136	5	5	5	180	5	5	5
5	5	5	5	49	5	5	5	93	5	5	5	137	5	5	5	181	5	5	5
6	5	5	5	50	5	5	5	94	5	5	5	138	5	5	5	182	5	5	5
7	5	5	5	51	5	5	5	95	5	5	5	139	5	5	5	183	5	5	5
8	5	5	5	52	5	5	5	96	5	5	5	140	5	5	5	184	5	5	5
9	5	5	5	53	5	5	5	97	5	5	5	141	5	5	5	185	5	5	5
10	5	5	5	54	5	5	5	98	5	5	5	142	5	5	5	186	5	5	5
11	5	5	5	55	5	5	5	99	5	5	5	143	5	5	5	187	5	5	5
12	5	5	5	56	5	5	5	100	5	5	5	144	5	5	5	188	5	5	5
13	5	5	5	57	5	5	5	101	5	5	5	145	5	5	5	189	5	5	5
14	5	5	5	58	5	5	5	102	5	5	5	146	5	5	5	190	5	5	5
15	5	5	5	59	5	5	5	103	5	5	5	147	5	5	5	191	5	5	5
16	5	5	5	60	5	5	5	104	5	5	5	148	5	5	5	192	5	5	5
17	5	5	5	61	5	5	5	105	5	5	5	149	5	5	5	193	5	5	5
18	5	5	5	62	5	5	5	106	5	5	5	150	5	5	5	194	5	5	5
19	5	5	5	63	5	5	5	107	5	5	5	151	5	5	5	195	5	5	5
20	5	5	5	64	5	5	5	108	5	5	5	152	5	5	5	196	5	5	5
21	5	5	5	65	5	5	5	109	5	5	5	153	5	5	5	197	5	5	5
22	5	5	5	66	5	5	5	110	5	5	5	154	5	5	5	198	5	5	5
23	5	5	5	67	5	5	5	111	5	5	5	155	5	5	5	199	5	5	5
24	5	5	5	68	5	5	5	112	5	5	5	156	5	5	5	200	5	5	5
25	5	5	5	69	5	5	5	113	5	5	5	157	5	5	5	201	5	5	5
26	5	5	5	70	5	5	5	114	5	5	5	158	5	5	5	202	5	5	5
27	5	5	5	71	5	5	5	115	5	5	5	159	5	5	5	203	5	5	5
28	5	5	5	72	5	5	5	116	5	5	5	160	5	5	5	204	5	5	5
29	5	5	5	73	5	5	5	117	5	5	5	161	5	5	5	205	5	5	5
30	5	5	5	74	5	5	5	118	5	5	5	162	5	5	5	206	5	5	5
31	5	5	5	75	5	5	5	119	5	5	5	163	5	5	5	207	5	5	5
32	5	5	5	76	5	5	5	120	5	5	5	164	5	5	5	208	5	5	5
33	5	5	5	77	5	5	5	121	5	5	5	165	5	5	5	209	5	5	5
34	5	5	5	78	5	5	5	122	5	5	5	166	1	1	1	210	5	5	5
35	5	5	5	79	5	5	5	123	5	5	5	167	1	1	1	211	5	5	5
36	5	5	5	80	5	5	5	124	5	5	5	168	1	1	1	212	5	5	5
37	5	5	5	81	5	5	5	125	5	5	5	169	1	1	1	213	5	5	5
38	5	5	5	82	5	5	5	126	5	5	5	170	5	5	5	214	5	5	5
39	5	5	5	83	5	5	5	127	5	5	5	171	5	5	5	215	5	5	5
40	5	5	5	84	5	5	5	128	5	5	5	172	5	5	5	216	5	5	5
41	5	5	5	85	5	5	5	129	5	5	5	173	5	5	5	217	5	5	5
42	5	5	5	86	5	5	5	130	5	5	5	174	5	5	5	218	5	5	5
43	5	5	5	87	5	5	5	131	5	5	5	175	5	5	5	219	5	5	5
44	5	5	5	88	5	5	5	132	5	5	5	176	5	5	5	220	5	5	5

Source : Field Survey, 2000

Table- G-11: Degree of Impact for Existing Land-use Parameter

	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	1	1	5	45	1	1	5	89	1	1	5	132	5	3	1	177	5	3	1
2	1	1	5	46	1	1	5	90	1	1	5	134	5	3	1	178	5	3	1
3	1	1	5	47	1	1	5	91	5	3	1	135	5	3	1	179	5	3	1
4	1	1	5	48	5	3	1	92	5	3	1	136	5	3	1	180	5	3	1
5	1	1	5	49	5	3	1	93	5	3	1	137	5	3	1	181	5	3	1
6	1	1	5	50	5	3	1	94	5	3	1	138	5	3	1	182	5	3	1
7	1	1	5	51	5	3	1	95	5	3	1	139	5	3	1	183	5	3	1
8	1	1	5	52	5	3	1	96	5	3	1	140	5	3	1	184	5	3	1
9	1	1	5	53	5	3	1	97	5	3	1	141	5	3	1	185	5	3	1
10	1	1	5	54	1	1	5	98	5	3	1	142	5	3	1	186	5	3	1
11	5	3	1	55	1	1	5	99	5	3	1	143	5	3	1	187	5	3	1
12	5	3	1	56	1	1	5	100	3	5	3	144	5	3	1	188	5	3	1
13	5	3	1	57	1	1	5	101	3	5	3	145	5	3	1	189	5	3	1
14	5	3	1	58	1	1	5	102	3	5	3	146	5	3	1	190	3	5	3
15	5	3	1	59	1	1	5	103	3	5	3	147	5	3	1	191	5	3	1
16	1	1	5	60	1	1	5	104	2	5	3	148	5	3	1	192	5	3	1
17	1	1	5	61	5	3	1	105	2	5	3	149	5	3	1	193	5	3	1
18	1	1	5	62	5	3	1	106	3	5	3	150	5	3	1	194	5	3	1
19	1	1	5	63	5	3	1	107	3	5	3	151	5	3	1	195	5	3	1
20	1	1	5	64	5	3	1	108	3	5	3	152	5	3	1	196	5	3	1
21	1	1	5	65	5	3	1	109	1	1	5	153	5	3	1	197	5	3	1
22	1	1	5	66	5	3	1	110	1	1	5	154	5	3	1	198	5	3	1
23	5	3	1	67	1	1	5	111	5	3	1	155	5	3	1	199	5	3	1
24	5	3	1	68	1	1	5	112	5	3	1	156	5	3	1	200	5	3	1
25	5	3	1	69	1	1	5	113	5	3	1	157	5	3	1	201	5	3	1
26	5	3	1	70	1	1	5	114	5	3	1	158	5	3	1	202	5	3	1
27	5	3	1	71	1	1	5	115	5	3	1	159	5	3	1	203	5	3	1
28	5	3	1	72	1	1	5	116	5	3	1	160	5	3	1	204	1	1	5
29	5	3	1	73	5	3	1	117	5	3	1	161	5	3	1	205	1	1	5
30	1	1	5	74	5	3	1	118	5	3	1	162	5	3	1	206	1	1	5
31	1	1	5	75	5	3	1	119	5	3	1	163	5	3	1	207	1	1	5
32	1	1	5	76	5	3	1	120	5	3	1	164	5	3	1	208	1	1	5
33	1	1	5	77	5	3	1	121	3	5	3	165	5	3	1	209	1	1	5
34	1	1	5	78	3	5	1	122	3	5	3	166	5	3	1	210	1	1	5
35	5	3	1	79	5	3	1	123	3	5	3	167	5	3	1	211	1	1	5
36	5	3	1	80	3	3	1	124	5	3	1	168	5	3	1	212	5	3	1
37	5	3	1	81	5	3	1	125	5	3	1	169	3	5	3	213	5	3	1
38	5	3	1	82	3	3	3	126	3	3	3	170	5	3	1	214	5	3	1
39	5	3	1	83	3	5	3	127	5	3	1	171	5	3	1	215	5	3	1
40	5	3	1	84	3	5	3	128	5	3	1	172	5	3	1	216	1	1	5
41	1	1	5	85	1	1	5	129	5	3	1	173	5	3	1	217	1	1	5
42	1	1	5	86	1	1	5	130	5	3	1	174	5	3	1	218	1	1	5
43	1	1	5	87	1	1	5	131	5	3	1	175	5	3	1	219	1	1	5
44	1	1	5	88	1	1	5	132	5	3	1	176	5	3	1	220	1	1	5

