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Ministry of Local Government, Rural Development & Cooperatives

Local Government Division

KALAI PAURASHAVA

MASTER PLAN: 2011-2031

MARCH, 2015

Technical Assistance: Local Government Engineering Department (LGED)

Government of the People's Republic of Bangladesh

Ministry of Local Government, Rural Development & Cooperatives

Local Government Division

KALAI PAURASHAVA MASTER PLAN: 2011-2031

STRUCTURE PLAN

URBAN AREA PLAN:

- Landuse Plan
- Transportation & Traffic Management Plan
- Drainage & Environmental Management Plan

WARD ACTION PLAN

March, 2015

KALAI PAURASHAVA

KALAI, JOYPURHAT

KALAI PAURASHAVA MASTER PLAN: 2011-2031

Published by:

KALAI PAURASHAVA

Supported by Upazila Towns Infrastructure Development Project (UTIDP) of

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Preface

Bangladesh has been experiencing rapid urbanization in the last four decades where level of urbanization has reached from 7.6% to nearly 29% between 1970 and 2011. Multidimensional complex factors like; socio-economic, political, demographic and climatic are responsible for this higher growth of spatial transformation. The fast urbanization is putting pressure on the small towns' limited land, urban services and environment along with countries big cities. Whereas urbanization is also considered as an opportunity and an integral part of the development process. Proper development plans and guidelines with necessary legislative measures and appropriate institutional arrangement can help to achieve sustainable urban as well as rural development.

However, presently, the Paurashavas has the legal mandate to take initiatives of formulating development plans, providing infrastructure and other services and creating opportunities for people to initiate developments with sustainable and harmonic approach. In this regards, Kalai had initiated steps to frame its' Master Plan (Physical Development Plan) by taking technical assistance from the Local Government Engineering Department (LGED). LGED under the Local Government Division of the Ministry of Local Government, Rural Development and Cooperatives initiated a project titled 'Upazila Towns Infrastructure Development Project (UTIDP)' providing all sorts of technical assistances to prepare long term physical development plan titled 'Master Plan' for Kalai Paurashava.

Master Plan of Kalai Paurashava has been prepared following the pre-requisite of the Local Government (Paurashava) Act, 2009. To prepare the Master Plan, LGED engaged consulting firm named AQUA Consultants & Associates Ltd. and set up a Project Management Office (PMO) deploying a Project Director, Deputy Project Director, experienced Urban Planners as Individual Consultant and support staffs. Regular monitoring, evaluation and feedback from PMO had also accelerate the pace and quality of the master plan preparation tasks. During formulation of the Master Plan, the Paurashava authority along with the project & the Consultant ensure people's opinion, observation and expectation in various ways: conducting sharing meetings, Public Hearing etc. At the end of the formulation process, the Paurashava completed all procedures necessary for its approval as per the related clauses and sub-clauses of the Local Government (Paurashava) Act, 2009. Paurashava Authority has submitted this Plan to the Local Government Division of the Ministry of Local Government, Rural Development and Cooperatives for final approval and gazette notification.

This Master Plan comprises of three tier of plan in a hierarchical order, these are: Structure Plan for 20 years, Urban Area Plan for 10 years and Ward Action Plan for 5 years. Urban Area Plan also comprises of three components namely; Land use plan, Traffic & Transportation Management plan and Drainage & Environmental Management Plan. This Master plan will serve as guidelines for the future infrastructure development of Kalai Paurashava together with land use control and effective management of service facilities.

The Paurashava Authority acknowledges the full support and all out cooperation from the consultant team, the Project Management office of UTIDP, LGED, Local Government Division of the Local Government, Rural Development and Cooperatives Ministry, public representatives, other stakeholders and civil society with deepest gratitude for accomplishing this remarkable assignment.

Cooperation and participation from national to local authorities, all government institutions, private entities and people of Kalai Paurashava will be necessary to implement this Master Plan successfully and make this Paurashava developed and livable. I hope Kalai Paurashava will be a model Paurashava in Bangladesh through building itself green and sustainable by successful implementation of this Master Plan.

(Md. Toufikul Islam Talukdar Belal)

Mayor

Kalai Paurahsava.

Executive Summary

The Master Plan Report of Kalai Paurashava has been prepared and submitted by the consultant AQUA-SCPL-RCC consortium for the partial fulfillment of the requirements stated in the Terms of Reference (ToR) for Upazila Towns Infrastructure Development Project (UTIDP; package- 9) being implemented by Local Government Engineering Department (LGED) under the Ministry of Local Government Rural Development and Co-operatives (LGRD&C) Government of the People's Republic of Bangladesh. The Master Plan Report is the fourth of the series of the reports to be submitted as per the ToR of the project "Upazila Town Infrastructure Development Project-Preparation of Kalai Paurashava Master Plan (Structure Plan, Urban Area Plan and Ward Action Plan)".

Prior to starting the Master Plan report the consultant undertook field visit and organized a meeting with the stakeholders to understand the growth pattern, problems and prospects in future developing aspects of the project area. Kalai was established as "C" class municipality in 2001 and later it was upgraded to "B" class. Existing Paurashava boundary cover an area of 3435.1 acres and it was delineated as planning area for preparation of Master Plan with due emphasis on local and regional development agenda for next 20 years.

The pattern of settlements in the Paurashava reflects that the Paurashava still possesses predominantly the rural characteristics. No planned residential area exists in the Paurashava. Structures are established without any planning standard and in haphazard manner. Population density of the Paurashava area is found 1184/ sq. km in the year 2011. The Growth Rate of Kalai Paurashava is estimated to be 1.63%. The expected population for 2031 is 22750. The gross density of the area will be 7 ppa (person per acre) in 2031. People in this Paurashava mostly belong to middle income groups. Only a small number of people belong to higher income group. According to BBS 2011, among the economically active age group of population, 39.15% are found engaged directly in Employment activities while 48.52 % are found not engaged in employment activities. Not working population found about 12.33%, whereas looking for work found 0.28 % and 48.24% of population found engaged in house hold work. The major occupations found are agriculture, industry and services in government, non-government and private organi zations, day-laboring in agriculture.

Kalai is located within the flood plain of the Jamuneswary River. As the town is located in a well-connected place in the region, it offers great opportunities for establishment of industries encouraging investments leading to employment generation. The development activities taking place within the Paurashava area is attracting migration from the rural areas. Kalai is located to the east of Joypurhat district, some 20 km away from the district town of Joypurhat. The area has good road connection to Joypurhat district and the remainder of Rajshahi Division via Joypurhat District Headquarters.The area has good road connection to Rajshahi district and the remainder of Rajshahi Division.

Maximum level of Kalai Paurashava is 26.8 m located at ward no 8 and lowest point is recorded as 20.3 m located at ward no 8. Average elevation of Kalai Paurashava area is derived as 24.2 m. Average spot height gives the indication of relative of various wards. It seen that ward 1, 6 and 7 are comparatively high land area. A small part of the ward no 4, 6 and 8 are low land and rest of them are high areas. For Kalai Paurashava mean spot height for Agricultural Land is found to be 24.14 mPWD whereas the mean spot height found for mixed use zones is about 24.61 mPWD and mean spot height found for residential is about 24.45 mPWD. In Kalai Paurashava there are about 55.14 Km road out of which 48% is Pucca, 31 km is semi-pucca and 21 km is Katcha.

The project area is just like predominantly agricultural in character like other upazilla towns. Land use survey reveals that agriculture is the most dominant land use category of the Kalai Paurashava which comprises 79.10% of the total land area of the Paurashava. The land under agriculture purpose use is mostly double cropped area, which are low-lying depressions and remain under water during the monsoon flood. Paurashava Commercial, educational and mixed use lands are very much negligible in percentage. Core areas (Ward Nos. 2) of the town along this highway and its close vicinity developed with diversified land use without any proper planning guidelines causing many difficulties such as, traffic congestion, drainage problems and environmental degradations etc. for the town. Good transportation linkage within the region and other parts of the country and potential for agriculture has created abundant scope for establishment of agro-based industries with adequate forward and backward linkages in the Paurashava.

The structure plan (Part-A) area consist of different zones (Core Area, Fringe Area, Peripheral Area, New Urban Area, Agriculture, Water body and Major Circulation) and it covers about 3435.1 acres of land. Agricultural area (2416.37 acres) is the highest percentage of land (70.34%). The core area covers only 52.66 acres of land and the percentage is 1.53.

Urban Area Plan is the mid level plan that covers the the area 3435.1 acres. It lays down the land use zoning plan and infrastructure development proposals at the town level. Land use planning is an important part of Master Plan ensuring that land is used efficiently for the benefit of economy, society and environment of Kalai Paurashava. Urban Area Plan is the first phase illustration of the Structure Plan intended to be implemented over a time span of 10 years that includes 1st phase (1st-5th year) and 2nd phase (6th-10th year) of development programs.

The components of Urban Area Plan include Land Use Plan, Transportation and Traffic Management Plan, Drainage and Environmental Management Plan, Proposals for Urban Services. The future housing area estimates on a recommended planning standard of 100/150 persons per acre. With this standard, the maximum land required to accommodate total projected population (22750) in the year 2031 will be 227.5 acres. Existing residential land of Kalai Paurashava is 351.52 acres and net residential density of 22.93 persons per acre. The consultant, therefore, recommended 430.15 acres of land for housing and for different urban services for the population of the Paurashava in 2031 (target net density is 53 persons per acre). Total commercial land in 2031 has been fixed at 32.39 acres, Education 18.70 acres, open space 25.70 and transport 4.83 acres. But in the time of land use proposal of Kalai Paurashava it is not possible to maintain the all standard due to insufficient land. In land use proposal 243.91 acres of land is for Urban Residential Zone where 186.24 is for rural settlement.

The Transportation and Traffic Management Plan covers the scope of improvement of the existing network and system and plan proposals for new development. The proposals on improvement and new development are made for the project area up to 2031. The existing circulation network of Kalai Paurashava is 55.14 km and the proposed circulation network is 77.09 km including existing. Highest width of Road have been proposed as 80ft (ROW) and minimum width of road 20ft (ROW) in entire Paurashava. The main intention of transport plan is to ensure proper functional linkage within other regional centres, one truck terminal, one bus terminal and seven tempo stand is proposed to cover the whole area.

The purpose of the Drainage Plan is to make an assessment of the present drainage facilities and to improve future development. This Plan shall be a planning tool and shall be used as a guideline for Kalai Paurashava that shall be responsible for the approval of drainage improvements. Natural canal in Kalai Paurashava is acting as a critical role in entire Paurashava. Total 168.72 acres of water body is found in this Paurashava but among them which cover greater than 0.25 acres have been identified in Master Plan. So, the water bodies included in master plan is around 116.78 acres. Present man made drain is about 12.34 km and all this drains is pucca. The proposed drain of Kalai Paurashava is about 56.74 km where 9.52 km is primary drain, 12.74 is secondary drain and 34.47 is Tertiary drain. This will designated up to 2031.

Kalai Paurashava is lacking for sewerage system. This Paurashava does not possess good solid waste management system. The Kalai Paurashava has no solid waste disposal system as well as no transfer station. The Paurashava has only three temporary cleaner engaged for cleaning the Paurashava office building only. It has one dump truck, one pull cart but no dustbin. The solid waste management coverage is only a part of the total area. In master plan 2.08 acres of land is reserved for dumping ground and it is located in ward no 6. Total 05 waste transfer stations have been proposed in entire area.

In Part-C of the report contains Ward Action Plan of each individual Ward and this Development Proposals will be implemented within 1st to 5th year of planning period. The Ward Action Plans (Part-C) are prepared under the framework of Structure Plan and Urban Area Plan. The Ward Action Plans contain details of development proposals at Ward level including the problems and opportunities existing therein and also include the proposals made in the upper level plan that is in the Urban Area Plan. The Ward Action Plans have been formulated for execution within a period of 5 years.

Finally, The Paurashava is self-sufficient neither in preparation of plan nor in implementation of plan proposals; is dependence on central government for technical and financial assistance huge. This dependence might hinder the overall plan making and implementation process. Besides, plan implementation would require the Paurashava to have a good coordination among various stakeholders and with the line ministry (LGRD&C) in place. Therefore a right kind of Institutional arrangement, and implementation framework would be required for successful implementation of the plan proposals and its future updating. However, the current project regarding Preparation of Master Plan for Kalai Paurashava under “UTIDP” emphasizes on having proper guidelines and planning standards by the Paurashava for ensuring sustainable and planned development of the Paurashava.

Preparation of Master Plan for Paurashavas under
Upazila Towns Infrastructure Development Project (UTIDP)

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ACRONYMS

BM	Bench Mark
BTM	Bangladesh Transverse Mercator
CBD	Central Business District
CNG	Compressed Natural Gas
CS	Cadastral survey
DGPS	Differential Global Positioning System
DLRS	Directorate of Land Records and Survey
DPA	Demarcation of Planning Area
DPHE	Department of Public Health and Engineering
GCP	Ground Control Point
GIS	Geographic Information System
GPS	Global positioning system
K.P.H	kilometers Per Hour
K.M.	Kilometer
LGED	Local Government Engineering Department
MSL	Mean Sea Level
O-D	Origin and destination Survey
PCU	Passenger Car Unit
PWD	Public Works Department
RHD	Roads and Highway Department
RTK-GPS	Real Time Kinematics Global Positioning System
SOB	Survey of Bangladesh
TCP	Temporary Control Points
TIC	Tentative points)
TS	Total Station
UTIDP	Upazila Towns Infrastructure Development Project

LOCAL WORDS

Khal	Canal
Tempo	Human hauler
Bazar	Trade Center
Hat	Weekly an occasional Market
Paurashava	Municipality

Chapter 1: Introduction

1.1 General

Urbanization in Bangladesh is moving at a rapid pace. Between1961 to 1981, the average urban growth rate was 8%. The present average growth rate is about 4.5%. According to the population census of 2001, the share of urban population was about 23.29% and at present (2011) it is approximately 28.4%. By the year 2015, the share of urban population will be about 37% of the national population. The importance of urban development is emphasized in terms of its role in the national economy. More than 60% of the national GDP is derived from the non-agricultural sectors that are mainly based in urban areas. Again, the most foreign exchange earning sectors, like, garment and knitwear enterprises are agglomerated in urban areas. These sectors earn over 70% of the foreign exchange. Remittance is also a major sector of foreign exchange earnings and a large share of the remittance goes into the purchase of urban land. Surplus remittance is invested in business and manufacturing located in urban areas. These phenomena indicate the increasing role of urban areas being played in the national economy. The expansion of urban economy leads to the growth of urban population and concomitant haphazard urban spatial growth without planning. The rapid urbanization is marked by the creation of Paurashavas, whose number at present stands at 322. Paurashavas are created not only to provide urban services to their citizens, but also to create a livable environment through development of planned and environmentally sound living space.

The present infrastructure provisions in the Paurashavas are in a precarious state. Drains are mostly clogged that cannot drain out water during heavy rains and natural drainage systems have either been filled up or occupied by land grabbers creating water logging during monsoon. Traffic in Paurashavas is increasing day by day with the increase in population and demand. But the sub-standard road network cannot keep pace with the growing demand for movement. As a result, congestion becomes a common problem. Road networks are not developed in planned and systematic way leaving room for traffic congestion that increases economic loss to the people due to travel delay. The land use development in the Paurashavas is unorganized and unplanned, which is a major source of environmental deterioration. Building Construction Rules are not effectively enforced in the Paurashavas mainly for want of a well formulated Master Plan and qualified planning professional.

Under the above circumstances, it is high time to think about solving the problems of the Paurashavas that might otherwise be emerged critically in the future. To overcome all likely problems to come in future, the Paurashavas should go for planned development through preparation and implementation of a Master Plan. The Master Plan can be prepared exercising the power conferred to them by the Local Government (Paurashava) Act 2009. The Upazila Town Infrastructure Development Project (UTIDP) aims to prepare Master Plan for 223 Upazila level Paurashavas and Kuakata Tourism center under 12 packages for a period of next 20 years. The project has provisions for separate plans for land use control, drainage and environment, traffic and transportation management and improvement. The project also aims to prepare a Ward Action Plan (WAP) to ensure systematic execution of future infrastructure development projects. There is

also aim to prepare proposals to enhance Paurashava revenue so that it becomes more capable to meet its own capital needs. The location of Kalai within Bangladesh is shown in ***Map 1-1***.

Map 1-1: Kalai Paurashava within Bangladesh

Thus the Master Plan of Kalai Paurashava suggests for the development of urban infrastructure, such as new roads and bridges/culverts, drainage facilities, street lights, markets, bus stands, solid waste management, sanitation, water supply, community facilities and other such infrastructure in order to equip the Paurashava to face future challenges of urbanization and economic regeneration. The Master Plan will initially focus on growth and development, social integration and environmental improvement following principles of sustainable development.