Source : Field Survey, 2000

Table- G-12: Degree of Impact for Land Value Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	5	5	5	45	5	5	5	89	5	5	5	132	5	5	5	177	5	5	5
2	5	5	5	46	5	5	5	90	5	5	5	134	5	5	5	178	5	5	5
3	5	5	5	47	5	5	5	91	5	5	5	135	5	5	5	179	5	5	5
4	5	5	5	48	5	5	5	92	5	5	5	136	5	5	5	180	5	5	5
5	5	5	5	49	5	5	5	93	5	5	5	137	5	5	5	181	5	5	5
6	5	5	5	50	5	5	5	94	5	5	5	138	5	5	5	182	5	5	5
7	5	5	5	51	5	5	5	95	5	5	5	139	5	5	5	183	5	5	5
8	5	5	5	52	5	5	5	96	5	5	5	140	5	5	5	184	5	5	5
9	5	5	5	53	5	5	5	97	5	5	5	141	5	5	5	185	5	5	5
10	5	5	5	54	5	5	5	98	5	5	5	142	5	5	5	186	5	5	5
11	5	5	5	55	5	5	5	99	5	5	5	143	1	1	1	187	5	5	5
12	5	5	5	56	5	5	5	100	5	5	5	144	1	1	1	188	5	5	5
13	5	5	5	57	5	5	5	101	5	5	5	145	1	1	1	189	5	5	5
14	5	5	5	58	5	5	5	102	5	5	5	146	5	5	5	190	5	5	5
15	5	5	5	59	5	5	5	103	5	5	5	147	5	5	5	191	5	5	5
16	5	5	5	60	5	5	5	104	5	5	5	148	5	5	5	192	5	5	5
17	5	5	5	61	5	5	5	105	5	5	5	149	5	5	5	193	5	5	5
18	5	5	5	62	5	5	5	106	5	5	5	150	5	5	5	194	5	5	5
19	5	5	5	63	5	5	5	107	5	5	5	151	5	5	5	195	5	5	5
20	5	5	5	64	5	5	5	108	5	5	5	152	5	5	5	196	5	5	5
21	5	5	5	65	5	5	5	109	5	5	5	153	5	5	5	197	5	5	5
22	5	5	5	66	5	5	5	110	5	5	5	154	5	5	5	198	5	5	5
23	5	5	5	67	5	5	5	111	5	5	5	155	5	5	5	199	5	5	5
24	5	5	5	68	5	5	5	112	5	5	5	156	5	5	5	200	5	5	5
25	5	5	5	69	5	5	5	113	5	5	5	157	5	5	5	201	5	5	5
26	5	5	5	70	5	5	5	114	5	5	5	158	5	5	5	202	5	5	5
27	5	5	5	71	5	5	5	115	5	5	5	159	5	5	5	203	5	5	5
28	5	5	5	72	5	5	5	116	5	5	5	160	5	5	5	204	5	5	5
29	5	5	5	73	5	5	5	117	5	5	5	161	5	5	5	205	5	5	5
30	5	5	5	74	5	5	5	118	5	5	5	162	5	5	5	206	5	5	5
31	5	5	5	75	5	5	5	119	5	5	5	163	5	5	5	207	5	5	5
42	5	5	5	76	5	5	5	120	5	5	5	164	5	5	5	208	5	5	5
33	5	5	5	77	5	5	5	121	5	5	5	165	5	5	5	209	5	5	5
34	5	5	5	78	5	5	5	122	5	5	5	166	5	5	5	210	5	5	5
35	5	5	5	79	5	5	5	123	1	1	1	167	5	5	5	211	5	5	5
36	5	5	5	80	5	5	5	124	1	1	1	168	5	5	5	212	5	5	5
37	5	5	5	81	5	5	5	125	1	1	1	169	5	5	5	213	5	5	5
38	5	5	5	82	1	1	1	126	1	1	1	170	5	5	5	214	5	5	5
39	5	5	5	83	1	1	1	127	1	1	1	171	5	5	5	215	5	5	5
40	5	5	5	84	1	1	1	128	2	3	3	172	5	5	5	216	5	5	5
41	5	5	5	85	3	3	3	129	3	3	3	173	5	5	5	217	5	5	5
42	5	5	5	86	5	5	5	130	3	3	3	174	5	5	5	218	5	5	5
43	5	5	5	87	5	5	5	131	5	5	5	175	5	5	5	219	5	5	5
44	5	5	5	88	5	5	5	132	5	5	5	176	5	5	5	220	5	5	5

Source : Field Survey, 2000

Table- G-13 : Degree of Impact for Social standing of the area Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	3			45	3			89	3			133	3			177	3		
2	3			46	3			90	3			134	3			178	3		
3	3			47	3			91	3			135	3			179	3		
4	3			48	3			92	3			136	3			180	3		
5	3			49	3			93	3			137	3			181	3		
6	2			50	3			94	1			138	3			182	3		
7	3			51	3			95	1			139	3			183	3		
8	3			52	3			96	3			140	3			184	3		
9	3			53	3			97	3			141	3			185	5		
10	3			54	3			98	3			142	3			186	5		
11	3			55	3			99	3			143	5			187	5		
12	3			56	5			100	5			144	5			188	5		
13	3			57	5			101	5			145	5			189	5		
14	3			58	3			102	5			146	5			190	3		
15	3			59	3			103	5			147	5			191	3		
16	5			60	3			104	3			148	2			192	5		
17	3			61	3			105	3			149	3			193	3		
18	3			62	3			106	3			150	3			194	3		
19	3			63	3			107	3			151	3			195	3		
20	3			64	3			108	3			152	5			196	5		
21	3			65	3			109	1			153	3			197	3		
22	3			66	3			110	1			154	3			198	3		
23	3			67	3			111	3			155	3			199	3		
24	3			68	4			112	3			156	3			200	3		
25	3			69	2			113	3			157	3			201	3		
26	3			70	3			114	3			158	3			202	3		
27	3			71	3			115	3			159	3			203	3		
28	3			72	5			116	4			160	5			204	3		
29	4			73	3			117	3			161	3			205	3		
30	2			74	3			118	3			162	3			206	2		
31	3			75	3			119	3			163	3			207	3		
32	3			76	5			120	5			164	5			208	3		
33	3			77	3			121	3			165	5			209	3		
34	5			78	3			122	5			166	5			210	5		
35	3			79	3			123	5			167	5			211	3		
36	3			80	3			124	5			168	5			212	3		
37	5			81	3			125	5			169	4			213	5		
38	3			82	3			126	5			170	3			214	3		
39	3			83	3			127	3			171	3			215	3		
40	5			84	3			128	3			172	4			216	3		
41	3			85	2			129	3			173	3			217	3		
42	3			86	3			130	3			174	3			218	5		
43	2			87	3			131	3			175	3			219	3		
44	3			88	3			132	3			176	3			220	3		

Source : Field Survey, 2000

Table- G-14 : Degree of Impact for Distance to School Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	3	3	3	45	1	1	1	89	1	1	1	133	5	5	5	177	5	5	5
2	3	3	3	46	1	1	1	90	1	1	1	134	5	5	5	178	5	5	5
3	3	2	2	47	1	1	1	91	5	5	5	135	5	5	5	179	5	5	5
4	2	3	3	48	3	3	3	92	5	5	5	136	5	5	5	180	5	5	5
5	3	3	3	49	5	5	5	93	5	5	5	137	5	5	5	181	5	5	5
6	3	4	4	50	5	5	5	94	5	5	5	138	5	5	5	182	5	5	5
7	2	3	3	51	5	5	5	95	5	5	5	139	5	5	5	183	5	5	5
8	3	3	3	52	5	5	5	96	5	5	5	140	5	5	5	184	5	5	5
9	5	1	1	53	5	5	5	97	5	5	5	141	5	5	5	185	5	5	5
10	1	1	1	54	5	5	5	98	5	5	5	142	5	5	5	186	5	5	5
11	3	3	3	55	1	1	1	99	5	5	5	143	5	5	5	187	5	5	5
12	5	5	5	56	1	1	1	100	5	5	5	144	5	5	5	188	5	5	5
13	5	5	5	57	1	1	1	101	5	5	5	145	5	5	5	189	5	5	5
14	5	5	5	58	1	1	1	102	5	5	5	146	5	5	5	190	5	5	5
15	5	5	5	59	1	1	1	103	5	5	5	147	5	5	5	191	5	5	5
16	5	5	5	60	1	1	1	104	5	5	5	148	5	5	5	192	5	5	5
17	5	5	5	61	5	5	5	105	5	5	5	149	5	5	5	193	5	5	5
18	5	5	5	62	5	5	5	106	5	5	5	150	5	5	5	194	5	5	5
19	3	3	3	63	5	5	5	107	5	5	5	151	3	3	3	195	1	1	1
20	1	1	1	64	5	5	5	108	5	5	5	152	5	5	3	196	1	1	1
21	1	1	1	65	5	5	5	109	5	5	5	153	1	1	1	197	5	5	5
22	1	1	1	66	5	5	5	110	5	5	5	154	1	1	1	198	5	5	5
23	5	5	5	67	3	3	3	111	5	5	5	155	1	1	1	199	5	5	5
24	5	5	5	68	1	1	1	112	5	5	5	156	5	5	5	200	5	5	5
25	5	5	5	69	1	1	1	113	5	5	5	157	5	5	5	201	5	5	5
26	5	5	5	70	1	1	1	114	5	5	5	158	5	5	5	202	5	5	5
27	5	5	5	71	1	1	1	115	5	5	5	159	5	5	5	203	3	3	3
28	5	5	5	72	1	1	1	116	5	5	5	160	5	5	5	204	1	1	1
29	5	5	5	73	3	3	3	117	5	5	5	161	5	5	5	205	1	1	1
30	5	5	5	74	3	3	3	118	5	5	5	162	5	5	5	206	1	1	1
31	5	5	5	75	3	3	3	119	5	5	5	163	5	5	5	207	1	1	1
32	5	5	5	76	3	3	3	120	5	5	5	164	5	5	5	208	1	1	1
33	5	5	5	77	1	1	1	121	5	5	5	165	5	5	5	209	1	1	1
34	5	5	5	78	3	3	3	122	5	5	5	166	5	5	5	210	1	1	1
35	5	5	5	79	3	5	5	123	5	5	5	167	5	5	5	211	1	1	1
36	5	5	5	80	5	5	5	124	5	5	5	168	5	5	5	212	1	1	1
37	5	5	5	81	5	5	5	125	5	5	5	169	5	5	5	213	3	3	3
38	5	5	5	82	5	5	5	126	5	5	5	170	5	5	5	214	3	3	3
39	5	5	5	83	5	5	5	127	5	5	5	171	5	5	5	215	3	3	3
40	5	5	5	84	5	5	5	128	5	5	5	172	5	5	5	216	1	1	1
41	5	5	5	85	3	3	3	129	5	5	5	173	3	3	3	217	1	1	1
42	3	3	3	86	3	3	3	130	5	5	5	174	1	1	1	218	1	1	1
43	1	1	1	87	5	5	5	131	5	5	5	175	1	1	1	219	1	1	1
44	1	1	1	88	5	5	5	132	5	5	5	176	5	5	5	220	1	1	1