1.2 Philosophy of the Preparation of Master Plan

The philosophy behind preparation of Master Plan of the Upazila level Paurashava lies in the very motive of providing community welfare through a process of spatial organization, socio-economic rejuvenation, environmental improvement and provision of amenities to the present and future generations. The Master Plan aims for rational use of scarce land resources for concentrated development at urban scale following the principles of sustainable development.

1.3 Objectives of the Master Plan

As per the Terms of Reference (TOR), the objectives of the preparation of Master Plan of Kalai Paurashava are to:

a) Find out development issues and potentials of the Paurashava and make a 20- year development vision for the Paurashava and prepare a Master Plan in line with the vision for the development;

b) Plan for the people of Paurashava to develop and update provisions for better transport and communication network, housing, roads, markets, bus terminals, sanitation, water supply, drainage, solid waste management, electricity, education, leisure and such other infrastructure facilities for meeting the social and community needs of the all sort of groups for better quality of life;

c) Prepare a multi-sector short and long term investment plan through participatory process for better living standards by identifying area based priority-drainage master plan, transportation and traffic management plan, other need specific plan as per requirement in accordance with the principle of sustainability;

d) Provide controls for private sector development, with clarity and security in regard to future development;

e) Provide guideline for development considering the opportunity and constrains of future development of the Upazila Town; and

f) Prepare a 20-year Master Plan to be used as a tool to ensure and promote growth of the Kalai Paurashava in line with the guiding principles of the Master Plan and control any unplanned growth by any private and public organization.

1.4 Approach and Methodology

The UTIDP Project is aimed for substantial development of infrastructure and services for the Paurashava with optimum provision of opportunities for Paurashava dwellers and making scope for extending services to surrounding areas.

The current project is preparing a Master plan of the Paurashava, where the existing condition and different problems are identified, studied and analyzed and the probable solutions are to be sought to ameliorate the same. The study moves through a process of data collection-analysis and fixation of objectives for planning. The approach is based on field survey for data collection and collection of information from secondary sources. The data is presented through maps, text and tabular form. Than the survey report and maps are prepared and submitted. Analysis of collected data is carried out to identify the nature and extent of problems prevailing in the Paurashava in order to fix the objectives of the actions to be undertaken in the form of planning and the interim report prepared and submitted. Through the process, involvement of the stakeholders has been ensured to make the planning as much sustainable as possible. For this purpose, continuous formal and informal discussions and meetings have been carried out throughout the project period using participatory approach. The discussions serve two purposes, first, a sense of belongingness develops within the minds of the stakeholders, particularly among the citizens, about the master plan to be prepared, and secondly, identification of problems and finding their solutions become easier with the participation of stakeholders, as the local stakeholders are more knowledgeable about local problems and possible solutions of those problems.

After doing all these jobs thoroughly the Master Plan had been done based on a prepared planning standard for Paurashava level town and formulating future strategies for the corresponding area. Again after final consultation with the stakeholders on the prepared plan the Final Master Plan has to be completed.

1.5 Scope of Work

The scope of work under this consultancy services covers all aspects related to the preparation of Master Plan, which includes Land Use Plan, Transportation and Traffic Management Plan, Drainage and Environmental Management Plan and Ward Action Plan for the proposed Paurashava. In order to prepare these plans, the activities contain but not limited to the following:

1. Visits have been made to the Paurashava at different stages of work of the preparation of Master Plan of Kalai Paurashava.

2. Feasibility for preparation of Master Plan has been submitted to the office of the PD, UTIDP.

3. An Inception Seminar has been organized at the Paurashava level to inform the Paurashava about the scope and Terms of Reference for the preparation of Master Plan. A thorough investigation has been made based on potential scope and opportunities available in the Paurashava to develop a 20 year development vision for it linking the ideas and view of the Paurashava people.

4. Determination of the study area and planning area has been done based on existing condition, demand of the Paurashava and potential scope for future development. A detailed survey has been conducted on the existing conditions of socio-economic, demographic, transportation and traffic, physical features, topographic, and land use of the Paurashava area following the approved format and data have been collected from primary and secondary sources. Analysis of such data and information has been carried out to find out the possible area of intervention to forecast future population of the Paurashava (15-20 years), vis-a-vis assess their requirement for different services, such as physical infrastructure facilities, employment generation, housing, right of way and land requirement for the existing and proposed roads, drains, playgrounds, recreation centers and other environmental and social infrastructure. The following major tasks have been accomplished:

    a. Identification and investigation of the existing natural and man-made drains, natural river system, the extent and frequency of floods, area of planning intervention have been done. Other works include study of the contour and topographic maps produced by the relevant agencies and review of any previous drainage Master Plan available for the Paurashava.

    b. A comprehensive (storm water) Drainage Master Plan for a plan period of 20 years has been prepared considering all relevant issues including discharge calculation, catchments areas, design of main and secondary drains along with their sizes, types and gradients and retention areas with preliminary cost estimates for the proposed drainage system.

    c. Recommendations have been made on planning, institutional and legal mechanisms to ensure provision of adequate land for the establishment of proper rights of way for (storm water) drainage system in the Paurashava.

    d. Collection and assessment of the essential data relating to existing transport Land Use Plan, relevant regional and national highway development plans, accident statistics, number and type of vehicles registered for each Paurashava have been made.

    e. Assessment has been made on the requirements of critical data and data have been collected through reconnaissance and traffic surveys, which should estimate present traffic volume, forecast the future traffic growth, identification of travel patterns, areas of traffic conflicts and their underlying causes.

    f. Study has been conducted on the viability of different solutions for traffic management and development of a practical short term traffic management plan has been accomplished, including one way systems, restricted access for large vehicles, improved signal system, traffic islands, roundabouts, pedestrian crossings, deceleration lanes for turning traffic, suitable turning radius, parking policies and separation of pedestrians and rickshaws etc.

g. Assessment has been done on the non-pedestrian traffic movements that are dominated by cycle rickshaw. Special recommendations should be made as to how best to utilize this form of transport without causing unnecessary delays to other vehicles. Proposals should also consider pedestrians and their safety, with special attention for the children.

h. Assessment has been made on the current land use with regard to road transportation, bus & truck stations, railway stations etc, and recommendations to be provided on actions to optimize this land use.

i. Preparation of a Road Network Plan based on topographic and base Map prepared under the Project. Recommendation has been made on the road development standards, which serve as a guide for the long and short term implementation of road. Also Traffic and Transportation Management Plan and traffic enforcement measure have been suggested.

j. Preparation of the Master Plan with all suitable intervention, supported by appropriate strategic policy, outline framework, institutional arrangement and possible source of fund for effective implementation of the plan.

k. Preparation of a plan has been set out proposed Master Plan at 3-levels namely Structural Plan, Urban Area Plan and Ward Action Plan.

l. At the first level, policies and strategies have been worked out for the preparation of a Structure Plan for each Paurashava under the package. The Master Plan has been prepared consisting of Structural Plan, Land Use Plan, Transportation and Traffic Management Plan, Drainage and Environmental Management Plan and Ward Action Plan.

m. A total list of primary and secondary roads, drains and other social infrastructures for each Paurashava for a plan period of next 20 years has been made. Examining and classifying according to the existing condition, long, medium and short term plans have been proposed and estimated cost for improvement of drain and road alignment and other infrastructures have been prepared.

n. In line with the proposed Master Plan, a Ward Action Plan has been proposed with list of priority schemes for the development of roads, drains, traffic management and other social infrastructures for implementation during the first five years of plan period.

o. With the help of concerned Paurashava, at least 2 public consultation meetings or seminars have been organized, one for discussion on Interim Report and the other on Final Report on the proposed Master Plan. Beneficiary's point of view has been integrated in the plan with utmost careful consideration.

p. Preparation and submission of Master Plan and Report with required standards as per the TOR.

1.6 Organization of the Master Plan Report

The Master Plan Report is organized in three major parts with an introduction at the beginning. The three major parts contain various components of work under the UTIDP of LGED. The three major parts of the Master Plan of Kalai Paurashava are as follows:

INTRODUCTION: It describes the ToR of the UTIDP, philosophy and objectives of the Master Plan, methodology and scope of the work and organization of the Master Plan Report.

PART – A: The Structure Plan sets the conceptual framework and strategies for planned development of the Paurashava based on its potentials for next 20 years up to 2031.

PART – B: Urban Area Plan includes i) Land Use Plan; ii) Transportation and Traffic Management Plan; iii) Drainage and Environmental Management Plan; and iv) Proposals for Urban Services.

PART – C: Ward Action Plan presents ward wise detailed proposals for implementation within first five years of the Master Plan period of 20 years.

Chapter 2: Introduction to Structure Plan

The Master Plan Report is the fourth of the series of the reports to be submitted as per the ToR of the project "Upazila Town Infrastructure Development Project - Preparation of Kalai Paurashava Master Plan (Structure Plan, Urban Area Plan and Ward Action Plan)". Part A of this report describes the Structure Plan of Kalai Paurashava and Chapter 2 describes the conceptual issues related to the preparation of Structure Plan for Kalai Paurashava.

2.1 Background of the Paurashava

As per the Local Government (Paurashava) Act 2009, the Paurashavas in Bangladesh are categorized mainly into A, B, and C classes based mainly on annual income of the Paurashava. There is also a separate category called "Special Class", basically for industrial and commercial hubs of Narayanganj and Tongi within the Dhaka Metropolitan Development Area (DMDA).

Kalai is a B-category Paurashava with an area of 12.91 sq. km (3435.1 acre) that was established in 2001 with 9 wards following the Paurashava Ordinance 1977. It is bounded on the east by Shibganj Upazila of Bogra district and Gobindaganj Upazila of Gaibanda district, on the south by Khetlal Upazila and Shibganj Upazila of Bogra district and on the west by Khetlal Upazila. It largely influences the area's economic activity. Cross border trade has been a historical phenomenon between these two places.The location of Kalai within Joypurhat District is shown in **Map 2-1**.

Kalai, the second smallest Upazila of Joypurhat district in respect of population, came into existence on 19 August 1981 as Thana and as Upazila in1984. Previously it was a part of Khetlal Upazila. It is learnt that there lived a saint locally known as Bairagi whose name was Kalai in the present place of the Upazila headquarters. It is generally believed that the Upazila might have derived its name from the name of that Bairagi.

Kalai is located to the east of Joypurhat district, some 20 km away from the district town of Joypurhat. Kalai Paurashava is located within the flood plain of Jamuneswary River where the river is on east to Kalai. Most of the areas of Kalai Paurashava are comparatively highly elevated and mostly free from annual flooding. In these areas most of the buildings are constructed in normal height. On the other hand, the fringe areas of the Paurashava such as Mulgram, Kathail, Thupsara, Hatior are of low lying and the houses in these areas are mostly constructed above 2-3 feet high from the ground level.The town is not subject to annual flooding but was inundated during the flood of 1988. Flooding in the area usually takes place due to the overflow of the River Atrai and Jamuneswary and it is occurred mainly in the rainy season. Duration of flooding was not more than one week and the flood level was about 1meter above the surface. There are few depressions and retention ponds to serve as catchments basin which make them more vulnerable to flooding during the rainy monsoon.

Because of the physiographic characteristics of the region, the settlements are clustered either on higher grounds or built up linearly following the roads or embankments as low lands including the

agricultural lands mostly remain under water during the rainy season and in many cases for a considerable period beyond rainy season. The locations, history, geology, settlement pattern all have important implications in the Master Plan of Kalai Paurashava.

2.2 Vision of the Structure Plan

The vision of the plan is the creation of an urban livable environment, where people irrespective of their socio-economic, demographic and religious identities can live and enjoy today within affordable means without sacrificing interests of tomorrow. The implementation of Master Plan of the Paurashava will translate this vision into reality.

Map 2-1: Kalai Paurashava within Joypurhat District

2.3 Objectives of the Structure Plan

To guide long term growth within the Structure Plan Area by means of demarcation of the future growth areas and indication of potential locations of major development areas includes: a) indication of important physical infrastructure; and b) setting out policy recommendations for future development. According to the Terms of Reference, the objectives of Kalai Paurashava Structure Plan are:

- Description of the Paurashava's administrative, economic, social, physical environmental growth, functional linkage and hierarchy in the national and regional context; catchments area; population; land use and urban services; agencies responsible for different sectoral activities, etc.
- Identification of urban growth area based on analysis of patterns and trends of development, and projection of population, land use and economic activities for next 20 years.
- Identification and description of physical and environmental problems of Kalai Paurashava.
- Discussion of relevant policies to analyze and find out potential scopes for the use in the present exercise and also find out constraints and weakness of the existing policy to suggest appropriate measures for the development and management of Kalai Paurashava.
- To provide land use development strategies.
- To provide strategies and policies for sectoral as well as socio-economic, infrastructural and environmental issues of development.
- To discuss about implementation issues including institutional capacity building and strengthening of Paurashava, resource mobilization etc.

2.4 Concepts, Content and Format of the Structure Plan

Concept

Structure Plan is a kind of guide plan, or framework plan, or an indicative plan that is presented with maps and explanatory texts in a broader planning perspective than other components of Master Plan. Structure Plan indicates the broad magnitudes and directions of urban growth, including infrastructure networks, the placement of major facilities such as hospitals and upazila complex. A Structure Plan is not intended to specify detailed lot by lot land use or local road configurations and development proposals. Rather it identifies the areas where growth and change are such that more detailed local and action plans are needed. Structure Plan does not require excessive effort in gathering data and it is flexible and dynamic and can be changed to accommodate demanded changes. The present Structure Plan is an overall long term strategic plan for the Paurashava Shahar (Town), Kalai.

Structure Plan is the 1st component of the Master Plan package. The other two lower level components are Urban Area Plan and Ward Action Plan. Structure Plan lays down the framework of the future plan including strategy and the sectoral policies. The Urban Area Plan and the Ward Action Plan detail out development proposals under the framework of Structure Plan. The extended area was selected in consultation with the Paurashava for possible extension of the Paurashava. But no development proposals are suggested for the extended part as existing

Paurashava area is enough to accommodate population and services during Structure Plan period, that is, up to the year 2031.

Content and Format of the Structure Plan

The Structure Plan is an indicative plan that gives a brief on the future development of an area with policy guidelines. It is a long-term plan with flexibility in the sense that it sets down a broad framework for future development, but not the details. The format of a Structure Plan comprises written document and indicative major development locations presented in maps and diagrams as parts of the report. The written text analyses the issues that are not possible to be presented as diagrams, drawings and maps. Therefore, the written document is as important as the physical plan and diagrams and should be read in conjunction with each other.

2.5 Duration and Amendment of the Structure Plan

The Structure Plan is to remain valid for a period of 20 years from the time of its approval that is up to the year 2031. Structure Plan can contain two Urban Area Plan for the time period of 10 years each and four Ward Action Plan for the time period of 5 years each.

2.6 Structure Plan Area

The total area of Kalai Paurashava Structure Plan is 3435.1 acres that include total area of Paurashava, and there is no extended area in the structure plan of Paurashava. All the 9 wards of the Paurashava are covered by Structure Plan area.

Chapter 3: Existing Development Status of Kalai Paurashava

This chapter of the report makes a review of the various issues related to existing growth trend of the Paurashava and unveils its problems. The existing scenario in development status concerning socio-economic, physical infrastructure and environment are presented in the following paragraphs.

3.1 Social Development

Development is a dynamic issue. Measurement of social development essentially requires time series data. Consultant collected recent data of the project area by means of sample survey (5% of total households) with no reference to previous situation. Population census reports are the only sources of information for Paurashava level data, but they cover only a selected number of issues that are not sufficient to make a qualitative judgment of social improvement. It makes a review of social development based on available population census data of 1991 and 2001 and presents the current situation using the sample socio-economic survey data. This social review indicates positive social development in Kalai Paurashava. As per household survey, present average household size of the Paurashava is 4.2, which was 5.84 in 2001 and 5.6 in 1991. This indicates the success of family planning programme at Kalai Paurashava though the figure is still much higher than the national average (4.8%). Success is also achieved in education sector. Literacy rate was raised to 89.39 % in 2008 from 45.22% in 2001 and only 38.5% in 1991. The employment situation is also slightly improved in this Paurashava. Unemployment rate was reduced from 31.93% as per population census 2001 to 31.43 % as per household survey in 2008.

3.2 Economic Development

Economic development is one of the main indicators to make a major deference between urban and rural area. Economic development is also important to upgrade the Paurashava status. The more any Paurashava would be economically advanced the more urban services and amenities would be provided.

The principal criterion to judge the economy of an urban centre is to learn about its main sources of employment. Besides, the number of productive enterprises and tertiary level activities are also the indicators of the pattern and level of economic activities in any area. It is revealed from the sample survey on all categories of people, as 79.10 % of the Paurashava area is under agriculture so, the people engaged in Agri/Forestry Livestock was the highest which is 60.68%. So a major portion of people is engaged in agriculture for their livelihood. About 9.30% are engaged in small business and trading activities, about 6.48% are engaged in private services. So, the economic picture of the Paurashava is not very bright. Poverty haunts over one third of its population and activities in the service sector have not yet gained momentum.