Source : Field Survey, 2000

Table- G-15 Degree of Impact for Distance to Medical facilities Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	1	1	1	45	3	3	2	89	3	3	3	133	1	1	1	177	1	1	1
2	1	1	1	46	3	3	3	90	1	1	1	134	1	1	1	178	1	1	1
3	1	1	1	47	1	1	1	91	1	1	1	135	1	1	1	179	1	1	1
4	1	1	1	48	1	1	1	92	1	1	1	136	1	1	1	180	1	1	1
5	1	1	1	49	3	3	3	93	1	1	1	137	1	1	1	181	1	1	1
6	1	1	1	50	3	3	3	94	1	1	1	138	1	1	1	182	1	1	1
7	1	1	1	51	3	3	3	95	1	1	1	139	1	1	1	183	3	3	3
8	1	1	1	52	5	5	5	96	1	1	1	140	1	1	1	184	3	3	3
9	1	1	1	53	5	5	5	97	1	1	1	141	3	3	3	185	5	5	5
10	1	1	1	54	5	5	5	98	1	1	1	142	3	3	3	186	5	5	5
11	1	1	1	55	5	5	5	99	3	3	3	143	5	5	5	187	5	5	5
12	1	1	1	56	5	5	5	100	3	3	3	144	5	5	5	188	5	5	5
13	3	3	3	57	5	5	5	101	2	3	3	145	5	5	5	189	5	5	5
14	3	3	3	58	2	3	3	102	3	3	3	146	5	5	5	190	5	5	5
15	3	3	3	59	3	3	3	103	3	3	3	147	5	5	5	191	5	5	5
16	3	3	3	60	1	1	1	104	2	3	3	148	5	5	5	192	5	5	5
17	3	3	3	61	1	1	1	105	3	3	3	149	5	5	5	193	5	5	5
18	1	1	1	62	3	3	3	106	3	3	3	150	5	5	5	194	3	3	2
19	1	1	1	63	3	3	3	107	2	3	3	151	5	5	5	195	2	2	3
20	1	1	1	64	3	3	3	108	3	3	3	152	3	3	3	196	1	1	1
21	1	1	1	65	5	5	5	109	3	3	3	153	3	3	3	197	1	1	1
22	1	1	1	66	5	5	5	110	1	1	1	154	1	1	1	198	1	1	1
23	1	1	1	67	5	5	5	111	1	1	1	155	1	1	1	199	1	1	1
24	1	1	1	68	5	5	5	112	1	1	1	156	1	1	1	200	1	1	1
25	3	3	3	69	5	5	5	113	1	1	1	157	1	1	1	201	1	1	1
26	3	3	2	70	5	5	5	114	1	1	1	158	1	1	1	202	1	1	1
27	3	2	2	71	3	3	3	115	1	1	1	159	1	1	1	203	3	3	2
28	3	3	3	72	1	1	1	116	1	1	1	160	1	1	1	204	3	3	3
29	3	1	1	73	1	1	1	117	1	1	1	161	1	1	1	205	3	3	3
30	3	2	2	74	1	1	1	118	1	1	1	162	3	3	3	206	3	3	3
31	3	2	2	75	1	1	1	119	1	1	1	163	3	3	3	207	3	3	3
32	1	1	1	76	1	1	1	120	1	1	1	164	3	3	3	208	3	3	3
33	1	1	1	77	1	1	1	121	1	1	1	165	5	5	5	209	3	3	3
34	1	1	1	78	1	1	1	122	3	3	3	166	5	5	5	210	3	3	3
35	1	1	1	79	1	1	1	123	3	3	3	167	5	5	5	211	3	3	3
36	3	3	3	80	3	3	3	124	3	3	3	168	5	5	5	212	1	1	1
37	5	5	5	81	3	3	3	125	3	3	3	169	5	5	5	213	1	1	1
38	5	5	5	82	3	3	3	126	3	3	3	170	5	5	5	214	1	1	1
39	5	5	5	83	3	3	3	127	5	5	5	171	5	5	5	215	1	1	1
40	5	5	5	84	3	3	3	128	5	5	5	172	5	5	5	216	1	1	1
41	5	5	5	85	3	3	3	129	5	5	5	173	3	3	3	217	1	1	1
42	5	5	5	86	3	3	3	130	5	5	5	174	2	2	3	218	1	1	1
43	5	5	5	87	3	3	3	131	3	3	3	175	3	3	3	219	1	1	1
44	5	5	5	88	3	3	3	132	1	1	1	176	1	1	1	220	1	1	1

Source : Field Survey, 2000

Table- G-16: Degree of Impact for Recreation Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	1	1	1	45	3	3	3	89	3	3	3	133	1	1	1	177	1	1	1
2	1	1	1	46	1	1	1	90	1	1	1	134	1	1	1	178	1	1	1
3	1	1	1	47	1	1	1	91	1	1	1	135	1	1	1	179	1	1	1
4	1	1	1	48	3	3	3	92	1	1	1	136	1	1	1	180	1	1	1
5	1	1	1	49	3	3	3	93	1	1	1	137	1	1	1	181	3	3	3
6	1	1	1	50	3	3	3	94	1	1	1	138	3	3	3	182	3	3	3
7	1	1	1	51	3	3	3	95	1	1	1	139	3	3	3	183	3	3	3
8	1	1	1	52	3	3	3	96	3	3	3	140	3	3	3	184	3	3	3
9	1	1	1	53	3	3	3	97	3	3	3	141	5	5	5	185	3	3	3
10	1	1	1	54	3	3	3	98	3	3	3	142	5	5	5	186	3	3	3
11	1	1	1	55	3	3	3	99	5	5	5	143	5	5	5	187	3	3	3
12	1	1	1	56	3	3	3	100	5	5	5	144	5	5	5	188	3	3	3
13	1	1	1	57	3	3	3	101	5	5	5	145	5	5	5	189	3	3	3
14	1	1	1	58	3	3	3	102	5	5	5	146	5	5	5	190	3	3	3
15	1	1	1	59	1	1	1	103	5	5	5	147	5	5	5	191	3	3	3
16	1	1	1	60	1	1	1	104	5	5	5	148	3	3	3	192	3	3	3
17	1	1	1	61	3	3	3	105	5	5	5	149	3	3	3	193	3	3	3
18	1	1	1	62	5	5	5	106	3	3	3	150	3	3	3	194	1	1	1
19	1	1	1	63	5	5	5	107	3	3	2	151	1	1	1	195	1	1	1
20	1	1	1	64	5	5	5	108	3	2	2	152	1	1	1	196	1	1	1
21	1	1	1	65	5	5	5	109	1	1	1	153	1	1	1	197	1	1	1
22	1	1	1	66	5	5	5	110	1	1	1	154	1	1	1	198	1	1	1
23	3	3	3	67	5	5	5	111	1	1	1	155	1	1	1	199	1	1	1
24	3	3	3	68	5	5	5	112	1	1	1	156	1	1	1	200	1	1	1
25	3	3	3	69	3	3	3	113	1	1	1	157	1	1	1	201	3	3	3
26	3	3	3	70	3	3	3	114	1	1	1	158	1	1	1	202	3	3	3
27	3	3	3	71	3	3	3	115	1	1	1	159	1	1	1	203	3	3	3
28	3	3	3	72	1	1	1	116	1	1	1	160	3	3	3	204	3	3	3
29	3	3	3	73	1	1	1	117	3	3	3	161	3	3	3	205	3	3	3
30	3	3	3	74	1	1	1	118	3	3	3	162	3	3	3	206	3	3	3
31	3	3	3	75	1	1	1	119	3	3	3	163	5	5	5	207	3	3	3
32	3	3	3	76	1	1	1	120	5	5	5	164	5	5	5	208	3	3	3
33	2	2	2	77	3	3	3	121	5	5	5	165	5	5	5	209	3	3	3
34	1	1	1	78	3	3	3	122	5	5	5	166	5	5	5	210	4	3	3
35	3	3	3	79	3	3	3	123	5	5	5	167	5	5	5	211	2	2	3
36	3	3	3	80	5	5	5	124	5	5	5	168	5	5	5	212	1	1	1
37	3	3	3	81	5	5	5	125	5	5	5	169	5	5	5	213	3	3	3
38	3	3	3	82	5	5	5	126	5	5	5	170	3	3	3	214	3	3	3
39	3	3	3	83	5	5	5	127	3	3	3	171	3	3	3	215	3	3	3
40	3	3	3	84	5	5	5	128	3	3	3	172	2	3	3	216	3	3	3
41	3	3	3	85	5	5	5	129	3	3	3	173	1	1	1	217	3	3	3
42	3	3	3	86	5	5	5	130	1	1	1	174	1	1	1	218	3	3	3
43	3	3	3	87	3	3	3	131	1	1	1	175	1	1	1	219	3	3	3
44	3	3	3	88	3	3	3	132	1	1	1	176	1	1	1	220	3	3	3