3.2.1 Economic Activities

Economic activity is the lifeblood of any urban centre. The higher is the economic activity, the higher will be the level of employment and consequent physical growth. So, before going for a development plan, it is necessary to assess the current level, constraint and prospects of economic activities of the Paurashava.

The principal criterion to judge the economy of an urban centre is to learn about its main sources of employment. Besides, the number of productive enterprises and tertiary level activities are also the indicators of the pattern and level of economic activities in any area. Although the local economy of Kalai Paurashava is yet to emerge as a vibrant one, its current activities as discussed in this section require care analysis for planned development in the future. In the case of expanding bilateral trade between Bangladesh and India and cross-border trade between Kalai and bordering area of India, the Paurashava may experience higher economic growth in the near future.

Industry

Except some small scale processing units, there is virtually no manufacturing, as such, in the Paurashava. The town actually has no strong industrial base. There are a number of rice processing units and saw mills in the town that may grow in the future, and should choose suitable locations in the Master Plan.

Commerce

The commercial activities in the Paurashava are dominated by retail small business. The Kalai bazar located beside through the Bogra-Joypurhat Highway is the largest bazar of the Paurashava. The retailers mostly collect their goods from this bazar, which is also the largest wholesale market.

Services

The household survey shows, 6.48% of the male adults are engaged in service of different kinds as employment. Among them, majority of the proportion work in different private sectors agencies, while a little proportion serve in public enterprises that include shops and other business enterprises.

Agriculture

Agriculture is the dominating sector in terms of labour force in Kalai Paurashava. According to BBS 2011, 57.69 % of active labourforce are engaged in this sector for maintain their livelihood. The farmers and farm laborers work in farm lands, both, within and outside the Paurashava. It is evident from land use survey of the Paurashava that about 79.1% of the Paurashava lands are still under agriculture.

Agro-based

As the Paurashava is mostly rural in nature at present, with effective agricultural extension services, the agricultural output can be increased many times to serve the agro-based industries in

future. In this backdrop, the major challenge is to strike a balance between urbanization and maintenance of rural nature of the project area.

Informal Sector Economic Activities

Informal sector study was not a part of ToR, so the consultant did not conduct any formal study on the informal sector. It can be considered that the informal sector characteristics at upazila level Paurashava are same all over Bangladesh. It is more prominent, where the concentration of people takes place. Informal sector is a part and parcel of urban economy in developing countries. They have small capital and are usually self-employed. In Kalai, the concentration of informal businesses is found around the bazar area, transport terminal and stoppage areas and also near the bazar area.

3.2.2 Existing Employment Pattern

Out of the employed male population, more than half of the people are engaged in agricultural related jobs. Since secondary sector employment is seriously lacking in the town, people move to self-employment like small business. Trading has not been found feasible as employment in the town, mainly, because of lower level of affordability of the people powered by remittance they receive from abroad regularly. Of the total working population of surveyed households of Kalai Paurashava, about 4299 people are in the active working force.

About 12 percent of the working force is unemployed. The scenario is unlikely to change unless there is any major investment in the industrial sector that can pool a large number of workers and render the local economy more vibrant services.

It is evident from the household survey that there is insignificant employment in the service sector. Already mentioned earlier, a small portion of males is employed in government/autonomous organizations. It is observed that no female population is employed in private company. It is unlikely that public sector jobs will show any major improvement in future. But with the increase in business, and industry there is possibility that private sector jobs will show further increase.

3.3 Population

According to BBS 2011, the total population of Kalai Paurashava was 16464 and the density of population was 1185 persons/ sq.km with an annual growth rate of 1.63. At Present, Ward 02 is the most densely populated area. The density per sq.km is 3604 in this Ward, followed by 1424 in Ward no. 09 and 1104 for Ward no. 08.

Table 3-1: Population Distribution in Kalai Paurashava

Ward No.	Area (in sq. km)	Population 2011	Density (persons/ sq.km)
WARD-1	2.27	2282	1007
WARD-2	0.77	2775	3604
WARD-3	1.84	1869	1016
WARD-4	1.71	1603	937
WARD-5	1.55	1681	1085
WARD-6	1.45	1507	1039

Ward No.	Area (in sq. km)	Population 2011	Density (persons/ sq.km)
WARD-7	1.77	1605	907
WARD-8	1.44	1590	1104
WARD-9	1.09	1552	1424
Total	13.90	16464	1185

Sex Ratio

The average sex ratio (males per 100 females) for the project area is 99: 100, lower than the national average (106:100).

Again, percentage of elderly (65+) male population is much higher than the percentage of elderly female population. In the total population, however, the male population outnumbers the female population. These are some interesting information that can be observed from sample household survey at Kalai Paurashava.

Marital Status

According to the BBS 2011, the percentage of married women is about 72 among the women whereas the percentage is 70 for males. A negligible percentage of population is widow or widower. There is no respond of divorce, which is a good social aspect for the Paurashava.

Religious Status

Religious composition of population has various implications for area planning and overall welfare of the population. Almost 95 percent people of the study area belong to the Muslim community followed by Hindu and only seven Christian people live in this municipality.

Education

According BBS 2011, about 44% people are illiterate in Kalai Paurashava. At the same time the percentage of people having education at the graduation level and above is not that satisfactory. Women are lagging behind in respect of education in all the levels. According to the Census report 2011, a literacy rate in Kalai Paurashava is about 59 % for males and 49% for females.

Monthly Income and Expenditure of the Household

About 30% of the total surveyed population is in the income level up to BDT 3000 to 5000. The income level below 3000 and above 10000 comprises very low percentage of the households in the Paurashava. It appears that the most of the people in this Paurashava are of middle income group. Income and expenditure level is given in ***Fig 3-1***.

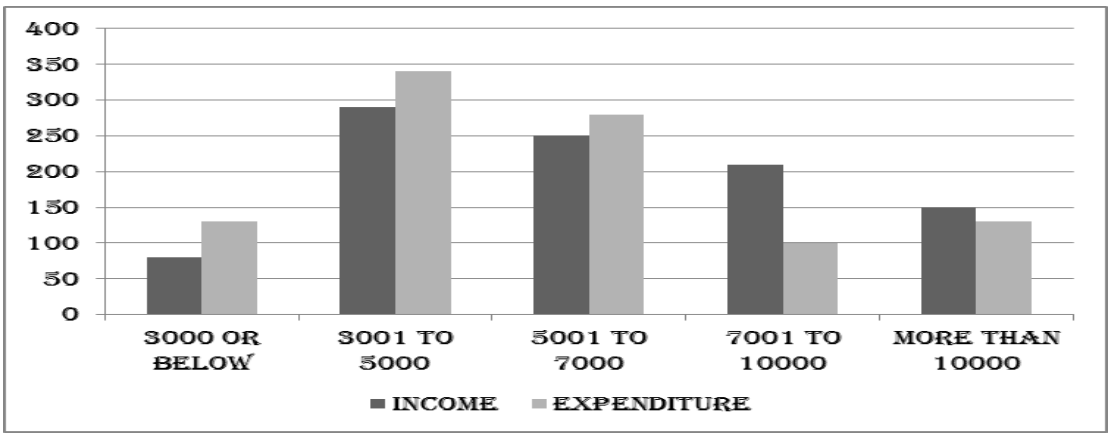


Fig 3-1: Percentage Distribution of the Household by Monthly Income and Expenditure at Kalai Paurashava

Of the other hand, The Survey reveals that in most of the cases households have to spend all their earnings without any savings. People, earning more than BDT 20,000, can save negligible portion of their earnings.

Migration pattern

In this Paurashava there is no significant migration scenario. Only a few people out of total sample have been found migrated in this Paurashava. And they migrated in this Paurashava due to poverty.

3.4 Physical Infrastructure Development

Buildings and Structures

Paurashava has mainly grown following the major transport networks. Buildings and structures developed are based on road network system of the Paurashava. The dweiiling units in the project area is dominated by Katcha structure (62.49%) followed by Semi-pucca (28.44%), and lastly Pucca (9.07%). maximum Pucca structures are located in the Ward Nos. 2.

In Kalai Paurashava it is found that, about 90.83% structures are single storied. The Survey findings also reveal that, among the Wards highest percentage of 1 storied building found in Ward no. 8, highest number of 2 storied building in Ward no. 4 and highest number of 3 storied building in Ward no. 2. In this Paurashava it is found that about 0.12% structures (7) are used for Governmental institution. It can be noticed that these governmental offices are located in wards in 1, 2 and 3 only. Paurashavas education, health, recreation, commercial and automobile facilities are mainly located in the Ward nos. 02, 03 and 01.

Transport and Communication

The Bogra-Joypurhat Road passing through the Kalai Paurashava acts as a major road of this area and it connects Kalai with Bogra, Joypurhat and its surroundings.Total length of roads in the Paurashava is 55.14 km. Length of katcha road is 11.72 km, semi-pucca 16.77 km and pucca road 26.64 km within the Paurashava area. In this Paurashava there are some LGED roads. Bogra-Joypurhat Road is main roads in this Paurashava which is owned and maintained by LGED. The Paurashava has one bus bus stoppage, but they are not sufficient to meet the demand. Land beside roadsides is being used for parking.

As the Paurashava is deprieved from the railway facilities, the transportation system is completely focused on road way. Water system transportation development is hardly possible in Kalai as no major river cross through the poura area.

3.5 Utility Services

The following paragraphs present the existing condition of utility services in the Paurashava.

Electricity

In Kalai Paurashava there is electricity connection. The survey finding shows that there are 514 electric poles within the Paurashava area. The people of the Paurashava complained that they face severe problem of load shedding.

Water Supply

In Kalai Paurashava, there are mainly two ways of water supply facilities. These are tube-well and piped water supply. Water supply network is under construction. At present about 92% of the households are using hand tube wells and deep tube wells as main source of water supply for drinking and cooking purpose.

Telecommunication

As a Paurashava, telephone network exists in Kalai Paurashava. According to survey, the Paurashava accommodates 18 telephone poles. Besides land phone the Paurashava is well served by the private own mobile operator companies.

Solid Waste Management

Solid waste collection and disposal in Kalai Paurashava is the responsibility of Paurashava authority. The Paurashava has no solid waste disposal site of its own. It normally dumps the solid waste into low lying areas and canals. Total population of Kalai Paurashava will be 22750 (projected) during the year 2031. Dumping place or waste transfer station is hardly found in the poura area. The collected waste is dumped into the wetland. CBO or NGO based collection system does not exist within the Paurashava area.

Gas Supply

The Paurashava has no gas supply facility at present.

Drains

It has been found that the entire drains of Kalai Paurashava are Pucca. The field survey indicates that there is moderate amount of drainage in Kalai Paurashava. In this Paurashava, there is 12.34 km drain.

3.6 Environmental Issues

Surface water of ponds, canals and rivers at is observed to be fresh and free from salinity. Paurashava authority has taken initiative to reduce surface water pollution. At present, 16.69% inhabitants of the Paurashava use sanitary latrine. According to BBS 2001, 32.01% households

have sanitary toilet facility. There is no latrine connected to drain. 52.94% households in the Paurashava have others toilets.

From the overall survey findings, it has been revealed that the inhabitants of the Paurashava do not face any severe environmental problem. The problems that exist here can be mitigated through proper planning of the Paurashava.

The urban environment of Kalai Paurashava includes both built and natural environment. Urbanization has some increased hazards on natural environment. Where the built environment overburdens the natural environment urban development cannot be sustainable. The urbanization is vital for country's economic growth. Urban centers concentrate services, infrastructure, labor, knowledge, entrepreneurship and markets. Cities and towns are key generators of economic activities. The urban economies are critically important in national economic growth and of development goal. Urbanization is unavoidable. So in every phase of planning processes, all these environmental issues shall be evaluated and proper measure shall be taken to minimize the adverse environmental impacts on land pollution, water and air quality, biodiversity resources and marine resources by energy usage, transport network, waste management, slum improvement, disaster etc. The town of Kalai is no different from other towns of Bangladesh, but as disasters are concerned it is highly vulnerable to at least one disaster, earthquake, due to its location in a particular seismic zone. Geological explorations and extractions make the area more vulnerable to any other town of the country. So care should be taken in construction of buildings in the town. Buildings are needed extra care to make them earthquake resistance to reduce loss of life and property. Special building codes are needed to prepare particularly for this region.

Kalai is located within the flood plain of Jamuneswary River.The town is not subject to annual flooding but was inundated during the flood of 1988. Some part of Mulgram, Kathail, Thupsara, Hatior experience little drainage problem. Paurashava in not normally affected by flood from the adjacent rivers. But the Paurashava is almost regularly affected by the storm water during monsoon period due to the inability of the existing drainage system to cope up with the situation. The existing drains cannot discharge the huge volume of storm water efficiently to the defined out falls. Because of prevailing such situation, local flooding occurs in many places of the Paurashava.

3.7 Institutional Capacity

The implementation of the Master Plan will require strengthening of the capacity of the Paurashava Authority. Although the capacity building is going in different ways by the government, the institutional capacity building for implementing the Master Plan of the Paurashava has not yet been seriously considered. This will be an important task for the government to restructure the organogram and include the required technical staff with appropriate job description for addressing the issues of implementing the Master Plan.

Existing Manpower

According to Paurashava manual, there should have been 78 officials and staff engaged in a "B" class Paurashava to manage the engineering, administrative, health, family planning, and conservancy works within the Paurashava area. In the organogram, Mayor is the head of the institution. Chief Executive Officer coordinates the three major divisions. These divisions are

Engineering (headed by Assistant Engineer), Administrative (headed by Secretary), and Conservancy, Health and Family Planning (headed by Health Officer). In this organogram, both full time and contractual officials are included.

Existing manpower scenario of Kalai Paurashava is not so good. There is acute shortage of manpower in each department of the Paurashava. The important posts lying vacant are the Posts, Assistant Engineer, Health Officer. Though a standard 'B' class Paurashava comprises of 27 personnel in Engineering Department, but Kalai Paurashava has to depend on 08 personnel in Engineering Department. Again in the administrative department the Paurashava has to depend on only 08 personnel for the administrative works.

Paurashava Town Planning and Implementation Capacity of Master Plan

At present, the Paurashava has no town planning department or any appropriate manpower, especially Town planner to prepare or implement town plan. The existing capacity of the Paurashava is seriously inadequate to implement the Paurashava Master Plan. The Paurashava must strengthen its capacity to implement its Master Plan, when it is completed by employing requisite manpower.

Conservancy and Health Services

Conservancy service of Kalai Paurashava is also very poor. Paurashava has no fixed waste dumping land. The waste collection and dumping is operated in traditional way. Conservancy department of the Paurashava is not established yet. Staffs are recruited on contract basis to convey the work of conservancy servi ce. There is no community based organization (CBO) for introducing house to house waste collection system in the Paurashava.

There is only one Upazila Health Complex exists in the Paurashava area but the service which is provided have failed to provide serve the quality service.

Logistic Support/Equipment

According to the Paurashava manual, a "B" class Paurashava should get logistic support/equipment to continue the work properly. This includes one jeep, one road roller (5-7 ton), two trucks/tractors, two motor cycles, three bicycles (according to the needs of the Paurashava), one mixture machine, one type writer machine, one photocopier machine and one duplicating machine. Paurashava got almost all of these logistic supports from the government, except the jeep and truck/tractor. Additionally, they have one Computer and printer for official support.

3.8 Urban Growth Area

The main concentration of development observed in a liner pattern along with Bogra-Joypurhat highway. The town center is based on Kalai mouza. This is the oldest part of the town. The development of the town spreads over towards the north to Awra, Thupsara, Duronja and Hatior.

The main concentration of development is observed in and around the Kalai Bazar. The Paurashava Office and most of the administrative offices are located in Kalai mouza while the Kalai Police Station is located in Thupsara mouza. The educational institutions such as schools, colleges, madrashas etc. are mostly located in ward 1 and 2.

The development pattern of the area mostly is dispersed and new development is taking place in Dahora, Purbo Sarail and Thupsara mouzas. The Core Area and development trends are shown in Map - 03 and Map - 04. The intensity of development in the town center is relatively high covering parts of wards 1, 2, 3, 4 and is found preponderance of mixed uses. The western side of the Paurashava is predominantly rural with scattered settlements.

The future growth potential of Kalai Paurashava is moderate. Recent trend in population increase indicates that high population density will not be a big problem in this Paurashava. However, it is obvious, and more likely that the growth of this Paurashava will follow natural increase and a little migration in population.

Analyzing the existing structure of the Paurashava and other growth factors it is expected that the future growth direction will occur in Growth direction indicates that kalai mouza located in the southern western part of the project area having higher concentration of development pressure and the surroundings of the Kalai raod area of Kalai Paurashava are highly dense. Several factors will lead such future growth direction.