Source : Field Survey, 2000

Table- G-17 : Degree of Impact for Distance to Highway Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	5	5	5	45	5	5	5	89	5	5	5	133	3	3	3	177	1	1	1
2	5	5	5	46	5	5	4	90	5	5	5	134	5	3	3	178	1	1	1
3	5	5	5	47	1	1	1	91	3	3	3	135	5	5	4	179	1	1	1
4	5	5	5	48	3	3	3	92	5	5	5	136	3	3	3	180	1	1	1
5	5	5	5	49	3	3	3	93	5	5	5	137	3	3	3	181	3	3	3
6	5	5	5	50	5	5	5	94	5	5	5	138	3	5	3	182	3	3	3
7	5	5	5	51	5	5	5	95	5	5	5	139	5	5	5	183	3	3	3
8	5	5	5	52	5	5	5	96	5	5	5	140	5	5	5	184	3	3	3
9	3	5	3	53	5	5	5	97	5	5	5	141	5	5	5	185	5	5	5
10	3	3	3	54	5	5	5	98	5	5	5	142	5	5	5	186	5	5	5
11	3	3	3	55	3	3	3	99	5	5	5	143	5	5	5	187	5	5	5
12	5	5	5	56	5	5	5	100	5	5	5	144	5	5	5	188	5	5	5
13	5	5	5	57	5	5	5	101	5	5	5	145	4	4	4	189	5	5	5
14	5	5	5	58	3	3	3	102	5	5	5	146	5	5	5	190	5	5	5
15	3	3	3	59	3	3	3	103	5	5	5	147	5	5	5	191	5	5	5
16	5	5	5	60	3	3	5	104	5	5	5	148	5	5	5	192	5	5	5
17	5	5	5	61	3	3	3	105	5	5	5	149	3	3	4	193	5	5	5
18	5	5	5	62	5	5	5	106	5	5	5	150	3	3	3	194	5	5	5
19	5	5	5	63	5	5	5	107	5	5	5	151	3	3	3	195	5	5	5
20	5	5	5	64	5	5	5	108	5	5	5	152	5	5	5	196	5	5	5
21	3	3	3	65	5	5	5	109	5	5	5	153	1	1	1	197	1	1	1
22	3	3	3	66	3	3	3	110	5	5	5	154	3	3	1	198	1	1	3
23	3	3	3	67	3	3	3	111	1	1	1	155	3	3	1	199	1	1	3
24	3	3	3	68	5	5	5	112	1	1	1	156	3	3	1	200	1	1	1
25	5	5	5	69	5	5	5	113	5	5	5	157	3	3	1	201	1	1	1
26	5	5	5	70	5	5	5	114	5	5	5	158	3	3	3	202	1	1	1
27	5	5	5	71	5	5	5	115	5	5	5	159	3	3	3	203	1	1	1
28	3	3	3	72	5	5	5	116	5	5	5	160	3	3	3	204	1	1	1
29	3	3	3	73	5	5	5	117	5	5	5	161	5	5	5	205	3	3	3
30	5	5	5	74	5	5	5	118	5	5	5	162	5	5	5	206	3	3	3
31	5	5	5	75	3	3	3	119	5	5	5	163	5	5	5	207	5	5	5
32	5	5	5	76	3	3	3	120	5	5	5	164	5	5	5	208	3	3	3
33	3	5	3	77	5	5	5	121	5	5	5	165	5	5	5	209	3	3	3
34	3	3	3	78	3	3	3	122	5	5	5	166	5	5	5	210	3	3	3
35	5	5	5	79	3	3	5	123	5	5	5	167	5	5	5	211	5	3	3
36	3	3	3	80	5	5	5	124	5	5	5	168	5	5	5	212	1	1	1
37	5	5	5	81	5	5	5	125	5	5	5	169	5	5	5	213	1	1	1
38	5	5	5	82	5	5	5	126	5	5	5	170	5	5	5	214	1	1	1
39	5	5	5	83	5	5	5	127	5	5	5	171	5	5	5	215	1	1	1
40	5	5	5	84	5	5	5	128	5	5	5	172	5	5	5	216	1	1	1
41	3	3	3	85	3	3	3	129	5	5	5	173	5	5	5	217	1	1	1
42	5	5	5	86	3	3	3	130	5	5	5	174	5	5	5	218	1	1	1
43	5	5	5	87	3	5	5	131	5	5	5	175	5	5	5	219	1	1	1
44	5	5	5	88	5	5	5	132	5	5	5	176	1	1	1	220	1	1	1

Source : Field Survey, 2000

Table- G-18 : Degree of Impact for Distance to Waterway Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1			1	45			1	89			1	133			1	177			1
2			1	46			1	90			1	134			1	178			1
3			1	47			1	91			1	135			1	179			1
4			1	48			1	92			1	136			1	180			1
5			1	49			1	93			1	137			1	181			1
6			1	50			1	94			1	138			1	182			1
7			1	51			1	95			1	139			3	183			5
8			1	52			3	96			1	140			3	184			5
9			5	53			5	97			1	141			5	185			5
10			5	54			5	98			1	142			5	186			5
11			1	55			5	99			3	143			5	187			5
12			1	56			3	100			3	144			3	188			5
13			1	57			1	101			5	145			3	189			5
14			1	58			1	102			5	146			1	190			5
15			1	59			1	103			5	147			1	191			5
16			3	60			1	104			3	148			1	192			3
17			3	61			1	105			1	149			1	193			1
18			5	62			1	106			1	150			1	194			1
19			5	63			1	107			1	151			1	195			1
20			5	64			1	108			1	152			1	196			1
21			5	65			3	109			1	153			1	197			1
22			5	66			3	110			1	154			1	198			1
23			1	67			5	111			1	155			1	199			1
24			1	68			3	112			1	156			1	200			1
25			1	69			3	113			1	157			1	201			1
26			1	70			1	114			1	158			1	202			3
27			1	71			1	115			1	159			1	203			3
28			1	72			1	116			1	160			3	204			5
29			2	73			1	117			1	161			5	205			5
30			5	74			1	118			1	162			5	206			5
31			3	75			1	119			3	163			5	207			5
32			2	76			1	120			3	164			5	208			5
33			5	77			1	121			5	165			3	209			5
34			1	78			1	122			5	166			3	210			5
35			1	79			1	123			3	167			3	211			3
36			1	80			1	124			3	168			3	212			1
37			1	81			3	125			1	169			3	213			1
38			1	82			3	126			1	170			1	214			1
39			3	83			3	127			1	171			1	215			3
40			3	84			5	128			1	172			1	216			3
41			5	85			3	129			1	173			1	217			3
42			5	86			3	130			1	174			1	218			3
43			3	87			1	131			1	175			1	219			3
44			3	88			1	132			1	176			1	220			3

Source : Field Survey, 2000

Table- G-19 . Degree of Impact for Distance to Local Bus Stop Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	5	5	5	45	5	5	5	89	5	5	5	133	3	3	3	177	1	1	1
2	5	5	5	46	2	2	3	90	5	5	5	134	3	3	3	178	1	1	1
3	5	5	5	47	1	1	1	91	3	3	3	135	5	5	5	179	1	1	1
4	5	5	5	48	3	3	3	92	5	5	5	136	5	5	5	180	1	1	1
5	5	5	5	49	4	4	5	93	5	5	5	137	3	3	3	181	2	3	3
6	5	5	5	50	5	5	5	94	5	5	5	138	3	3	3	182	3	3	3
7	5	5	5	51	5	5	5	95	5	5	5	139	5	5	5	183	3	3	3
8	5	5	5	52	5	5	5	96	5	5	5	140	5	5	5	184	2	2	2
9	1	1	1	53	5	3	2	97	5	5	5	141	5	5	5	185	5	5	5
10	1	1	1	54	4	4	5	98	5	5	5	142	5	5	5	186	5	5	5
11	1	1	1	55	3	2	3	99	5	5	5	143	5	5	5	187	5	5	5
12	5	5	5	56	5	5	5	100	5	5	5	144	5	5	5	188	5	5	5
13	5	5	5	57	5	5	5	101	5	5	5	145	5	5	5	189	5	5	5
14	5	5	5	58	3	3	3	102	5	5	5	146	5	5	5	190	5	5	5
15	3	3	3	59	1	1	1	103	5	5	5	147	5	5	5	191	5	5	5
16	5	5	5	60	3	2	3	104	5	5	5	148	5	5	5	192	5	5	5
17	5	5	5	61	3	3	3	105	5	5	5	149	5	5	5	193	5	5	5
18	5	5	5	62	5	5	5	106	5	5	5	150	3	3	3	194	5	5	5
19	5	5	5	63	5	5	5	107	5	5	5	151	3	3	3	195	5	5	5
20	5	5	5	64	5	5	5	108	5	5	5	152	5	5	5	196	5	5	5
21	3	3	3	65	5	5	5	109	5	5	5	153	1	1	1	197	1	1	1
22	1	1	1	66	3	3	3	110	5	5	5	154	1	1	1	198	1	1	1
23	3	3	3	67	3	3	3	111	1	1	1	155	1	1	1	199	1	1	1
24	3	3	3	68	5	5	5	112	1	1	1	156	1	1	1	200	1	1	1
25	5	5	5	69	5	5	5	113	5	5	5	157	1	1	1	201	1	1	1
26	5	5	5	70	5	5	5	114	5	5	5	158	1	1	1	202	1	1	1
27	5	5	5	71	5	5	5	115	5	5	5	159	1	1	1	203	1	1	1
28	5	5	5	72	5	5	5	116	5	5	5	160	3	3	3	204	1	1	1
29	5	3	3	73	5	5	5	117	5	5	5	161	5	5	5	205	3	3	2
30	5	5	5	74	5	5	5	118	5	5	5	162	5	5	5	206	2	2	2
31	5	5	5	75	5	3	5	119	5	5	5	163	5	5	5	207	2	3	3
32	5	5	5	76	5	5	4	120	5	5	5	164	5	5	5	208	3	3	3
33	3	5	3	77	3	3	2	121	5	5	5	165	5	5	5	209	3	3	2
34	3	3	3	78	3	3	3	122	5	5	5	166	5	5	5	210	3	3	3
35	3	3	5	79	3	3	3	123	5	5	5	167	5	5	5	211	3	3	3
36	5	5	5	80	5	5	5	124	5	5	5	168	5	5	5	212	1	1	1
37	5	5	5	81	5	5	5	125	5	5	5	169	5	5	5	213	1	1	1
38	5	5	5	82	5	5	5	126	5	5	5	170	5	5	5	214	1	1	1
39	5	5	5	83	5	5	5	127	5	5	5	171	5	5	5	215	1	1	1
40	5	5	5	84	5	5	5	128	5	5	5	172	5	5	5	216	1	1	1
41	3	3	3	85	5	3	2	129	5	5	5	173	5	5	5	217	1	1	1
42	5	5	5	86	3	3	2	130	5	5	5	174	5	5	5	218	1	1	1
43	5	5	5	87	3	3	3	131	5	5	5	175	5	5	5	219	1	1	1
44	5	5	5	88	5	5	5	132	5	5	2	176	1	1	1	220	1	1	1

Source : Field Survey, 2000

Table- G-20 : Degree of Impact for Distance to Commercial Facilities Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	3	3	3	45	1	1	1	89	1	1	1	133	5	5	5	177	5	5	5
2	3	3	3	46	1	1	1	90	1	1	1	134	5	5	5	178	5	5	5
3	3	3	3	47	1	1	1	91	5	5	5	135	5	5	5	179	5	5	5
4	3	3	3	48	3	3	3	92	5	5	5	136	5	5	5	180	5	5	5
5	3	3	3	49	5	5	5	93	5	5	5	137	5	5	5	181	5	5	5
6	5	5	5	50	5	5	5	94	5	5	5	138	5	5	5	182	5	5	5
7	5	5	5	51	5	5	5	95	5	5	5	139	5	5	5	183	5	5	5
8	3	3	3	52	5	5	5	96	5	5	5	140	5	5	5	184	5	5	5
9	1	1	1	53	5	5	5	97	5	5	5	141	5	5	5	185	5	5	5
10	1	1	1	54	5	5	3	98	5	5	5	142	5	5	5	186	5	5	5
11	5	5	5	55	1	1	1	99	5	5	5	143	3	3	3	187	3	3	3
12	5	5	5	56	1	1	1	100	5	5	5	144	5	5	5	188	5	5	5
13	5	5	5	57	1	1	1	101	5	5	5	145	5	5	5	189	5	5	5
14	5	5	5	58	1	1	1	102	5	5	5	146	5	5	5	190	5	5	5
15	5	5	5	59	1	1	1	103	5	5	5	147	5	5	5	191	5	5	5
16	5	5	5	60	1	1	1	104	5	5	5	148	5	5	5	192	5	5	5
17	5	5	5	61	3	3	3	105	5	5	5	149	5	5	5	193	5	5	5
18	5	5	5	62	5	5	5	106	5	5	5	150	5	5	5	194	3	3	3
19	3	3	3	63	5	5	5	107	5	5	5	151	3	3	3	195	1	1	1
20	1	1	1	64	5	5	5	108	5	5	5	152	3	3	3	196	1	1	1
21	1	1	1	65	5	5	5	109	5	5	5	153	1	1	1	197	5	5	5
22	1	1	1	66	5	5	5	110	5	5	5	154	1	1	1	198	5	5	5
23	5	5	5	67	3	3	3	111	5	5	5	155	1	1	1	199	5	5	5
24	5	5	5	68	1	1	1	112	5	5	5	156	5	5	5	200	5	5	5
25	5	5	5	69	1	1	1	113	5	5	5	157	5	5	5	201	5	5	5
26	5	5	5	70	1	1	1	114	5	5	5	158	5	5	5	202	5	5	5
27	5	5	5	71	1	1	1	115	5	5	5	159	5	5	5	203	3	3	3
28	5	5	5	72	1	1	1	116	5	5	5	160	5	5	5	204	1	1	1
29	5	5	5	73	3	3	3	117	5	5	5	161	5	5	5	205	1	1	1
30	5	5	5	74	3	3	3	118	5	5	5	162	5	5	5	206	1	1	1
31	5	5	5	75	3	3	3	119	5	5	5	163	5	5	5	207	1	1	1
32	5	5	5	76	3	3	3	120	5	5	5	164	5	5	5	208	1	1	1
33	5	5	5	77	3	3	3	121	5	5	5	165	5	5	5	209	1	1	1
34	5	5	5	78	3	3	3	122	5	5	5	166	5	5	5	210	1	1	1
35	5	5	5	79	3	3	3	123	5	5	5	167	5	5	5	211	1	1	1
36	5	5	5	80	5	5	5	124	5	5	5	168	5	5	5	212	1	1	1
37	5	5	5	81	5	5	5	125	5	5	5	169	5	5	5	213	3	3	3
38	5	5	5	82	5	5	5	126	5	5	5	170	5	5	5	214	3	3	3
39	5	5	5	83	5	5	5	127	5	5	5	171	5	5	5	215	3	3	3
40	5	5	5	84	5	5	5	128	5	5	5	172	5	5	5	216	1	1	1
41	5	5	5	85	3	3	3	129	5	5	5	173	3	3	3	217	1	1	1
42	3	3	3	86	3	3	3	130	5	5	5	174	1	1	1	218	1	1	1
43	1	1	1	87	3	3	3	131	5	5	5	175	1	1	1	219	1	1	1
44	1	1	1	88	3	3	3	132	5	5	5	176	5	5	5	220	1	1	1