The recent pattern of development has created a more dispersed form of urban development. The Paurashava officers have indicated that they would like to see new development concentrated around the existing town center. Undeveloped land does exist which could be used for this purpose. It does however require extensive landfill before development can take place and is understood to suffer from speculative ownership.

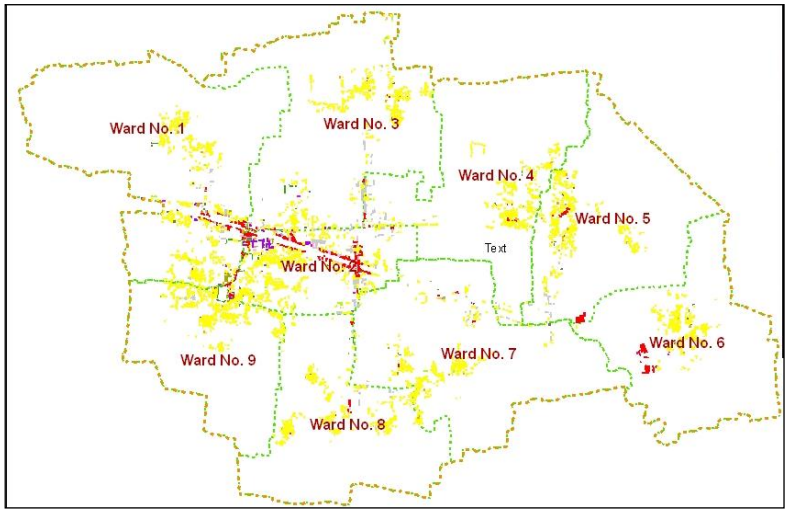


Fig 3-2: Future Growth Direction of Kalai Paurashava

3.9 Catchments Area

It is widely recognized that there is a strong interdependence of social, economic and environmental development between rural and urban areas. The cities and towns play an important role in rural development as markets for their goods and products, and also as the sites for food processing and other agricultural related activities, and as source of non-farm income, especially from wage labour. On the other hand, urban areas rely on rural areas for food production, labour, and raw materials for manufacturing and markets for their products. This linkage is stronger in samll town like the Paurashavas, primarily due to their proximity to the

surrounding rural hinterland. People of the catchment areas can access public service offices and hospitals in the towns with less difficulty than offices in cities, while schools and other facilities serve a large number of the catchment area population, contributing significantly to rural development.

As Kalai Paurashava is located between Joypurhat and Bogra district, it is influenced by both Bogra and Joypurhat. The favorable location has benefits in two ways: it allows people to come to to purchase goods and services, and it allows businesses, including wholesale businesses, to deliver goods and services to places outside the town. Kalai is located on Kalai Upazilla. The Upazila comprises 1 Paurashava namely Kalai Paurashava. It is one of the Upazila of Joypurhat district. As Upazila headquarters it has the administrative functions as well as those that go with its more established role related to its status as a Paurashava.

Transport and communication connectivity is an important factor for economic development of an area. Kalai is located to the east of Joypurhat district, some 20 km away from the district town of Joypurhat. The area has good road connection to Joypurhat district and the remainder of Rajshahi Division via Joypurhat District Headquarters. This Paurashava has good road connections to Bogra and also have good road connection to Joypurhat District.The regional transportation network is shown in **Map 3-1**.

3.10 Land Use and Urban Services

The general land uses of the project area are shown in Table 10.1 in Chapter 10. In the land use pattern of the Paurashava, 16 types of land uses are found. It is clearly evident from survey report that agricultural land use (almost 79.1%) dominates the Paurashava area, followed by residential (25.50%), water bodies (10.23%), road network and transport and communication (only 1.08%), and government services and educational land use occupy same percentage of land (less than 0.5%). Paurashava has experienced major development along the Bogra-Joypurhat highway.

Settlemets are found particularly in the areas of higher elevation following linear pattern along side the roads and More specifically around the central bazar. The trend of settlement growth is greater in areas close to the main road. The core part of the Paurashava is the most built up part of the planning area. Apart from core area, in most of the other areas, residential developments have taken place as dispersed settlements on high lands. Dispersed settlements make provision of services difficult.

3.11 Paurashava Functional Linkage with the Regional and National Network

Any development initiative at the local level must relate to the national level plans in order to achieve cohesion and integrity with overall development of the country to attain the national development objectives.

The present system of national level planning hardly links the local level plans. The present system of allocation of resources in national development budget is a top down approach, which is highly influenced by political objectives. As a result, urban sector is not yet considered a priority sector and due to resource constraint, many problems of the Paurashavas remain unresolved. Therefore,

it is important to establish a linkage between the local plans and the national development plan so that aspirations of the people can be realized. National development plans are prepared considering the overall needs and aspirations of the country with respect to different sectors of development.

This necessitates for a bottom up approach of development planning and the budget allocation should be made according to the choice of the local governments who are accountable to the Paurashava people directly. Budget should be allocated according to the priority list of the projects prepared by the Paurashava that is supposed to reflect the needs of the Paurashava people as the list can be prepared by the counselors and the Mayor who are directly elected by the people.

The aim of the Structure Plan is to prepare a development plan for Kalai Paurashava with full participation of its stakeholders. In the process of planning, a large number of development projects have been identified in different sectors. Implementation of development projects will improve infrastructure and services and will create an environment for utilization of local resources. This will attract more investment in the locality to generate new employment. New employment will generate income for the poor people and shall improve the poverty situation, which is the main objective of PRSP. New jobs will also be created during implementation of various development projects of the Paurashava prepared under the master plan. New and improved road infrastructure will increase mobility vis-a-vis economic activities of the Paurashava that will help to address the problems of unemployment.

The current program of Paurashava Planning helps to address urban poverty through adequate steps taken up to accelerate urban infrastructure development based on the Kalai Paurashava plan. The new developments will induce new investments in trade and industry and lead to generation of more employment in the service, construction, transport and informal sectors. This will directly assist in reducing poverty. It will help absorb additional work force of rural areas as a result of natural growth of population. Agricultural sector has limitations in absorbing labor force.

Map 3-1: Communication Network of Rajshahi Region showing Connectivity with Kalai Paurashava

3.12 Role of Agencies for Different Sectoral Activities

The successful implementation of Structure Plan depends upon the efficiency of the stakeholders and the degree of integration and coordination among them. Structure Plan of a town involves a complex affair having numerous stakeholders influencing the decision making process of development.

Care has been taken for all programmes and projects to be developed in a sound manner technically, socially, environmentally and institutionally with full participation of local communities. Due care has been taken so that there have no significant adverse internal or external environmental impacts. Sustainable urban development based on a continuous dialogue between the actors involved in urban development is needed to improve the urban environment. It is expected that after the completion and implementation of the Master Plan and as well as the mentioned projects and programmes of other organizations in Kalai, this small town will develop with its full potential.

Development Schemes Implemented by the GOs

The recent infrastructure development schemes implemented by the Government includes roads, road lights etc.

Kalai is an agriculture-based urban area and Upazila Agriculture Office has a significant influence on its agricultural sector. Central Government use subsidy for the betterment of the farmers. Local office distributes fertilizer to the poor farmers with 20 kg per head through the Paurashava. Some times, the agriculture office distributes 10 kg per head to balance between demand and allocation of fertilizer. Besides, agriculture office also arranges training workshops for the farmers on modern techniques of cultivation that increase production.

Upazila Fisheries and Livestock Office distribute fish fry and fertilizers for fish and vaccination of poultry and other livestock to the people free of cost. They also arrange training session to train the people. Upazila Parisad some times takes initiatives for afforestation and distribution of saplings.

Upazila Health Complex only implements a few activities like vaccination, training on child and mother health etc.

In Kalai Paurashava there is electricity connection. The survey finding shows that there are 514 electric poles, 9 telecommunication towers and 18 telephone poles within the Paurashava area. In Kalai Paurashava there is no electric substation. The people of the Paurashava complained that they face severe problem of load shedding.

The Rural Electrification Board (REB) at present is providing electricity facility within Paurashava area. There is no existing substation within the Paurashava or even in the entire Kalai Upazila. The power is being distributed from Joypurhat Palli Bidyut Samiti sub-station through transmission line to the Paurashava area.

DPHE recently conducted a survey in Kalai. It covers Paurashava and its surrounding areas. Main responsibility of DPHE within the Paurashava is to design water supply network, implement and maintain the network. The authority has prepared water supply network for Kalai Paurashava, but failed to implement it.

Local Government and Engineering Department (LGED) has upcoming project of construction of road, culverts and box culverts within the Paurashava.

Development Schemes Implemented by the NGOs

There is no mentionable infrastructure development project undertaken by the NGO's in the Paurashava. Several NGOs are working in Kalai to develop socio-economic condition and to alleviate poverty of the local people providing infrastructure service and other facilities. Operationally important NGOs are Asroy, Human Right Organization, Bangladesh Warrior's Sanshad, BRAC and Social Work Centre.

Development Schemes Implemented by Private Sector

There are a few development works that have been implemented by private sector. Some commercial activities and private schools have been developed by private initiative.

Chapter 4: Critical Issues for Planning

Deficiency in infrastructure and services is one of the major critical problems of the Paurashavas in Bangladesh, and is no exception. The reasons for such deficiency may vary, but are mostly linked with the institutional capacity and resource potential of the Paurashavas. The institutional capacity of each similar category Paurashava in terms of manpower and other logistics at present can be same across the country, but their efficiency and performance in practice may vary for a variety of reasons.

Chapter 4 describes the critical issues for planning based on the existing conditions in respect of Socio-Economic and Demographic issues, Transport and Communication, Urban Utilities, Drainage and Environment, related other issues namely disaster, land use control, law and regulation etc. The weaknesses in the present development processes are also taken into consideration to identify the critical issues for planning at Kalai Paurashava.

4.1 Socio-Economic and Demographic Issues

Most of the Paurashavas in Bangladesh are basically urban centers with direct links to rural areas. There are significant differences in the standard of socio-economic well being and demographic characteristics of these small towns with large cities in the country. Most of these Paurashava towns have small population, not enough to sustain economic growth to render services and facilities for quality of life needed in an urban environment. As a result, qualities in socio-cultural and demographic matters suffer from inadequacies in their requirements of facilities and services of various kinds. Since Kalai Paurashava has all such problems and shortcomings, in the preparation of various components of the Master Plan, this aspect of reality in development has to be addressed for sustainable solutions.

4.2 Transportation and Communication

Transportation and communication network plays very important role in the growth pattern of both urban and rural settlements and their socio-economic and environmental development. Houses and other establishments always prefer road side lands to have easy access to different places and functions. The transportation and communication network at Kalai Paurashava is not yet planned and developed to serve a town. The Paurashava has a very low traffic volume to sustain high cost of development in this sector, particularly in areas of low population density and scattered settlements. However, without planning a transport network for the Paurashava area as a whole, a standard transport network and an efficient traffic management system for the future cannot be ensured. The nature of problems and deficiencies are identified below.

a. Unplanned and Narrow Road

Roads in the town are being developed without using any planning standard and network plan. As a result, narrow roads with tortuous pattern are common. Narrow roads and poor maintenance of roads are major problems for traffic movement in some parts of the Paurashava. New houses and other structures are cropping up along these sub-standard narrow roads. This is likely to poise traffic movement problems in the future, when development becomes more intense and density of

population increases. The existing narrow roads require widening and improvements of pavement. Some road segments within the Paurashava are built in an unplanned manner. These segments will require improvement as per future traffic volume and required space for turning lane in the intersections.

b. Traffic Congestion

A very level of vehicular traffic in the streets of the town at present does not pose a threat for congestion in the near future. However, occasional congestions are found to arise from non-motorized traffic at selected locations, where public assembly is profound, especially Bazar more intersection. At present such congestions happen due to poor designing of the intersections. The slow moving rickshaws, on street parking and on street loading-unloading of goods are found to be the major sources of traffic congestion.

Manually operated rickshaw is a cozy and cheap traffic mode that can take passengers to their door steps. It is, therefore, a very popular mode that requires special planning attention in the design of transportation network and individual roads. Walking and cycling is encouraged in contemporary town planning practices to create healthy environment for all. Pedestrian safety should be an important element in the design of roads and other related infrastructure. These aspects require special attention in the Master Plan of Kalai Paurashava.

Reason for Congestion

- Lack of management is the prime reason for traffic congestion. There is a common tendency among the rickshaw pullers to disobey rules. They roam about the busy areas in search of passengers and park rickshaws at critical points leading to congestion.
- There is no proper and adequate space for parking auto-rickshaws and tempos. They are parked on the road. On road waiting for trips by these vehicles is also a source of congestion.
- Local buses often take passengers from wherever they find. In the same way, they disembark passengers according to their desires. These practices hamper smooth traffic movement.

c. Bus, Truck, and Tempo Terminal/Stand

Kalai has no formal bus and truck terminals and designated parking space for tempos and slow moving vehicles, such as rickshaws, van or cart. It has few bus stoppages along the main road. For the planned development of township in the future, these facilities are to be provided at suitable locations.

Map 4-1: Communication Network of Bogra Region showing Connectivity with Kalai Paurashava

4.3 Urban Utilities

A key issue related to the sustainable development of planning area providing a minimum quality and standard of living, pertains to the availability of and accessibility to basic infrastructure facilities, viz. water, power, sewerage, drainage and solid waste management. The present state of infrastructure problems in the Paurashava may become a cause of crisis. At present, state of telecommunications and power scenario in Kalai Paurashava is not so good. There is no water and gas supply system in this Paurashava. Thus critical need of advance action and arrangement is required for adequate provision of physical infrastructure.

4.4 Drainage and Environment

Majority of the population at Kalai Paurashava is deprived of drainage facility. Uncollected waste is washed out into the roadside drains and natural canals. Blockage of drains by solid waste reduces the carrying capacity of drains and natural canals and become a source of pollution. Paurashava has very limited resources to clean the drains. It has been observed that in some areas, domestic sewage conveys directly to the water channels. Water logging is a problem at some parts of Kalai Paurashava, causing water logging for 5-7 days each time a heavy rainfall occurs between June and November every year.

The sources of surface water pollution are domestic waste, unhealthy sanitation and extensive use of fertilizer in the agriculture. Condition of solid waste management at Kalai Paurashava is very poor. There are only 12 dustbins. One truck and two push carts are used to collect solid waste. Hospital waste is dumped to their own dustbin. Garbage of kitchen markets is dumped to nearby dustbins. The present conditions demand substantial improvement to ensure desirable environment.

4.5 Related Other Issues

Paurashava is located under Joypurhat District. The Kalai Paurashava is important in the national context for some reasons. It is well connected by road with all over the country via Rajshahi Divisional headquarter. Baneshwar-Ishwardi regional highway passes through the Paurashava providing good communication facilities with all over the country via Baneshwar and Ishwardi. The Jamuneswary Rivers are of hydrographical importance of the area. Many agricultural Products produced in this area are exported throughout the country. As the Paurashava is located adjacent to the Indian Border so it has a great importance in case of Internationl business.

4.6 Disaster Issues

As Kalai is located along the tectonic plate boundary, the Paurashava is moderately vulnerable to earthquake. Mitigation measures following building designs and construction rules are to be suggested in the Plan of the Paurashava town. In the flood of 1998, most of the households were affected by flood at Kalai Paurashava. About 78.26 percent of these affected households lost crops. In the planning and designing of the drainage system, the aspect of flooding has to be considered seriously.

4.7 Land Use Control

A Land Use Plan of the town was prepared in 1988 by Urban Development Directorate (UDD), but it was never brought into practice due to lack of regulatory measure for implementation. Instead, discretionary decisions are used in case of land use decisions. The Land Use Plan at that time was prepared for the Upazila Headquarters by UDD, but remained under the administrative control of the Ministry of LGRD & C. So conflict and lack of legal basis in implementation prevailed. In the present context of socio-economic demand and land use dynamics in the country, development of a Paurashava without a Master Plan cannot be imagined. The preparation of Master Plan is mandatory as per Local Government (Paurashava) Act 2009.

4.8 Laws and Regulations

Absence of adequate planning and development control is a problem in all urban areas of Bangladesh and in this case Kalai is no exception. A number of legislative measures are there to help the administration of urban area, urban development and management. But all of these planning laws cannot be readily enforced and many of them are not adequate in regulating planned development. Due to lack of proper implementation and enforcement, many important laws are mostly not applied by the urban local governments. As a result, weakness in the implementation of planned development in the Paurashava remains to be a critical problem and has to be addressed.