Source Field Survey, 2000

Table- G-21: Degree of Impact for Distance to CBD Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	1	1	1	45	3	3	3	89	3	3	3	133	1	1	1	177	1	1	1
2	1	1	1	46	1	1	1	90	1	1	1	134	1	1	1	178	1	1	1
3	1	1	1	47	1	1	1	91	1	1	1	135	1	1	1	179	1	1	1
4	1	1	1	48	3	3	3	92	1	1	1	136	1	1	1	180	1	1	1
5	1	1	1	49	3	3	3	93	1	1	1	137	1	1	1	181	3	3	3
6	1	1	1	50	3	3	3	94	1	1	1	138	3	3	3	182	3	3	3
7	1	1	1	51	3	3	3	95	1	1	1	139	3	3	3	183	3	3	3
8	1	1	1	52	3	3	3	96	1	1	1	140	3	3	3	184	3	3	3
9	1	1	1	53	3	3	3	97	3	3	3	141	5	5	5	185	3	3	3
10	1	1	1	54	3	3	3	98	3	3	3	142	5	5	5	186	3	3	3
11	1	1	1	55	3	3	3	99	5	5	5	143	5	5	5	187	3	3	3
12	1	1	1	56	3	3	3	100	5	5	5	144	5	5	5	188	2	2	2
13	1	1	1	57	2	2	3	101	5	5	5	145	5	5	5	189	3	3	3
14	1	1	1	58	3	3	3	102	5	5	5	146	5	5	5	190	3	3	3
15	1	1	1	59	1	1	1	103	5	5	5	147	5	5	5	191	3	3	3
16	1	1	1	60	1	1	1	104	5	5	5	148	3	3	3	192	3	3	3
17	1	1	1	61	3	3	3	105	5	5	5	149	3	3	3	193	3	3	3
18	1	1	1	62	5	5	5	106	3	3	3	150	2	3	3	194	1	1	1
19	1	1	1	63	5	5	5	107	3	3	3	151	1	1	1	195	1	1	1
20	1	1	1	64	5	5	5	108	3	3	3	152	1	1	1	196	1	1	1
21	1	1	1	65	5	5	5	109	1	1	1	153	1	1	1	197	1	1	1
22	1	1	1	66	5	5	5	110	1	1	1	154	1	1	1	198	1	1	1
23	3	3	3	67	5	5	5	111	1	1	1	155	1	1	1	199	1	1	1
24	3	3	3	68	5	5	5	112	1	1	1	156	1	1	1	200	1	1	1
25	3	3	3	69	3	3	3	113	1	1	1	157	1	1	1	201	3	3	3
26	3	3	3	70	3	3	3	114	1	1	1	158	1	1	1	202	3	3	3
27	3	3	3	71	3	3	3	115	1	1	1	159	1	1	1	203	3	3	3
28	3	3	3	72	1	1	1	116	1	1	1	160	3	3	3	204	3	3	3
29	3	3	3	73	1	1	1	117	3	3	3	161	3	3	3	205	2	2	2
30	3	3	3	74	1	1	1	118	3	3	3	162	3	3	3	206	3	3	3
31	3	3	3	75	1	1	1	119	3	3	3	163	5	5	5	207	3	3	3
32	3	3	3	76	1	1	1	120	5	5	5	164	5	5	5	208	3	3	3
33	3	3	3	77	3	3	3	121	5	5	5	165	5	5	5	209	3	3	3
34	1	1	1	78	3	3	3	122	5	5	5	166	5	5	5	210	3	3	3
35	3	3	3	79	3	3	3	123	5	5	5	167	5	5	5	211	3	3	3
36	3	3	3	80	5	5	5	124	5	5	5	168	5	5	5	212	1	1	1
37	3	3	3	81	5	5	5	125	5	5	5	169	5	5	5	213	3	3	3
38	1	1	1	82	5	5	5	126	5	5	5	170	3	3	3	214	3	3	3
39	3	3	3	83	5	5	5	127	3	3	3	171	2	2	3	215	3	3	3
40	3	3	3	84	5	5	5	128	3	3	3	172	3	3	3	216	3	3	3
41	3	3	3	85	5	5	5	129	3	3	3	173	1	1	1	217	3	3	3
42	3	3	3	86	5	5	5	130	1	1	1	174	1	1	1	218	3	3	3
43	3	3	3	87	3	3	3	131	1	1	1	175	1	1	1	219	3	3	3
44	3	3	3	88	3	3	3	132	1	1	1	176	1	1	1	220	3	3	3

Source : Field Survey, 2000

Table- G-22 : Degree of Impact for Distance to Sewer line Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	3	3	3	45	1	1	1	89	5	5	5	133	5	5	5	177	3	3	3
2	3	3	3	46	1	1	1	90	5	5	5	134	5	5	5	178	5	5	5
3	3	3	3	47	1	1	1	91	5	5	5	135	5	5	5	179	5	5	5
4	3	3	3	48	3	3	3	92	5	5	5	136	5	5	5	180	5	5	5
5	3	3	3	49	5	5	5	93	5	5	5	137	5	5	5	181	5	5	5
6	3	3	3	50	5	5	5	94	5	5	5	138	5	5	5	182	5	5	5
7	3	3	3	51	5	5	5	95	5	5	5	139	5	5	5	183	5	5	5
8	3	3	3	52	5	5	5	96	5	5	5	140	5	5	5	184	5	5	5
9	1	1	1	53	5	5	5	97	5	5	5	141	5	5	5	185	5	5	5
10	1	1	1	54	5	5	5	98	5	5	5	142	5	5	5	186	5	5	5
11	3	3	3	55	5	5	5	99	5	5	5	143	5	5	5	187	5	5	5
12	3	3	3	56	1	1	1	100	5	5	5	144	5	5	5	188	5	5	5
13	3	3	3	57	1	1	1	101	5	5	5	145	5	5	5	189	5	5	5
14	3	3	3	58	1	1	1	102	5	5	5	146	5	5	5	190	5	5	5
15	3	3	3	59	1	1	1	103	5	5	5	147	5	5	5	191	5	5	5
16	3	3	3	60	1	1	1	104	5	5	5	148	5	5	5	192	5	5	5
17	3	3	3	61	3	3	3	105	5	5	5	149	5	5	5	193	5	5	5
18	3	3	3	62	5	5	5	106	5	5	5	150	5	5	5	194	5	5	5
19	1	1	1	63	5	5	5	107	5	5	5	151	5	5	5	195	5	5	5
20	1	1	1	64	5	5	5	108	5	5	5	152	5	5	5	196	5	5	5
21	1	1	1	65	5	5	5	109	5	5	5	153	5	5	5	197	3	3	3
22	1	1	1	66	5	5	5	110	5	5	5	154	3	3	3	198	3	3	3
23	5	5	5	67	5	5	5	111	5	5	5	155	3	3	3	199	3	3	3
24	5	5	5	68	3	3	3	112	5	5	5	156	5	5	5	200	3	3	3
25	5	5	5	69	3	3	3	113	5	5	5	157	5	5	5	201	3	3	3
26	5	5	5	70	3	3	3	114	5	5	5	158	5	5	5	202	3	3	3
27	5	5	5	71	3	3	3	115	5	5	5	159	5	5	5	203	3	3	3
28	5	5	5	72	3	3	3	116	5	5	5	160	5	5	5	204	3	3	3
29	5	5	5	73	5	5	5	117	5	5	5	161	5	5	5	205	3	3	3
30	5	5	5	74	5	5	5	118	5	5	5	162	5	5	5	206	3	3	3
31	5	5	5	75	5	5	5	119	5	5	5	163	5	5	5	207	3	3	3
32	5	5	5	76	5	5	5	120	5	5	5	164	5	5	5	208	3	3	3
33	5	5	5	77	5	5	5	121	5	5	5	165	5	5	5	209	3	3	3
34	5	5	5	78	5	5	5	122	5	5	5	166	5	5	5	210	3	3	3
35	3	3	3	79	5	5	5	123	5	5	5	167	5	5	5	211	3	3	3
36	5	5	5	80	5	5	5	124	5	5	5	168	5	5	5	212	1	1	1
37	5	5	5	81	5	5	5	125	5	5	5	169	5	5	5	213	1	1	1
38	5	5	5	82	5	5	5	126	5	5	5	170	5	5	5	214	1	1	1
39	5	5	5	83	5	5	5	127	5	5	5	171	5	5	5	215	1	1	1
40	5	5	5	84	5	5	5	128	5	5	5	172	5	5	5	216	1	1	1
41	5	5	5	85	5	5	5	129	5	5	5	173	5	5	5	217	1	1	1
42	5	5	5	86	5	5	5	130	5	5	5	174	5	5	5	218	1	1	1
43	1	1	1	87	5	5	5	131	5	5	5	175	5	5	5	219	1	1	1
44	1	1	1	88	5	5	5	132	5	5	5	176	3	3	3	220	1	1	1