A substantial portion of national resource is invested in building construction in both public and private sectors. In order to ensure optimum return of this investment and to achieve satisfactory performance of the buildings in terms of safety, serviceability, health, sanitation and general welfare of the people, building construction needs to be controlled and regulated. Legislative measure for such control has been provided in the Bangladesh National Building Construction Act, 1952 and from time to time, regulations have been promulgated by the government under the Section 18 of this Act. As per law, it is mandatory to get any structure approved from appropriate authority before construction. Permission for building construction in the Paurashava is administered by this authority within its jurisdiction. However, as elsewhere in the country, noncompliance to these rules is also observed here.

a. Weak Local Government

Though Paurashava is a democratically elected urban local government, its authority is limited to work as a local government. In most cases, prior government permission is required before taking any legal action against unscrupulous acts. Section- 66, Section-69 (1) and (2), Section- 72 (4), Section-32 (2) of the Local Government (Paurashava) Act 2009 are few examples. This is one of the reasons that there has been a little progress in decentralization of governance at local level in Bangladesh.

b. Lack of Fund

Local bodies in this country are in constant shortage of funds as is the case in development. The sources of the Paurashavas income are generally taxes, rates, fees and charges levied by it, and rents and profits accruing from individuals and institutions. The government grants, profits from investments, receipts accruing from the trusts placed with it, loans raised by it and proceeds from other services are the other sources of income for the Paurashava.

The lack of efficient manpower, poor assessment system, and weak legal enforcement for practicing an efficient revenue generation and collection system are the main reasons for the current weakness in the financial management. It is widely accepted that there are also corrupt practices in our public institutions in delivering services, which require to be addressed through institutional and legal reforms.

c. Public Participation in Plan Making Process

The planning and development Acts of earlier times had contained a little scope for the authorities concerned to seek public opinion on their city/town plans prepared before they are sent to the government for final approval. Not having any scope for public participation is against the democratic norms of an elected urban local government like the Paurashava Authority. The authority must involve people by law in the planning and development process, and hear their views, needs and grievances to mitigate problems. This vital aspect should be incorporated in a stronger manner in the law through revision.

d. Coordination of Activities of Public Sector Development Agencies

There are a large number of public sector development agencies working in the town and surrounding areas, but there is lack of coordination among activities of these development agencies. Absence of coordination results wastage of resources and often brings misery to the people. This is commonly evident in our urban development works, for example, as one agency digs the streets for telecommunication network and repairs the streets, another agency starts digging for sewerage ducts. Effective coordination by law in this case is necessary for an integrated approach in development saving time and resources. There should be legal provisions for such coordination by the Paurashava Authority to ensure accountability of the agencies working for their respective jobs in the Paurashava area.

e. New Rules for Practicing Planning Standards

At present, there is no standard for infrastructure, services and facilities provided by the public sector. There is need to formulate standard rules for services and facilities and get incorporated in the Local Government (Paurashava) Act 2009 to secure public interests. A standard has been set in the UTIDP for future land use proposals in the Master Plan of the Paurashava.

f. Betterment fee

Due to failure of execution of the powers of charging betterment fee, all the benefits of land value enhancement due to Paurashava development of infrastructure go to the adjacent landowners or the persons having interest therein. A proper execution of betterment fees will help increase in revenue earning of the Paurashava.

g. Penalty for Violation of Plan Provisions

The penalty for violation of plan provisions provided in the Bangladesh National Building Construction Act (Section 49) is only Tk. 5000/- and for delay Tk.50/day, if violation continues further after notification. This is an extremely low rate of penalty, which should be revised for a substantial increase to prevent any violation effectively. The penalty provision should be more stringent to ensure enforcement of plan provisions.

4.9 Existing Problems and Weaknesses in the Development

The two major problems that currently exist in Kalai Paurashava include the following:

a) The Paurashava town has a weak economic and revenue base that does not support improvement in the socio-economic well being of the people. The Paurashava authority for lack of resources, fails to make required investments in the development of physical infrastructure to improve the quality of life of the people living in the town.

b) The Paurashava has also no definite plan for the development of various physical infrastructures in a planned manner. With lack of resources, it also lacks in professionally skilled manpower to carry out development in a planned way.

Thus for making this Paurashava a vibrant urban center, attention should be paid toward cost-effective development of all of its required infrastructure in phases, with the help of professionally skilled manpower and utilizing the newly prepared Master Plan as an important tool for all sorts of development.

Chapter 5: Reviews of Policies, Laws and Regulations

5.1 Introduction

The urban planning and land use regulations per se are essential for municipal development. They impact on land market favorably or unfavorably and result in social benefits and costs depending on their nature and the specific contexts in which they are applied. Policies, regulations and processes that facilitate availability of land and its uses for planned development at affordable costs need to be continued and those lead to contrary results need t0o be eliminated or modified.

5.2 Review of Relevant National Policies

The various existing policies, regulations and laws of the country have direct and indirect effects on the preparation and implementation of Master Plans of the Paurashavas in the country. These are briefly reviewed in this chapter to examine their adherence with the Master Plans of the Paurashavas.

5.2.1 Directives of the Local Government (Paurashava) Act 2009 for Preparing the Master Plan

The Local Government (Paurashava) Acts at different times since 1960's till the present time have iterated that a Paurashava as it gets established must prepare its Master Plan for planned development of the municipal town. So far, three ordinances have been made in the year 1967, 1977 and 2008, all suggesting for planned development. The Local Government Act was later modified and enacted as Local Government (Paurashava) Act 2009 in the national Parliament on 6, October, 2009.

The 2009 Act made provision for having the Master Plan prepared by a Paurashava within five years of its inception. The Master Plan of a Paurashava town is aimed for ensuring planned development, and should include the following:

- Survey of history, detailed statistical information, public service activities and other mentioned subjects of the Paurashava;
- Development, extension and upgradation of any area within the Paurashava; and
- Control and regulation of development of any land, any building construction and renovation within the Paurashava.

Actions Suggested in the Act to Prepare Master Plan

The Local Government (Paurashava) Act 2009 suggests for having qualified Town Planner in it's Organogram of Manpower to undertake the job of preparing the Master Plan of the Paurashava. Until such qualified Town Planner is not available in the Paurashava, the Paurashava may require a competent national government authority to prepare such plan for the Paurashava. The Act also

makes it contingent to form a Town Planning Committee within the capacity of it's manpower to execute the Master Plan of the Paurashava Town.

Paurashava has no Town Planner and Town Planning Committee at the moment. This makes the Paurashava dependent on having the Master Plan currently being prepared by LGED.

5.2.2 National Land Use Policy 2001

To safeguard the use of its land resources, particularly the valuable agricultural land of the country, the government in 2001 declared the National Land Use Policy. The policy proposed for the preparation of national land use plan, which is very much relevant to the current plan of the Paurashava.

The land use plan is to be based on the criteria of land productivity, land capability and land suitability, use and requirement of land by agriculture, forestry, industrialization, urbanization and housing. Following are the key issues of the national land use plan:

- Execution of coordinated land conservation programs aimed at prevention of desertification and weathering of land, conservation of land fertility, development and conservation of land.
- Prevention of destroying the landscape by earth cutting, excavation and removal of land.
- Formulation and effective execution of Land Use Plan in order to ensure planned use of land.
- Payment of compensation to those who will be affected by land weathering and land acquisition by the government.
- Monitoring, survey and research on desertification, land reclamation, prevention of weathering of land, conservation and development of land and watershed areas.

The policy emphasizes on the planned and the best use of land, and stressed on the most intensive use of this scarce resources of the country. The policy aims to introduce 'land use zoning' based on particular characteristics of land, prevent unplanned expansion of residential areas and control of indiscriminate growth of industrial and commercial activities. In absence of execution, the situation in land use and land management is severely being deteriorated.

5.2.3 National Housing Policy, 1993

The Government of Bangladesh formulated the first ever housing policy of the country in 1993. The priority of the government is to create affordable housing, which might be possible through controlling unplanned and haphazard housing area development. The policy is committed to encourage private developers in land and infrastructure development, and house construction. The policy also made commitment to provide government assistance on participatory housing infrastructure development involving the community, NGOs, CBOs, private developers and social welfare organizations.

The policy declares that in housing activities, the government will continue to remain as a facilitator in housing sector. The government intends to provide housing only to the poor and the rootless classes of the society. The policy makes commitments to encourage private organizations, NGOs and CBOs in housing development, income generation and environmental improvement under local planning. The preparation of Master Plan of the Paurashavas is, therefore, a step forward to address the various development issues including housing for mass people at local level.

5.2.4 Population Policy 2004

Prepared in 2004, the Population Policy of Bangladesh responds to the critical need to deal with the complex national population problem in a holistic way. It aims to build national consensus and synergy among institutions: public, private, civil society and NGOs about the problem.

The objectives of the National Population Policy are to improve the living standard of the people through making a desirable balance between population and development. The Policy proposals can broadly be divided into four sectors, human resources development, decentralization of population activities, participation of NGOs and private sector in population planning. The population policy aims to create a large skilled workforce, emphasizing on education and training strategies.

The policy calls for decentralization of population activities and ensure people's participation through decentralization of services and devolution of power to the local levels. The policy aims to prepare Action Plan through participation of local elites, opinion makers, representatives of poorer section of the society along with the local level government officials. With a view to give a holistic approach, the population policy calls for making the NGOs and private sector as important partners in population activities at various levels.

5.2.5 Transportation Policy 2004

Prepared in 2004, following are the policy objectives of Transport Policy:

- To provide a safe and dependable transport service for all.
- Removal of unnecessary control and formulation of laws and regulations conducive to providing services.
- Fare control and reduction of transport cost of goods for export.
- Determining the roles of the Government sector and the private sector.
- To maintain an economic and environmental balance.
- To ensure maximum utilization of Government funds.
- Expansion of the role of transport in the ever increasing economic activities.
- Growth of traffic commensurate with economic development.
- Introduction of an integrated transport system and provision of alternate transport systems.

The aim is to encourage greater private sector participation with national ownership of road and rail infrastructure. Lease of infrastructure may be allowed on long term basis. The Government is interested to establish a user role within its transport planning process. The Government intends to make arrangements to realize the cost of transport operation and road maintenance from road users through new fiscal policies and protect public interests. The Government will regulate tariffs for passenger and goods both in road and rail transport.

5.2.6 National Environment Policy 1992

Government declared an environmental policy in 1992 with a view to safeguard the national environment. The main objectives of the policy are:

- To promote natural balance and overall development by means of conservation and development of environment.
- To save the country from natural disaster.
- To identify and control all sources of pollution and degradation.
- To ensure environment friendly development in all sectors.
- To ensure sustainable, long term and environment friendly use of all national resources.
- To get involved with all international initiatives on environmental issues.

The comprehensive environmental policy covers as many as 15 sectors of development namely, agriculture, industry, health and health promotion, energy, water resources, flood control and irrigation, land, forest, wild life and biodiversity, fish and animal resources, food, coastal and maritime environment, transport and communication, housing and urbanization, population, education and public awareness, science, technology and research, legal framework, institutional structure. The consultant highlights only those sectors that have relevance to urban development and planning.

Industrial Sector

The following environmental measures are important:

- Potential polluting industries must incorporate control measures in its set up.
- All industries must conduct EIA and take pollution control measures.
- All industries in residential areas to be gradually shifted and new locations to be
- identified for planned industrial development.
- The industries producing pollutants should have their own system of pollution monitoring.
- Recycling of waste in order to reduce the volume of waste.
- Safeguard health of industrial workers.

Health Sector

The following environmental issues are important:

- Supply of safe drinking water in the Paurashava area and introduction of low cost healthy sanitation system.
- Control of pollution in all kinds of water bodies by municipal, industrial and toxic materials.
- Ban on carrying waste during day time and in open garbage trucks.
- Steps to be taken to protect public health and environment from all activities harmful for human health.
- Inclusion of environment in the academic syllabi.

Energy Sector

The following are some relevant policies:

- Large scale for introduction of improved cooker and wide dissemination of the technology to conserve energy and save environment.
- Promotion of biogas, solar energy, mini hydro electric unit and wind mill as sources of energy.
- Take up measures to reduce the amount of harmful elements in fuel including, sulfur in diesel and lead in petrol.
- Care has to be taken so that use and transformation of primary and commercial energy does not create any adverse impact on the environmental balance.
- Appropriate measures have to be taken during extraction and distribution of different natural resources like, oil, gas coal, peat so that they do not create any adverse impact on air, water, land, hydrological balance and the eco-system.
- Care has to be taken during giving fitness certificate to vehicles that emit black smoke. Mobile courts will have to be arranged to enforce the relevant legal provisions.

Transport and Communication Sector

The important aspects are:

- Care to be taken to make the road infrastructure development congenial to environment and the development of roads does not impede drainage of water.
- Appropriate measure to be taken so that the passengers and the transport do not endanger public health by indiscriminate throwing of solid waste and defecation.
- The rail, road and water transport must adopt measures to control emission of excessive black smoke.
- Creation of public awareness about the effect of pollution of river water.
- Control on water pollution to be ensured in inland river ports and dockyards.

- Encourage railway rolling stocks that generate less pollution.
- Forestation on both sides of railways and roads.

Population Sector

The important aspects are:

- Conduct study on the impact of population growth on environment and take appropriate measures to mitigate the problems of population growth.
- Prepare manpower utilization plan to make planned and effective use of human resources congenial to environment.
- Emphasize participation of women in environment conservation.
- Appropriate measures are needed to safeguard health of the poor and save them from the adverse effects of environmental degradation.

5.2.7 Industrial Policy 2005

The key aspects of the Industrial Policy 2005 are to:

- To set up planned industries considering the real domestic demand, prospect of exporting goods abroad, and discouraging unplanned industries in the light of the past experience.
- To accept private initiatives as the main driving force of economic development and uphold the government's facilitating role in creating a favourable atmosphere for private investments.
- To take necessary initiatives to establish industries on state initiative in those sectors that are considered very important and essential, where private entrepreneurs are not forthcoming.
- To cater to the needs of consumer satisfaction of the local products; measures to be undertaken to: produce quality products, diversify goods, and provide support for enhancing productivity using appropriate and advanced technology.
- To provide inspiration for the speedy expansion of cottage industries and SMEs, and for further investment in these sectors so that new employment opportunities are generated, unemployment reduced and poverty alleviation programs made available.
- To prioritize the expansion and development of agro-based and agricultural processing industries, and assist in the expansion of poultry, dairy and goat-sheep industry as agricultural industries.
- To provide women entrepreneurs with all necessary assistance in establishing industries in various sectors.
- To provide all necessary assistance for producing environment-friendly product with the objective to creating a pollution-free environment in the industrial sector.

- Enrich the industrial sector with the proper utilization of various natural and mineral resources.

5.2.8 National Tourism Policy 1992 and 2010

Recognizing the contribution of tourism to the socio-economic development of the country, the government framed the National Tourism Policy in 1992. The government in a gazette notification in May 2010 declared that the government may declare any potential site as a tourist area and if declared so, any development within the area will require formal permission from the government. The attractions of tourism can be varied, and the major policy thrusts for the sector are:

- To create interest in tourism among the people
- To preserve, protect, develop and maintain tourism resources
- To take steps for poverty-alleviation through creating employment
- To build a positive image of the area concerned
- To identify sectors for private capital investment
- To arrange entertainment and recreation
- To strengthen solidarity and integrity among the peoples

5.2.9 Agriculture Policy 1999

Agriculture Policy of Bangladesh was framed in 1999. A new policy is currently under preparation. The following are the important considerations in the 1999 Agriculture Policy.

The major issues dealt within the policy are, seed, fertilizer, irrigation, pest management, agricultural research, extension services, marketing of agro-products, land use, education and training, environment and agriculture, women and agriculture, coordination of various agencies engaged in agricultural development. Most of these issues are not relevant to the current Master Plan. The only relevant issue is the land use. So, review has been carried out on the land use only.

The Policy stresses on all possible steps to ensure optimum use of land. Its use has to be compatible with the overall goals of socio-economic services and utility provisions. The policy targeted to take the following steps to ensure planned utilization of land:

- Land zoning programme will be taken up by the Soil Resources Development Institute (SRDI) on a priority basis. Integrated approach of SRDI will be further strengthened for this purpose.
- To ensure maximum utilization of land, bottom up planning through people's participation will be started from the mouza or village level.
- Measures can be taken to stop fertile agricultural land being used for non-agricultural purposes, such as private construction, house building, brickfield, etc.

- Acquisition of land in excess of requirement for non-agricultural purposes will be discouraged.

About one percent of agricultural lands are being converted into non-agricultural use every year. In a country of constantly growing population, withdrawal of land from agriculture will affect food production. So it is necessary to safeguard farm land from conversion. But this vital issue has been partially addressed in the policy. It states only about fertile land and not agricultural in general.

Government has not framed any effective mechanism to discourage acquisition of land in access of requirement for non-agricultural purpose. To protect agricultural land, immediate steps are necessary to delineate agricultural lands. This issue has not been covered in the policy. It has been found that large areas of agricultural lands are unnecessarily being included within Paurashava. Sometimes, it is about 70% of the total Paurashava area.

5.2.10 Urban Forest Policy 1994

Representing an amendment of the forest policy of 1979, current national forest policy was enacted in 1994 and officially announced on 31st May 1995. The policy was formulated to initiate a 20-year Forestry Master Plan (FMP). The plan provides a framework for optimizing the forestry sector's ability to stabilize environmental conditions and assist economic and social development. Three imperatives were identified: sustainability, efficiency and people's participation. Important objectives are:

- To afforest about 20% of the total area of the country by initiating various a forestation programmes in forest lands, fallow lands, lands not useful for agriculture, hinter lands and other possible areas to meet the basic needs of the present and future generations and to ensure greater contribution of the forestry sector to economic development;
- To enrich biodiversity in the existing degraded forests by conserving the remaining natural habitats of birds and animals.
- To strengthen agriculture by extending assistance to those sectors related with forest development, especially by conserving land and water resources
- To provide for and implement a forestation programmes on both public and private lands.

The policy statements which are most relevant to local participatory forestry are as follows:

- tree growing by communities, local groups or individual families on roadsides, windbreaks, canal/river banks and other public or marginal lands will be promoted through NGOs and relevant state agencies;
- Buffer zones attached to protected areas may be allocated for tree farming and agro-forestry on a long term lease basis;
- The State will provide technical assistance and financial support to promote all forms of homestead forestry;
- Cottage and small scale labor intensive industries, which contribute to the local economy and process wood and other forest based raw materials, will be promoted;

- The traditional rights of people living within and adjacent to designated forest areas will be maintained and their forest-related cultural values and religious beliefs will be respected.

5.2.11 National Plan for Disaster Management, 2008-15

National Plan for Disaster Management 2008-2015 is an outcome of the national and international commitments of the Government of Bangladesh (GoB) for addressing the disaster risks comprehensively. The plan is developed to reduce the vulnerability of the poor to the effects of natural, environmental and human induced hazards to a manageable and acceptable humanitarian level. The objectives of this Plan are to:

- Align the strategic direction of disaster management programs with national priorities and international commitments.
- Articulate the vision and goals for disaster management
- Outline the strategic direction and priorities to guide the design and implementation of disaster management policies and programs.
- Create a cohesive and well-coordinated programming framework incorporating government, non-government and private sector.
- Ensure that disaster management has a comprehensive and all-hazards focus comprising disaster risk reduction and emergency response.
- Illustrate to other ministries, NGOs, civil society and the private sector how their work can contribute to the achievements of the strategic goals and government vision on disaster management.

A holistic approach for disaster management has been emphasized to work together with all the stakeholders and build strategic, scientific and implementation partnerships with all the relevant government departments and agencies, other key non-government players including NGOs, academic and technical institutions, the private sector and the donors. The role of Government is mainly to ensure risk reduction and comprehensive disaster management.

5.2.12 National Plan of Action for Person's with Disabilities (PWDs) as well as Autism, 1995

In line with the Government policy the Department of Social Services under the Ministry of Social Welfare has an enthusiastic vision & mission to address the social issues relating to Person's with Disabilities (PWDs) as well as Autism. The National policy for the persons with disability, 1995 calls for social protection and ensured the rights of the vulnerable groups. In the recent time, dynamic and sustainable steps have been taken for the PWDs. The steps are:

- To establish separate ticket counters in railway station, bus terminals, river ports, steamer terminal, airport and airways office to facilitate easy availability of tickets for the PWDs.
- To maintain reserve seats in the bus, train and water transports for PWDs.

- To fill up 10 percent reserved quota for employment in government jobs by orphans and PWDs.
- To construct a ramp in all the government offices to facilitate easy movement of the PWDs.
- To withdraw the existing restrictions regarding appointment of PWDs in the Govt. class I & class II jobs, and arrange micro-credit for PWDs by all the Nationalized Commercial Banks (NCBs).

5.2.13 Review of Relevant Laws and Regulations

5.2.13.1 The Act (36 of 2000) for Conservation of Play field, Open space, Park and Natural Water Reservoir in Mega City, Divisional Town, District Town and Paurashavas of Bangladesh

According to the section 5 of the Act, any land having such use as play field, park and natural reservoir can not be changed or can not be used for any other purpose(s). However, in absence of Paurashava Master Plan, the Act can not be properly applied. This emphasizes upon having Master Plan for each Paurashava.

In the existing provision of the Act, any person violating the Act may be liable to punishment up to 5 years of imprisonment or Tk. 50,000 fine or both. The Act makes a provision for appeal, however, and any land owner having any land with above mentioned use may apply to the appropriate authority to have permission to change the use. The authority shall convey the results of appeal within 60 days of the appeal.

5.2.13.2 Bangladesh National Building Code (BNBC) 1993

The Bangladesh National Building Code (BNBC) 1993 was formulated in 1993, but given legal status in 2008. The purpose of Bangladesh National Building Code (BNBC) is to establish minimum standards for design, construction, quality of materials, use and occupancy, location and maintenance of all buildings in order to safeguard within achievable limits, life, limb, health, property and public welfare. It aims to insure public safety, health, and general welfare in so far as they are affected by the construction, alteration, repair, removal, demolition, use or occupancy or buildings, structures of premises, through structural strength, stability, means of egress, safety from fire and other hazards, sanitation, light and ventilation. The BNBC suggests for conservation and restoration of historic buildings.

5.2.13.3 The Building Construction Act 1952

This Act was prepared in 1952 to prevent haphazard construction of buildings and excavation of tanks that are likely to interfere with the planning of certain areas in Bangladesh. The Act is usually exercised in areas under the urban local governments. The Act sets some conditions regarding construction of buildings in urban areas, where the Act will be in execution.

Preparation of Master Plan

The Act calls for preparation of a Master Plan of the urban area concerned before approval of building plan. The Master Plan shall show the future land use of the area through land use zoning. The buildings will be approved according to the land use provisions of the zoning plan. Having a Master Plan prepared, a Paurashava has the scope of exercising the following provisions/actions:

Building Construction Rules

The Act in its Section 18 keeps provision for preparation of Building Construction (BC) rules to ensure healthy and environment friendly building development. The last BC Rules were prepared in 1996. However, due to special characteristics of building development in Dhaka city a separate set of BC Rules was prepared for Dhaka City in 2008 under the same Act.

Power to Removal of Construction (Section 3B)

The Act gives special power to plan approval authority to remove any building that did not follow the specified rules of the Act or take action against any building owner who constructs building violating the rules after approval of the building plan.

Restriction on Cutting of Hills (Section 3C)

The Act forbids cutting of any hill without prior permission of appropriate authority.

Removal of Unauthorized Building (Section 7)

The Act empowers the authority to remove any building that has been built violating the BC rules. On failure to do so, the authority itself shall dismantle it and the entire cost shall be recovered from the owner as public demand.

Appeal

The Act, however, keeps provision for appeal, if the owner finds himself aggrieved due to any action by the authority.

Observation on the Building Construction Act

For appropriate execution of the Act, there is necessity of having Master Plan for a Paurashava. At the moment, there is serious lack of monitoring of disobedience of rules by the builders. Once the Master Plan is made for a Paurashava Town, the Paurashava Authority will be able to follow the rules properly.

5.3 Applicability of the Acts, Regulations and Policies in the Paurashava Master Plan

The key aspects of the policies presented in this Chapter have both direct and indirect relationships with the preparation of Master Plan of Paurashava Town in general, and Kalai Paurashava in particular. The Local Government (Paurashava) Act 2009, the Building Construction Act 1952, the BNBC, the Conservation Act 2000, Agriculture Policy etc. have serious stakes in the execution of Paurashava Master Plan. The other policies also have relevance in the preparation of Master Plan for an Urban Centre. As a result, the relevant aspects of the Acts, rules, and policies are mentioned in this chapter and are taken into consideration in the preparation of the Master

Plan for the Paurashava. The key aspects that are most relevant with the preparation of Paurashava Master Plan are shown in **Table 5.1**.

Table 5-1: Important provisions of different Acts, Policies and Rules having relevance with the preparation of Paurashava Master Plan

Act/Ordinance, Policies, Rules	Relevance with Paurashava Master Plan
Local Government (Paurashava) Act 2009	Makes provision for having a Master Plan of the Paurashava Town. Provides legal basis for the preparation and implementation of Paurashava Master Plan. Suggests on the content and structure, and other relevant issues, such as provision for qualified Town Planner in the Paurashava staff.
National Land Use Policy 2001	Formulation and effective execution of Land Use Plan in order to ensure planned use of land. Suggests for aforestation, conservation and development of land maintaining landscape.
National Housing Policy, 1993	To create affordable housing through controlling unplanned and haphazard housing area development. To encourage private developers in land and infrastructure development, and house construction. Participatory housing infrastructure development involving the community, NGOs, CBOs, private developers and social welfare organizations.
Population Policy 2004	To improve the living standard of the people through a desirable balance between population and development. The proposals are divided into four sectors - human resources development, decentralization of population activities, participation of NGOs and private sector. The policy aims to create a large skilled workforce providing education and training.
Transportation Policy 2004	To provide a safe and dependable transport service for all. Removal of unnecessary control and formulation of laws and regulations conducive to providing services, determining the role of public and private sectors, maintaining an economic and environmental balance, maximum utilization of Government funds and introduction of an integrated transport system and provision of alternate transport systems.
National Environment Policy 1992	To promote natural balance and overall development by means of conservation and development of environment, save an area from natural disaster, identify and control all sources of pollution and degradation, ensure environment friendly development in all sectors, ensure sustainable, long term and environment friendly use of all national resources, and get involved with international initiatives on environmental issues.
Industrial Policy 2005	To set up planned industries considering the real domestic and export demand discouraging unplanned industries, provide necessary assistance for producing environment-friendly products with the objective of creating a pollution-free environment, and enrich the industrial sector with the proper utilization of various natural and mineral resources. To prioritize the expansion and development of agro-based and agricultural processing industries, and assist in the expansion of poultry, dairy and goat-sheep industry as agricultural industries; and provide women entrepreneurs with all necessary assistance in establishing such industries.
National Tourism Policy 1992 and 2010	To create interest in tourism among the people, preserve, protect, develop and maintain tourism resources, take steps for poverty-alleviation through creating employment, build a positive image of the area concerned, arrange entertainment and recreation, identify sectors for private capital investment,

Act/Ordinance, Policies, Rules	Relevance with Paurashava Master Plan
	and strengthen solidarity and integrity among the peoples.
Agriculture Policy 1999	To strengthen land zoning program, ensure maximum utilization of land through bottom up planning and people's participation, stop fertile agricultural land being used for non-agricultural purposes, and discourage acquisition of land in excess of requirement for non-agricultural purposes.
Urban Forest Policy 1994	To afforest about 20% of the total area of the country by initiating various aforestation programs in forest lands, fallow lands, lands not useful for agriculture, hinter lands and other possible areas to meet the basic needs of the present and future generations and to ensure greater contribution of the forestry sector to economic development; enrich biodiversity in the existing degraded forests by conserving the remaining natural habitats of birds and animals; To strengthen agriculture by extending assistance to those sectors related with forest development, especially by conserving land and water resources; and implement aforestation programs on both public and private lands.
National Plan for Disaster Management, 2008-15	To align the strategic direction of disaster management programs with national priorities and international commitments, articulate the vision and goals for disaster management, outline the strategic directions and priorities to guide the design and implementation of disaster management policies and programs, create a cohesive and well-coordinated programming framework incorporating government, non-government and private sector, and ensure that disaster management has a comprehensive and all-hazards focus comprising disaster risk reduction and emergency response.
National Plan of Action for Person's With Disabilities (PWDs) as well as Autism, 1995	To establish separate ticket counters in railway station, bus terminals, river ports, steamer terminal, airport and airways office to facilitate easy availability of tickets for the PWDs, fill up 10 percent reserved quota for employment in government jobs by orphans and PWDs, construct a ramp in all the government offices to facilitate easy movement of the PWDs, and withdraw the existing restrictions regarding appointment of PWDs in the Goverment Class I & class II jobs.
The Act (36 of 2000) for Conservation of Play field, Open space, Park and Natural Water Reservoir in Mega City, Divisional Town, District Town and Paurashavas of Bangladesh	To protect the existing use of land such use as play field, park and natural reservoir, and ensure punishment for conversion of such lands by any person/authority without proper permission from the appropriate authority..
Bangladesh National Building Code (BNBC) 1993	To establish minimum standards for design, construction, quality of materials, use and occupancy, location and maintenance of all buildings in order to safeguard within achievable limits, life, limb, health, property and public welfare. It aims to insure public safety, health, and general welfare in so far as they are affected by the construction, alteration, repair, removal, demolition, use or occupancy or buildings, structures of premises, through structural strength, stability, means of egress, safety from fire and other hazards, sanitation, light and ventilation. The BNBC also suggests for conservation and restoration of historic buildings.
The Building Construction Act 1952	The Act calls for preparation of a Master Plan of the urban area concerned before approval of building plan. The Master Plan shall show the future land use of the area through land use zoning. The buildings will be approved according to the land use provisions of the zoning plan.

Act/Ordinance, Policies, Rules	Relevance with Paurashava Master Plan
	To ensure healthy and environment-friendly building development. To empower special power to remove any building that did not follow the specified rules of the Act. To take action against any building owner who constructs building violating the rules after approval of the building plan. To forbid cutting of any hill without prior permission of appropriate authority. To keep provision for appeal, if the owner finds himself aggrieved due to any action by the authority.

Chapter 6: Projection of Future Growth by 2031

The future growth projection is helpful to draw mechanisms for improving and guiding long-term development strategies, identifying existing problems and future demand and making possible suggestions, to formulate viable projects for urban development and increase management capabilities of the concerned authority.

6.1 Projection of Population

It is a difficult task to collect detailed information of population for a recently declared Paurashava in Bangladesh. Perhaps no single factor is more important for planning than the size and composition of a region's population and the way it changes in the future. Estimation of future population for a specific period of a particular area is one of the most difficult tasks in the planning process. For Bangladesh, population projection is a very difficult task as the required data are not available for the particular area of a Paurashava and same is the case for Kalai.

The population figures collected from secondary sources, especially for the Paurashava were very much ambiguous. So for the final projection, several discussions were made with experts and BBS officials. Following the annual growth rate for the study area available from the 2001 Population Census, the projection up to the year 2031 with five years interval has been made.

The data found from several sources is arranged in different formats according to their requirement and analysis. So, comparison of data between different sources is very difficult. As a result, projection with various sources of information on population shows variable results in the calculation. Migration information is not available in population census by BBS as it only considers the natural growth rate. But actual population projection requires both natural growth rate and migration rate. For this unavailability of migration rate, population projection becomes very difficult.

By the formula population in any requisite year can be projected using the following equation which is also known as Geometric Progression Method of the following formula.

$Pn = Po (1+R/100) n$----------(i)

As projections are based on the assumption that the past trends will continue to operate in the future, population of current year (according to BBS, 2011) have been taken to estimate the future population. The existing population of Kalai Paurashava is 16464 in 2011 within an area of 3435.1 acres. With an annual growth rate of 1.63 %, the forecasted population of Kalai Paurashava for 2031 will be-

$Pn = Po (1+R/100) n$
$Pn = 16464 (1+1.63/100)^{20}$
$Pn = 22750$

Mentioned that, in BBS 2011, the growth rate of Kalai Paurashava is not mentioned clearly. In this case growth rate has been calculated from population differences between 2011 and 2001, which is 1.13%. In case of this report the higher growth rate which is 1.63 has been selected. With an annual growth rate of 1.13%, the forecasted population of Kalai Paurashava will be 20613 in the

year 2031. The gross density of the area will be 6 ppa (person per acre). Due to the maximum concentration of residence in Ward no. 02, the density of population will also be higher (18 ppa) in this area. **Table 6-1** shows ward wise population distribution of Kalai Paurashava based on growth rate 1.13 %.

Table 6-1: Population Projection with Density for Kalai Paurashava Up to 2031

Ward	Area (Acre)	Pop'11	PPA	Pop'16	PPA	Pop'21	PPA	Pop'26	PPA	Pop'31	PPA
1	561.487	2282	4	2418	4	2558	5	2706	5	2857	5
2	191.118	2775	15	2935	15	3105	16	3284	17	3474	18
3	453.827	1869	4	1977	4	2091	5	2212	5	2340	5
4	422.369	1603	4	1696	4	1794	4	1897	4	2007	5
5	382.891	1681	4	1778	5	1881	5	1990	5	2105	5
6	359.253	1507	4	1594	4	1686	5	1784	5	1887	5
7	438.365	1605	4	1698	4	1796	4	1900	4	2009	5
8	356.813	1590	4	1682	5	1779	5	1882	5	1991	6
9	268.941	1552	6	1642	6	1737	6	1837	7	1943	7
Total	3435.1	16464	5	17420	5	18426	5	19491	6	20613	6

Source: BBS, 2011. Estimation by the Consultant
Note: Annual Medium Growth rate for Population projection has been considered as 1.13%.

Table 6-2 shows the ward wise population growth of Kalai Paurashava up to 2031 at actual population growth rate consider as 1.63%.