Source : Field Survey, 2000

Table- G-23 . Degree of Impact for Distance to Fresh Water Supply Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	3	3	3	45	1	1	1	89	5	5	5	133	5	5	5	177	3	3	3
2	3	3	3	46	1	1	1	90	5	5	5	134	5	5	5	178	5	5	5
3	3	3	3	47	1	1	1	91	5	5	5	135	5	5	5	179	5	5	5
4	3	3	3	48	5	5	5	92	5	5	5	136	5	5	5	180	5	5	5
5	3	5	5	49	5	5	5	93	5	5	5	137	5	5	5	181	5	5	5
6	3	3	3	50	5	5	5	94	5	5	5	138	5	5	5	182	5	5	5
7	3	3	3	51	5	5	5	95	5	5	5	139	5	5	5	183	5	5	5
8	3	3	3	52	5	5	5	96	5	5	5	140	5	5	5	184	5	5	5
9	1	1	1	53	5	5	5	97	5	5	5	141	5	5	5	185	5	5	5
10	1	1	1	54	5	5	5	98	5	5	5	142	5	5	5	186	5	5	5
11	3	3	3	55	5	5	5	99	5	5	5	143	5	5	5	187	5	5	5
12	3	3	3	56	1	1	1	100	5	5	5	144	5	5	5	188	5	5	5
13	3	3	3	57	1	1	1	101	5	5	5	145	5	5	5	189	5	5	5
14	3	3	3	58	1	1	1	102	5	5	5	146	5	5	5	190	5	5	5
15	3	3	3	59	1	1	1	103	5	5	5	147	5	5	5	191	5	5	5
16	3	5	5	60	1	1	1	104	5	5	5	148	5	5	5	192	5	5	5
17	3	5	3	61	3	3	3	105	5	5	5	149	5	5	5	193	5	5	5
18	3	3	3	62	5	5	5	106	5	5	5	150	5	5	5	194	5	5	5
19	1	1	1	63	5	5	5	107	5	5	5	151	5	5	5	195	5	5	5
20	1	1	1	64	5	5	5	108	5	5	5	152	5	5	5	196	5	5	5
21	1	1	1	65	5	5	5	109	5	5	5	153	5	5	5	197	3	3	3
22	1	1	1	66	5	5	5	110	5	5	5	154	3	3	5	198	5	5	5
23	5	5	5	67	5	5	5	111	5	5	5	155	3	3	3	199	3	3	3
24	5	5	5	68	3	3	3	112	5	5	5	156	5	5	5	200	3	3	3
25	5	5	5	69	3	3	3	113	5	5	5	157	5	5	5	201	3	5	3
26	5	5	5	70	3	5	3	114	5	5	5	158	5	5	5	202	3	3	3
27	5	5	5	71	5	5	5	115	5	5	5	159	5	5	5	203	3	3	3
28	5	5	5	72	3	3	3	116	5	5	5	160	5	5	5	204	3	3	3
29	5	5	5	73	5	5	5	117	5	5	5	161	5	5	5	205	3	3	3
30	5	5	5	74	5	5	5	118	5	5	5	162	5	5	5	206	3	3	3
31	5	5	5	75	5	5	3	119	5	5	5	163	5	5	5	207	3	2	2
32	5	5	5	76	5	5	5	120	5	5	5	164	5	5	5	208	2	2	2
33	5	5	5	77	5	5	5	121	5	5	5	165	5	5	5	209	5	5	5
34	5	5	5	78	5	5	5	122	5	5	5	166	5	5	5	210	3	3	3
35	3	3	3	79	5	5	5	123	5	5	5	167	5	5	5	211	3	5	5
36	5	5	5	80	5	5	5	124	5	5	5	168	5	5	5	212	1	1	1
37	5	5	5	81	5	5	5	125	5	5	5	169	5	5	5	213	1	1	1
38	5	5	5	82	5	5	5	126	5	5	5	170	5	5	5	214	1	1	1
39	5	5	5	83	5	5	5	127	5	5	5	171	5	5	5	215	1	1	1
40	5	5	5	84	5	5	5	128	5	5	5	172	5	5	5	216	1	1	1
41	5	5	5	85	5	5	5	129	5	5	5	173	5	5	5	217	1	1	1
42	5	5	5	86	5	5	5	130	5	5	5	174	5	5	5	218	1	1	1
43	1	1	1	87	5	5	5	131	5	5	5	175	5	5	5	219	1	1	1
44	1	1	1	88	5	5	5	132	5	5	5	176	5	5	5	220	1	1	1

Source : Field Survey, 2000

Table - G-24: Degree of Impact for Distance to Power Line Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	3	3	3	45	1	1	1	89	5	5	5	133	5	5	5	177	3	3	3
2	3	3	3	46	1	1	1	90	5	5	5	134	5	5	5	178	5	5	5
3	3	3	3	47	1	1	1	91	5	5	5	135	5	5	5	179	5	5	5
4	3	3	3	48	3	3	3	92	5	5	5	136	5	5	5	180	5	5	5
5	3	3	3	49	5	5	5	93	5	5	5	137	5	5	5	181	5	5	5
6	3	3	3	50	5	5	5	94	5	5	5	138	5	5	5	182	5	5	5
7	3	3	3	51	5	5	5	95	5	5	5	139	5	5	5	183	5	5	5
8	3	3	3	52	5	5	5	96	5	5	5	140	5	5	5	184	5	5	5
9	1	1	1	53	5	5	5	97	5	5	5	141	5	5	5	185	5	5	5
10	1	1	1	54	5	5	5	98	5	5	5	142	5	5	5	186	5	5	5
11	3	3	3	55	5	5	5	99	5	5	5	143	5	5	5	187	5	5	5
12	3	3	3	56	1	1	1	100	5	5	5	144	5	5	5	188	5	5	5
13	3	3	3	57	1	1	1	101	5	5	5	145	5	5	5	189	5	5	5
14	3	3	3	58	1	1	1	102	5	5	5	146	5	5	5	190	5	5	5
15	3	3	3	59	1	1	1	103	5	5	5	147	5	5	5	191	5	5	5
16	3	3	3	60	1	1	1	104	5	5	5	148	5	5	5	192	5	5	5
17	3	3	3	61	3	5	5	105	5	5	5	149	5	5	5	193	5	5	5
18	3	3	3	62	5	5	5	106	5	5	5	150	5	5	5	194	5	5	5
19	1	1	1	63	5	5	5	107	5	5	5	151	5	5	5	195	5	5	5
20	1	1	1	64	5	5	5	108	5	5	5	152	5	5	5	196	5	5	5
21	1	1	1	65	5	5	5	109	5	5	5	153	5	5	5	197	5	5	5
22	1	1	1	66	5	5	5	110	5	5	5	154	3	3	3	198	3	3	3
23	5	5	5	67	5	5	5	111	5	5	5	155	3	3	3	199	3	3	3
24	5	5	5	68	3	3	3	112	5	5	5	156	5	5	5	200	3	5	3
25	5	5	5	69	5	5	5	113	5	5	5	157	5	5	5	201	5	5	5
26	5	5	5	70	3	3	3	114	5	5	5	158	5	5	5	202	3	3	3
27	5	5	5	71	3	3	3	115	5	5	5	159	5	5	5	203	3	3	3
28	5	5	5	72	5	3	3	116	5	5	5	160	5	5	5	204	5	5	5
29	5	5	5	73	5	5	5	117	5	5	5	161	5	5	5	205	3	3	3
30	5	5	5	74	5	5	5	118	5	5	5	162	5	5	5	206	3	3	3
31	5	5	5	75	5	5	5	119	5	5	5	163	5	5	5	207	3	3	3
32	5	5	5	76	5	5	5	120	5	5	5	164	5	5	5	208	3	3	3
33	5	5	5	77	5	5	5	121	5	5	5	165	5	5	5	209	5	5	5
34	5	5	5	78	5	5	5	122	5	5	5	166	5	5	5	210	3	3	3
35	3	3	3	79	5	5	5	123	5	5	5	167	5	5	5	211	5	5	5
36	5	5	5	80	5	5	5	124	5	5	5	168	5	5	5	212	1	1	1
37	5	5	5	81	5	5	5	125	5	5	5	169	5	5	5	213	1	1	1
38	5	5	5	82	5	5	5	126	5	5	5	170	5	5	5	214	1	1	1
39	5	5	5	83	5	5	5	127	5	5	5	171	5	5	5	215	1	1	1
40	5	5	5	84	5	5	5	128	5	5	5	172	5	5	5	216	1	1	1
41	5	5	5	85	5	5	5	129	5	5	5	173	5	5	5	217	1	1	1
42	5	5	5	86	5	5	5	130	5	5	5	174	5	5	5	218	1	1	1
43	1	1	1	87	5	5	5	131	5	5	5	175	5	5	5	219	1	1	1
44	1	1	1	88	5	5	5	132	5	5	5	176	2	3	3	220	1	1	1