Table 6-2: Population Projection with Density for Kalai Paurashava Up to 2031

Ward	Area (Acre)	Pop'11	PPA	Pop'16	PPA	Pop'21	PPA	Pop'26	PPA	Pop'31	PPA
1	561.487	2282	4	2478	4	2687	5	2913	5	3153	6
2	191.118	2775	15	3009	16	3262	17	3537	19	3834	20
3	453.827	1869	4	2026	4	2197	5	2382	5	2583	6
4	422.369	1603	4	1738	4	1884	4	2043	5	2215	5
5	382.891	1681	4	1823	5	1976	5	2142	6	2323	6
6	359.253	1507	4	1634	5	1771	5	1921	5	2082	6
7	438.365	1605	4	1740	4	1887	4	2046	5	2218	5
8	356.813	1590	4	1724	5	1869	5	2026	6	2197	6
9	268.941	1552	6	1683	6	1824	7	1978	7	2145	8
Total	3435.1	16464	5	17855	5	19358	6	20988	6	22750	7

Source: BBS, 2011. Estimation by the Consultant
Note: High Growth rate for Population projection has been considered as 1.63%.

Table 6-3 shows the ward wise population growth of Kalai Paurashava up to 2031 at a low annual population growth rate consider as 0.63%.

Table 6-3: Population Projection with Density for Kalai Paurashava Up to 2031

Ward	Area (Acre)	Pop'11	PPA	Pop'16	PPA	Pop'21	PPA	Pop'26	PPA	Pop'31	PPA
1	561.487	2282	4	2359	4	2434	4	2512	4	2587	5
2	191.118	2775	15	2864	15	2955	15	3049	16	3146	16
3	453.827	1869	4	1929	4	1990	4	2054	5	2119	5
4	422.369	1603	4	1654	4	1707	4	1761	4	1818	4
5	382.891	1681	4	1735	5	1790	5	1847	5	1906	5
6	359.253	1507	4	1555	4	1605	4	1656	5	1709	5

Ward	Area (Acre)	Pop'11	PPA	Pop'16	PPA	Pop'21	PPA	Pop'26	PPA	Pop'31	PPA
7	438.365	1605	4	1656	4	1709	4	1764	4	1820	4
8	356.813	1590	4	1641	5	1693	5	1747	5	1803	5
9	268.941	1552	6	1602	6	1653	6	1705	6	1760	7
Total	3435.1	16464	5	16993	5	17535	5	18095	5	18667	5

Source: BBS, 2011. Estimation by the Consultant
Note: Low Growth rate for Population projection has been considered as 0.63%.

With an annual growth rate of 1.63% (assuming higher growth rate), the forecasted population of Kalai Paurashava will be 22750 in the year 2031. The gross density of the area will be 7 ppa (person per acre). Due to the maximum concentration of residence in Ward no. 02, the density of population will also be higher (20 ppa) in this zone.

Again, with low growth rate of 0.63%, the forecasted population of Kalai Paurashava will be 18672 in the year 2031. The gross density will be 5 ppa (person per acre). Due to the maximum concentration of residence in Ward no. 2, the density of population will also be higher (16 ppa) in this zone.

In this case the higher growth rate which is 1.63 % has been accepted for the population forecast.

6.2 Identification of Future Economic Opportunities

The contribution of the small towns to the economic development of their hinterlands depends largely on the urban development in these urban centers. Depending on transport, communication and storage facilities, this Paurashava can play a vital role in linking rural farmers to the urban market. For instance, development of road network between this small town and its rural hinterlands may greatly benefit rural farmers as it enables them to transfer their agro produces to bigger markets. The industrial development in the Paurashava will have significant impact on the demand for raw materials that are required for the industrial production. All sorts of production materials, like brick, wood, bamboo etc. are produced in the countryside, serving as supply centers for urban demand. To support urban industries and related activities, it requires adequate infrastructure, such as urban rural transfer routes, communication and information structures. Investments in these projects result in enhanced productivity in both urban and rural areas.

Table 6-4 shows the work force of Paurashava. From the BBS- 2011, it is revealed that the among the economically active age group of population, 39.15% people are engaged with economic activity while a big portion activities and about 12.33 % populationa are not contributing in economic activities. A relativel smaller portion of people are looking for work. From the Household Survey it is revealed that the agricultural activities are the dominant occupation class in the town. The percentage of the people engaged in this occupation is in a major portion. The next highest occupation class found is the small industry and service. Most of the households' earning members often adopt a secondary occupation which indicates that under-employment is very much prevalent in the project area.

In the project area, most of the economically active population whose age is 10 years and above are involving in agriculture (farming), small business and transport sector.

Table 6-4: Existing Working Force for Kalai Paurashava

Status	Number	Percentage
Employed	1683	39.15
Looking for Work	12	0.28
Household Work	2074	48.24
Not Working	530	12.33
Total	4299	100

Source: Community Series (Zila: Joypurhat), Bangladesh Population Census-2011

However, it is extremely difficult to make any precise projection about future economy of this small urban center. Considering the present level of economic activities, no major change is anticipated in the local economy in the near future.

The town has good prospects to local economic upliftment provided appropriate government policies and initiatives are taken. People have money, but they will have to convert it into capital. The following suggestions may be considered.

First, training on entrepreneurship may be arranged for prospective young and educated entrepreneurs to encourage them to invest in manufacturing, in particular.

Second, local entrepreneurs may go for consumer goods production targeting local market.

Third, prospective investors may also explore possibilities of investment in agriculture sector for local as well as export market, particularly, in fisheries, poultry and horticulture.

Thoug agriculture is an important source of income mainly in Rajshahi region, services play an significant role in this area. Remittance is the main source of income of 50percent of the household of Paurashava (BBS, 2011 and household survey). They mainly invested on land, which is considered the safest investment, as the land value never falls. Without investment in basic industries, it is unlikely that the local economy will experience a major boost in the near future. Both government and private initiatives will bring prospective up gradation of the economy through proper policy for utilization of the remitted money inflow. It is the high time to create some special incentive packages for their investment make a rewarding role in the economy of the country.

6.3 Projection of Land use

Projected land use is a critical component to a comprehensive plan. The forecast determines the amount of land needed to accommodate future growth, and includes the land required for residential, commercial and industrial uses. In some instances, a community may have enough vacant lands within its boundary to accommodate its forecasted population increases and land use demands. In other instances, there may be a need to consider land outside a community's boundaries to accommodate this increase. According to land use projection it is reveals that there is no land required for residential purpose in the year 2031. The Consultants estimates about 350 of land for residential uses with a net residential density of 65 people per acre. Including existing commercial activities, the total commercial land in 2031 has been fixed at 26.53acres. Again need of educational land for projected population will be 32.99 acres and 11.19 acres of land for community facilities. A huge land (50.05 acres) will require for open space and recreational

facilities covering play field, park, neighborhood, park and stadium. The projection and demand on land requirements as per the planning standard approved by the PMO office of UTIDP project are discussed details in Chapter-10 and Section 10.1.2.

Chapter 7: Landuse Zoning Policies and Development Strategies

This chapter sets land use policies and development strategies for planning area. It classifies the Structure Plan area into categories and also includes strategies for optimum use of urban land resources, plans for new area development and areas for conservation and protection.

7.1 Zone of Structure Plan Area

To guide long term growth within the Structure Plan Area by means of demarcation of the future growth areas and indication of potential locations of major development zones are broadly classified into seven categories. **Table 7-1** shows the Structure Plan area zones, its area and percentage coverage. Details of the description of structure planning zones are given in the following paragraphs. **Map 7-1** and **Appendix-1** shows the structure plan of Kalai Paurashava.

Table 7-1: Structure Plan Policy Zoning

Zoning	Description of the Zone	Area (acre)	%
Core Area	This area is also known as built-up area. This is defined as the area which has the highest concentration of services; it also has the highest population concentration and density. It will absorb most population growth during the Land use Plan (2011-2031) period.	52.66	1.53
Fringe Area	This zone is developing areas which will take further decades to reach the population densities of the urban core area. Low initial densities in these areas do not justify supply of a full range of services as they will initially be underused. However, it is essential that planning and reservation of rights of way, at least for primary networks, be undertaken soon to enable provision when justified by increased density levels and allowed by resources.	251.22	7.31
Peripheral Area	This is the zone where a slow trend of urbanization is continuing in unplanned manner. The area identified in the Structure Plan as the likely choice for new urban development beyond the core area. Ideally, it might be reasonable to provide primary infrastructure networks in this area to foster development and encouraged to enable a more rapid urbanization in a planned way.	338.95	9.87
New Urban Area	This zone will be the required additional area for future planned urban development as per population projection. New facilities and services like road, drains, footpath, waste transfer station and other civic services will be provided. This area is proposed to grow within 2031.	81.17	2.36
Agriculture	Agricultural land (also *agricultural area*) denotes the land suitable for agricultural production, both crops and livestock. It is one of the main resources in agriculture. The land under annual crops, such as cereals, other technical crops, potatoes, vegetables, and melons; also includes land left temporarily fallow; land under permanent crops (e.g., fruit plantations); areas for natural grasses and grazing of livestock.	2416.37	70.34

Zoning	Description of the Zone	Area (acre)	%
Water body	Water body containing an area equals to or more than 0.25 acres excluding those of khal, irrigation canal and river will be treated as this category.	116.78	3.41
Major Circulation	Major circulation contains major road network and railways linkage with regional and national settings.	177.96	5.19
Total		**3435.1**	100

Map 7-1: Structure Plan Map of Kalai Paurashava

7.1.1 Core Area

Total 52.66 acres of land, which covers 1.53 % of Structure Plan area, is declared as Core Area (**Map 7-1** and ***Fig 7-1***). It is located with in Ward nos. 1, 2 and 3. It includes the highest concentration of services area for an example, schools, post office, police box, Bazar area etc. and it has the highest potentiality of development. Because the town developed based on the Bogra-Joypurhat Road, which is passes through the East-West direction of the Paurashava, there are differences in levels of provision, particularly between the formally developed and planned areas and the majority of unplanned areas. Levels of provision should be maintained in the planned areas. Since these areas are forecasted to show density increase and increased demand and therefore will require regular upgrading. The main thrust to improve services should be in the unplanned zones, particularly where the deficiencies already are great and quality of life will sharply decline when the services also have to cater for the additional population.

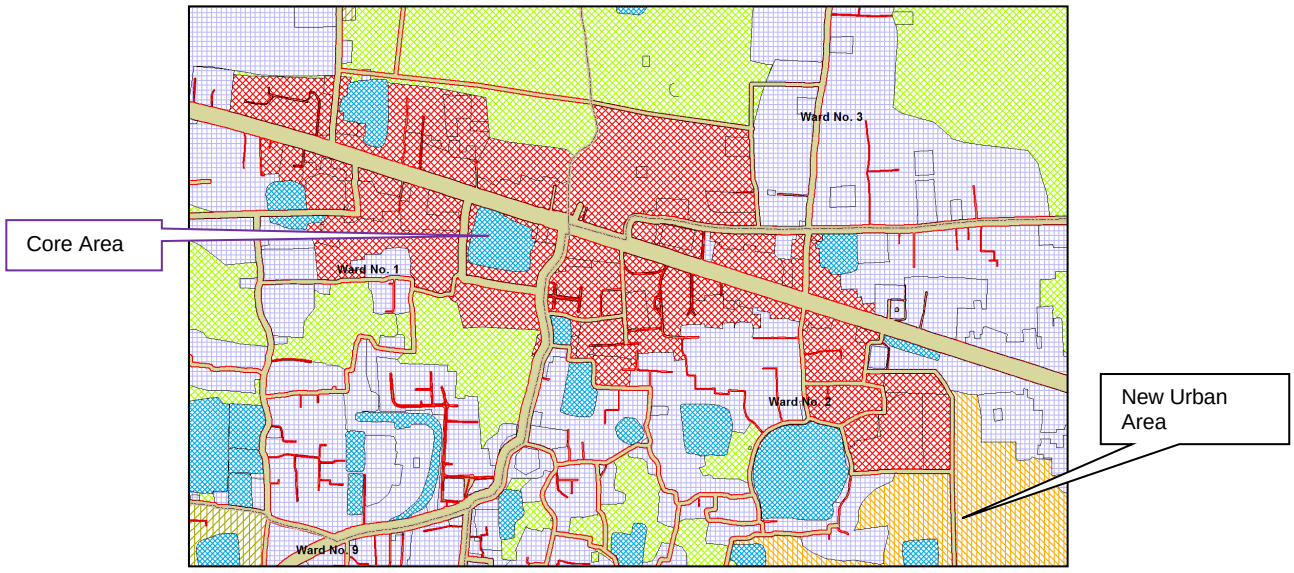


Fig 7-1: Core Area of Kalai Paurashava

7.1.2 Fringe Area

A total of 251.22 acres of land covering only 7.31 % of Structure Plan area is declared as Fringe Area (**Map 7-1** and **Fig 7-2**). Maximum fringe are of proposed structure plan is located surrounding of Core area. It covers large portion area of Ward nos. 1, 3 and 9. This area mainly proposed, where a slow trend of urbanization is continuing in unplanned manner. The area is identified in the Structure Plan as the likely choice for new urban development beyond the core area. Ideally, it might be reasonable to provide primary infrastructure networks in this area to foster development encouraging a more rapid urbanization in a planned way.

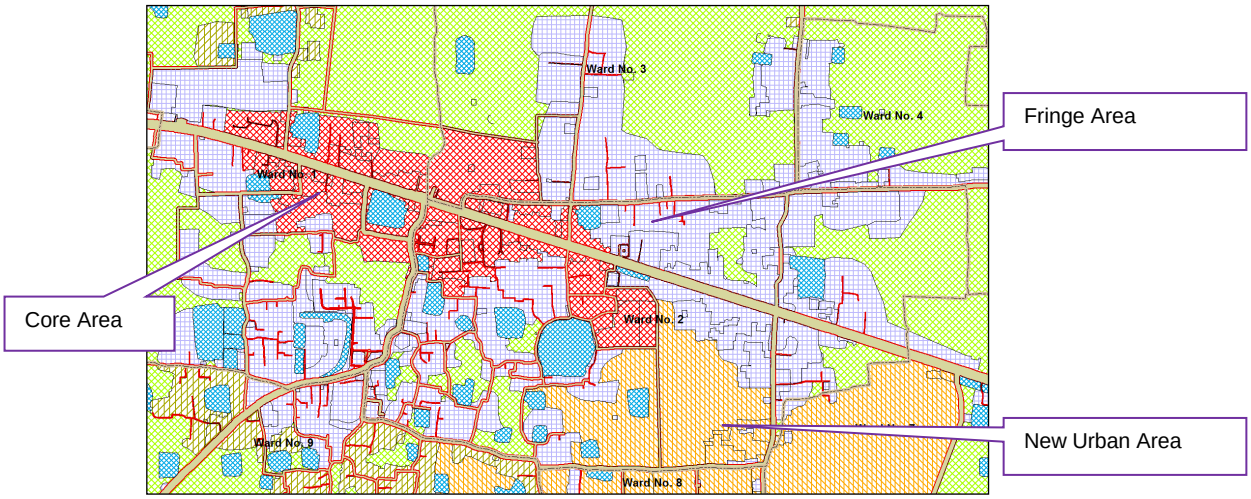


Fig 7-2: Fringe Area beside Core Area

7.1.3 Peripheral Area

A total of 338.95 of area, which covers 9.87% of Structure Plan area, is declared as Urban Peripheral Area (**Map 7-1** and ***Fig 7-3***). Peripheral area covers some portion of the all the wards except ward no. 3, 4, 5 and 6 of the Paurashava. This zone is developing areas that will take a longer time to reach the population densities of the urban core area. Low initial densities in these areas do not justify supply of a full range of services as they will initially be underused. However, it is essential that planning and reservation of rights of way, at least for primary networks, be undertaken soon to enable provision when justified by increased density levels and allowed by resources.