Source Field Survey, 2000

Table- G-25: Degree of Impact for Distance to Telecommunication line Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	5	5	5	45	1	1	1	89	5	5	5	133	5	5	5	177	3	3	3
2	3	3	3	46	1	1	1	90	5	5	5	134	5	5	5	178	5	5	5
3	3	3	3	47	1	1	1	91	5	5	5	135	5	5	5	179	5	5	5
4	3	3	3	48	3	3	3	92	5	5	5	136	5	5	5	180	5	5	5
5	3	3	3	49	5	5	5	93	5	5	5	137	5	5	5	181	5	5	5
6	3	3	3	50	5	5	5	94	5	5	5	138	5	5	5	182	5	5	5
7	3	3	3	51	5	5	5	95	5	5	5	139	5	5	5	183	5	5	5
8	3	3	3	52	5	5	5	96	5	5	5	140	5	5	5	184	5	5	5
9	3	1	1	53	5	5	5	97	5	5	5	141	5	5	5	185	5	5	5
10	3	1	1	54	5	5	5	98	5	5	5	142	5	5	5	186	5	5	5
11	3	3	3	55	5	5	5	99	5	5	5	143	5	5	5	187	5	5	5
12	3	3	3	56	1	1	1	100	5	5	5	144	5	5	5	188	5	5	5
13	3	3	3	57	1	1	1	101	5	5	5	145	5	5	5	189	5	5	5
14	3	5	5	58	1	1	1	102	5	5	5	146	5	5	5	190	5	5	5
15	5	5	5	59	1	1	1	103	5	5	5	147	5	5	5	191	5	5	5
16	3	3	3	60	1	1	1	104	5	5	5	148	5	5	5	192	5	5	5
17	3	3	3	61	3	3	3	105	5	5	5	149	5	5	5	193	5	5	5
18	5	5	5	62	5	5	5	106	5	5	5	150	5	5	5	194	5	5	5
19	1	1	1	63	5	5	5	107	5	5	5	151	5	5	5	195	5	5	5
20	1	1	1	64	5	5	5	108	5	5	5	152	5	5	5	196	5	5	5
21	1	1	1	65	5	5	5	109	5	5	5	153	5	5	5	197	5	5	5
22	1	5	5	66	5	5	5	110	5	5	5	154	2	2	3	198	3	3	5
23	5	5	5	67	5	5	5	111	5	5	5	155	3	3	3	199	3	3	3
24	5	3	3	68	5	5	5	112	5	5	5	156	5	5	5	200	3	3	3
25	5	5	5	69	5	5	5	113	5	5	5	157	2	2	3	201	5	5	3
26	5	5	5	70	3	3	3	114	5	5	5	158	5	5	5	202	3	3	5
27	5	5	5	71	3	3	3	115	5	5	5	159	5	5	5	203	3	3	3
28	5	5	5	72	5	3	3	116	5	5	5	160	5	5	5	204	3	3	3
29	5	5	5	73	5	5	5	117	5	5	5	161	5	5	5	205	3	3	3
30	5	5	5	74	5	5	5	118	5	5	5	162	5	5	5	206	3	3	3
31	5	5	5	75	5	5	5	119	5	5	5	163	5	5	5	207	3	3	3
32	5	5	5	76	5	5	5	120	5	5	5	164	5	5	5	208	3	3	3
33	5	5	5	77	5	5	5	121	5	5	5	165	5	5	5	209	5	5	5
34	5	5	5	78	5	5	5	122	5	5	5	166	5	5	5	210	5	5	5
35	3	3	3	79	5	5	5	123	5	5	5	167	5	5	5	211	3	3	5
36	5	5	5	80	5	5	5	124	5	5	5	168	5	5	5	212	1	1	1
37	5	5	5	81	5	5	5	125	5	5	5	169	5	5	5	213	1	1	1
38	5	5	5	82	5	5	5	126	5	5	5	170	5	5	5	214	1	1	1
39	5	5	5	83	5	5	5	127	5	5	5	171	5	5	5	215	1	1	1
40	5	5	5	84	5	5	5	128	5	5	5	172	5	5	5	216	1	1	1
41	5	5	5	85	5	5	5	129	5	5	5	173	5	5	5	217	1	1	1
42	5	5	5	86	5	5	5	130	5	5	5	174	5	5	5	218	1	1	1
43	1	1	1	87	5	5	5	131	5	5	5	175	5	5	5	219	1	1	1
44	1	1	1	88	5	5	5	132	5	5	5	176	3	3	3	220	1	1	1

Source : Field Survey, 2000

Table- G-26: Degree of Impact for Available Vacant Land Parameter

Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact			Cell_N	Degree of Impact		
	Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus		Resid	Comm	Indus
1	3	3	3	45	1	1	1	89	5	5	5	133	1	1	1	177	3	3	3
2	3	3	3	46	1	1	1	90	5	5	5	134	1	1	1	178	3	3	3
3	3	3	3	47	1	1	1	91	1	1	1	135	1	1	1	179	3	3	3
4	3	3	3	48	5	5	5	92	1	1	1	136	1	1	1	180	3	3	3
5	3	3	3	49	3	3	3	93	1	1	1	137	1	1	1	181	3	3	3
6	3	3	3	50	1	1	1	94	1	1	1	138	1	1	1	182	3	3	3
7	3	3	3	51	1	1	1	95	1	1	1	139	1	1	1	183	3	3	3
8	3	3	3	52	1	1	1	96	1	1	1	140	1	1	1	184	3	3	3
9	5	5	5	53	1	1	1	97	1	1	1	141	1	1	1	185	3	3	3
10	5	5	5	54	1	1	1	98	1	1	1	142	1	1	1	186	1	1	1
11	1	1	1	55	1	1	1	99	1	1	1	143	1	1	1	187	1	1	1
12	1	1	1	56	5	5	5	100	1	1	1	144	1	1	1	188	1	1	1
13	1	1	1	57	5	5	5	101	1	1	1	145	1	1	1	189	1	1	1
14	1	1	1	58	5	5	5	102	1	1	1	146	1	1	1	190	1	1	1
15	1	1	1	59	5	5	5	103	1	1	1	147	1	1	1	191	1	1	1
16	1	1	1	60	5	5	5	104	1	1	1	148	1	1	1	192	3	3	3
17	3	3	3	61	5	5	5	105	1	1	1	149	1	1	1	193	3	3	3
18	5	5	5	62	5	5	5	106	1	1	1	150	1	1	1	194	5	5	5
19	5	5	5	63	1	1	1	107	1	1	1	151	2	2	3	195	5	5	5
20	5	5	5	64	1	1	1	108	1	1	1	152	5	5	5	196	5	5	5
21	5	5	5	65	1	1	1	109	1	1	1	153	5	5	5	197	5	5	5
22	1	1	1	66	1	1	1	110	1	1	1	154	1	1	1	198	5	5	5
23	1	1	1	67	1	1	1	111	1	1	1	155	1	1	1	199	3	3	3
24	1	1	1	68	1	1	1	112	1	1	1	156	1	1	1	200	3	3	3
25	1	1	1	69	5	5	5	113	1	1	1	157	1	1	1	201	3	3	3
26	1	1	1	70	5	5	5	114	1	1	1	158	1	1	1	202	3	3	3
27	1	1	1	71	5	5	5	115	1	1	1	159	1	1	1	203	3	3	3
28	1	1	1	72	5	5	5	116	1	1	1	160	1	1	1	204	3	3	3
29	1	1	1	73	5	5	5	117	1	1	1	161	1	1	1	205	3	3	3
30	1	1	1	74	5	5	5	118	1	1	1	162	1	1	1	206	3	3	3
31	5	5	5	75	5	5	5	119	1	1	1	163	1	1	1	207	3	3	3
32	5	5	5	76	5	5	5	120	1	1	1	164	1	1	1	208	3	3	3
33	5	5	5	77	5	5	5	121	1	1	1	165	1	1	1	209	3	3	3
34	5	5	5	78	5	5	5	122	1	1	1	166	1	1	1	210	5	5	5
35	5	5	5	79	5	5	5	123	1	1	1	167	1	1	1	211	5	5	5
36	3	3	3	80	3	3	3	124	1	1	1	168	1	1	1	212	5	5	5
37	1	1	1	81	1	1	1	125	1	1	1	169	1	1	1	213	5	5	5
38	1	1	1	82	1	1	1	126	1	1	1	170	1	1	1	214	5	5	5
39	1	1	1	83	1	1	1	127	1	1	1	171	1	1	1	215	5	5	5
40	1	1	1	84	1	1	1	128	1	1	1	172	1	1	1	216	5	5	5
41	1	1	1	85	1	1	1	129	1	1	1	173	3	3	3	217	5	5	5
42	1	1	1	86	3	3	3	130	1	1	1	174	5	5	5	218	5	5	5
43	1	1	1	87	3	3	3	131	3	3	3	175	5	5	5	219	5	5	5
44	1	1	1	88	3	3	3	132	3	3	3	176	1	1	1	220	5	5	5

Source : Field Survey, 2000