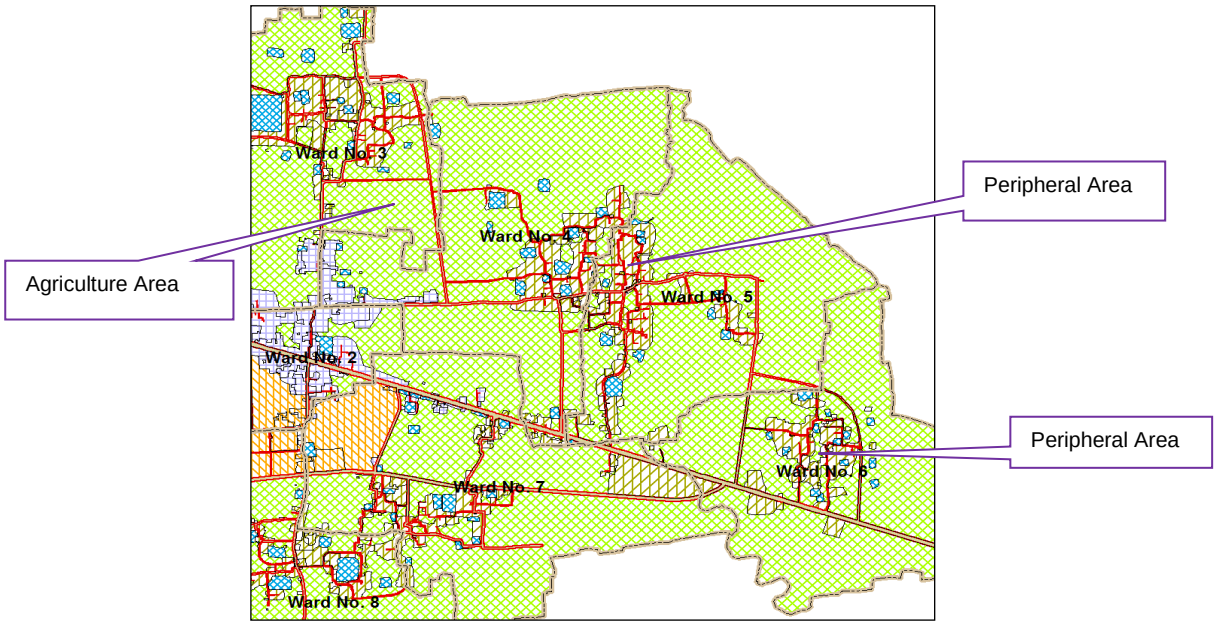


Fig 7-3: Peripheral Area of Kalai Paurashava

7.1.4 New Urban Area

Total 81.17 acres of land covering 2.36% of Structure Plan area is declared as New Urban Area (**Map 7-1** and ***Fig 7-4***). New urban area mainly located within Ward nos. 2, 7, 8 and 9. All these wards has partially involved with new urban area. It is assumed that town will be developed based on established as trade center which is mostly depends on successfully communication network and establish trading relation with others. So most of the new urban lands in Ward nos. 7, 8 and 9 will be use to meet the extra pressure of development trend for this for this reason.

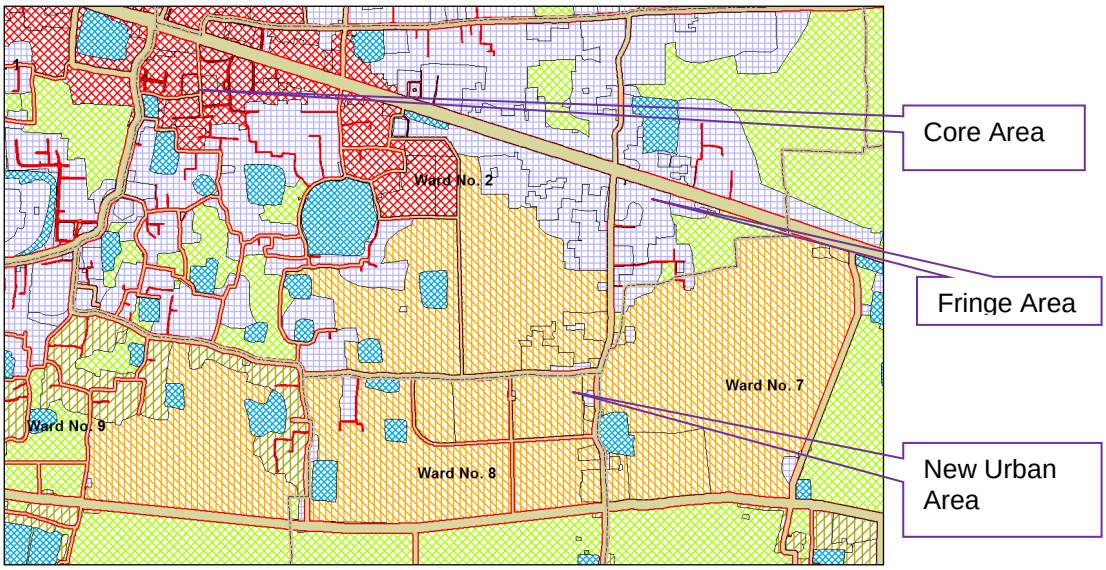


Fig 7-4: New Urban Area

7.1.5 Agriculture

Total 2416.37 acres of land covering 70.34 % of Structure Plan area is declared as Agriculture Area (**Map 7-1** and ***Fig 7-5***). Agriculture Area is quite spread all over the Paurashava.

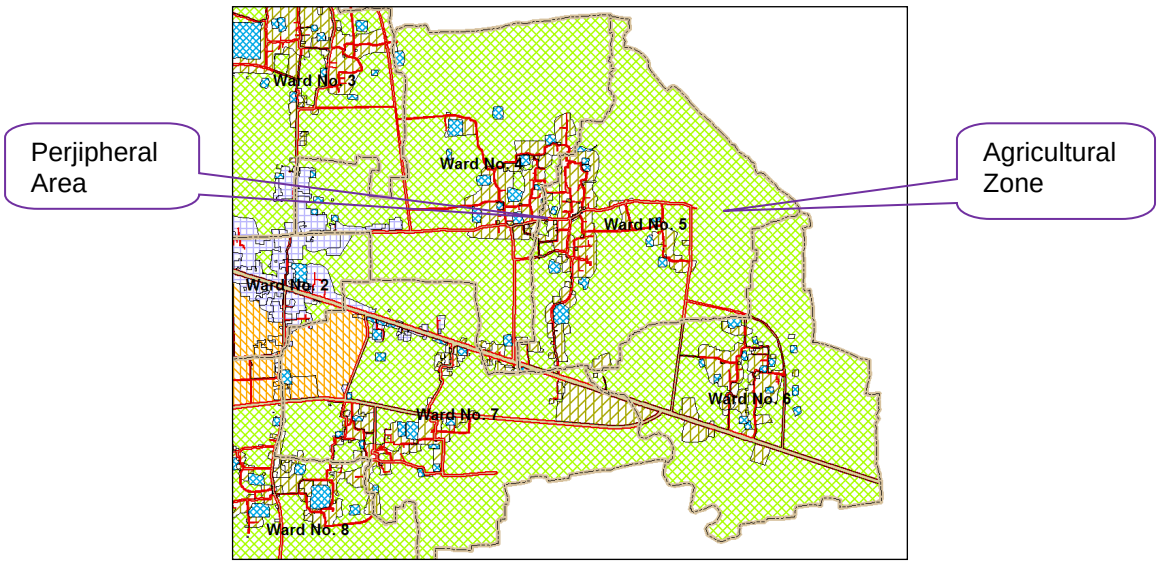


Fig 7-5: Agriculture Land spread all over of the Paurashava

7.1.6 Water body/Retention Area

Total 116.78 acres area, which covers 3.41 % of Structure Plan area, is declared as water body (**Map 7-1**). It includes pond, ditch and all the canals and river within the Paurashava. More detail information is provided in drainage and environmental plan.

7.1.7 Major Circulation Network

It contains major road network with Joypurhat and other neighbor urban center and also included the major road way network required for maintaining existing internal communication. Total 177.96 acres land which cover 5.19% of total structure plan area. Total length of the circulation network is about 77.11 km. **Map 7-1** shows major circulation network.

7.2 Strategies for optimum use of Urban Land Resources

7.2.1 Optimum use of Urban Land Resources

With a limited land mass, Bangladesh is the most densely populated country in the world. The land area of the country remains static amid continuously increasing population. Such a situation calls for strict regulation to utilize its scarce land resources for non-agricultural purposes. Increase in urban population means more demand for houses, roads, schools, hospitals, factories, bazars, shops, business centres, offices, other service facilities etc. Providing all these facilities require land and that is at the cost of valuable agricultural land, as the country has hardly any fallow land to accommodate all these land uses. Paurashava is surrounded by valuable fertile agricultural land. Any urban expansion will cost net deduction of agricultural land that will consequently affect local food and cash crop production. Practice of thriftiness on land utilization is, therefore, essentially needed in plans and development proposals. Such practice should start through adoption of conservative and rational standards of space use and their proper application in planning, designing and development. **Table 7-2** shows the optimum use of urban land resources.

Table 7-2: Policy for optimum use of urban land resources

Policy	Justification	Means of Implementation	Implementing Agency
Policy UA/1: Optimization of Available Land Resources Growth within the established urban area is not compact in Kalai. There are still large amount of land lying vacant amid all categories of land uses within the Paurashava area and beyond. Infilling of these lands should be promoted and encouraged to optimize use of land.	Keeping large land areas vacant within the existing built up area, extension of physical boundary of the town is not logical. Such a tendency might cause valuable agricultural land out of use. There is a need to economize the use of land, which is a scarce resource against an expanding population in the country.	*Control:* Imposition of tax on the land remaining vacant for a long time can be tried to discourage speculation on the land use practices. Measures should be adopted to minimize the use of land by public sector agencies. Policies to discourage large scale land acquisition for development by the public sector can be tried. *Promotion*:	- Kalai Paurashava; - Ministry of Land

Policy	Justification	Means of Implementation	Implementing Agency
		The public sector should develop infrastructure facilities and services in deprived areas to enable the land owners for development.	
Policy UA/2: Utilisation of Khas Land for Urban Development	Khas lands are public land that should be made best use for community purpose. Instead of evicting people from their own land for implementing development proposals, khas land should be used as much as possible.	Taking over of khas land by Paurashava that falls under different development proposals under the current development plan. Paurashava can later on hand over the land to the concerned authority that will implement the particular development proposals.	-Kalai Paurashava -Ministry of Land -DC, Joypurhat

7.2.2 Plans for New Area Development

Table 7.3 shows policy to develop new urban area. It includes justification of new area development, means of implementation and agencies for implementation.

Table 7-3: Policy for new area development

Policy	Justification	Means of Implementation	Implementing Agency
POLICY UA/3: INITIATIVES FOR NEW URBAN AREA DEVELOPMENT	New areas with their growing stage offer excellent opportunity for organized development with little or no compensation cost for eviction and less hindrances in motivation of the local residents in favor of organized development	Participatory approach to new urban area development is to be supported by innovative ideas of spatial development. Long motivational activities will have to be carried out for this purpose. Public sector with technical and financial support of the private sector and cooperation from service giving agencies will make the task easier.	- Kalai Paurashava - DPHE - Private sector

7.2.3 Areas for Conservation and Protection

To ensure liveable environment in the planning area, different areas are conserved in various forms, namely agricultural land, low land, pond and natural drainage, green belt, historic and heritage areas, etc. Details are given in **Table 7.4**.

Table 7-4: Area for conservation and protection

Type of Land	a. Means of Implementation	Implementing Agency
Loss of Productive Agricultural Land: The Master Plan area has a vast agricultural land in the northern side of this project. After implementation of the project, environment of agriculture will be converted into non-productive urban and semi-urban area.	The EIA Guidelines of DOE emphasized on the avoidance of productive agricultural land for any development project. Therefore, it will be wise to consider more economical use of land to avoid fertile lands. The town expansion and land acquisition should be based on the growth rate of population. According to population projection for the year 2031, the present residential land use area will grow with increasing density. So a large share of agricultural land can be spared at least for the time being.	- Paurashava - DOE
Low Land, Pond and Drainage Path: A total of 180 ponds with an area equal to or more than 0.25 acres within the Paurashava are declared as retention area. In no way permission for filling up of these ponds should be given. Paurashava should acquire these ponds at suitable time to use them for retention and emergency use.	This area is declared as water body in the Master Plan. As per the guideline of The Act (36 of 2000) for Conservation of Play field, Open space, Park and Natural Water Reservoir in Mega City, Divisional Town, District Town and Paurashavas of Bangladesh, this area will be conserved as water body. According to population projection for the year 2031, the present residential land use area can be developed with increasing density up to this year. So a large share of water body can be spared.	- Paurashava - Water Development Board
Green Belt: The Bank of the Jamuneswary river is declared as green belt. This area will be used for aforestation and recreational purposes for conservation of environment and creation of opportunity for tourism development in this town.	This area is declared as green belt in the Master Plan.	- Paurashava

7.3 Policies for Development

This section of the chapter sets forth strategies and policies for various components of the Master Plan on sectoral basis.

7.3.1 Policies for Socio-economic Sector

Population

Controlling population should be given utmost importance nationally, as because of the uninterrupted population growth, the country's economic problems are being accentuated, pressing on its resources. It makes poverty reduction difficult, which is the key to overall national development. It is, therefore, necessary to enhance population control drive. The people at the grassroots can play an effective role in this regard. An efficient, well trained and well paid grassroots level work force can help profoundly in achieving the targets of population control policy of the government. Side by side, promotion of education can be very effective in the creation of awareness about small family size. The Paurashava may undertake relevant measures in line with national objectives to strengthen its own position in population planning.

Strategy

Raise the level of education among mass people and emphasize more on grassroots level family planning workers' services with effective delivery of birth control services.

Table 7-5: Policy for Population Sector

Policy	Executing Agency
Popu/1: Declaring population as one of the most critical sectors of national development	-Ministry of Planning -Ministry of Health and Family Planning
Justification: Per capita national growth is being eaten up by constantly growing population. By controlling population, national benefits earned from economic growth can be shared in a better way, raising the level of living standard of the people.	
Popu/2: Putting more efforts and resources in raising the level of education.	-Ministry of Education -Ministry of Planning -Ministry of Health and Family Planning
Justification: Education would not only create awareness among the masses about the benefits of small family size, it will also help secure better job with higher pay that would reduce poverty.	
Popu/3: Creation of well paid and well trained grassroots level family planning workers for motivational work.	-Ministry of Planning -Ministry of Health and Family Planning
Justification: Grassroots level workers can give door to door motivational services and distribute birth control materials in a better way. To get good services they must be efficient and well paid.	

Economic Development and Employment Generation

Economic development of any place is associated with generation of employment. The generation of employment depends on the rate of investment in various sectors of an economy. An urban economy of any town starts building up with investment in the basic sector that leads to the building up of the non-basic sector. Investment in basic sector is not very bright in as it is a very small town with a very small size of population. However, the Paurashava must ensure that any foreseeable opportunity in economic development is given due attention for its own growth and economic benefits.

Strategy:

- Creating basic sector investment climate and leading the local economy forward through promotion of Small and Medium Enterprises (SME).

Table 7-6: Policy for Economic Development and Employment Generation

Policy	Executing Agency
Econ/1: Provision of bank loans on easy terms to attract prospective investors in the SME sector.	-Ministry of Industries -Ministry of Commerce
Justification: Easy loans would encourage and attract prospective investors for investment in small scale industries.	
Popu/2: Taking of measures to channelize remittance to value adding productive sectors.	-Ministry of Industries -Ministry of Commerce
Justification: Larger amount of remittance is being diverted to land purchase, which is considered as the safest investment. This huge capital may be diverted to productive sectors to help create more employment.	
Popu/3: Arranging entrepreneurship training programmes for prospective investors.	-Ministry of Industries -Ministry of Commerce
Justification: There are many potential investors who are ignorant of the ways and means of investment and operation of an enterprise. The training can help them get educated in these lines.	

Housing

As the town has low level of population, housing is yet to become a problem here. Housing policy and programmes are provided and executed by the national government. There is no local office of the National Housing Authority to execute housing programmes at Upazila level. As a local government, Paurashava can facilitate housing area development by means of providing road infrastructure, drainage, water supply, etc in designated housing zones. The consultant supports the prevailing national housing policy and advocates its execution at all levels, which at the moment is highly lacking.

No slums are observed in this small town, the way they are exposed in large cities. So no slum and squatter related problems are there in the town. This provides a better scope for planned housing development in the Paurashava.

Strategy:

- Upholding the role of Paurashava, as a facilitator to provide all necessary infrastructure and services to enable housing by people in general. As a least cost approach, involvement of the land owners can be encouraged in housing area development on a public-private partnership basis.

Table 7-7: Housing and Slum Improvement

Policy	Executing Agency
Policy House/1: Provision of necessary services and facilities to promote housing at private sector.	- National Housing Authority - Ministry of LGRD - Paurashava
Justification: It is more difficult to provide housing on public sector initiatives, as it involves funding and land acquisition that takes a long time. By providing infrastructure and services, general people can be encouraged to build their own houses.	
Policy House/2: Housing zone land owners can be involved in a participatory development approach, where Paurashava will provide infrastructure and the cost will be shared by land owners.	- National Housing Authority - Ministry of LGRD - Paurashava

Social Amenities and Community Facilities

Social amenities and community facilities include, education facilities, health facilities, open space recreation facilities like, park and playground, amusement park and community centre. For comfortable and healthy urban living, these facilities are the fundamentals. Since these are social services, they must be provided by the public sector agencies as public good. For education and health facilities, the national governments have policies and there are separate ministries and their agencies to execute the policies through programmes and projects. There are also Upazila level offices of the concerned agencies to take care of the execution of national education and health policies and programmes. For providing amenities like, park and playground and community centre, the responsibility lies with the Paurashava.

For park and playground, the Paurashava may secure local khas land. The open space recreation is difficult to provide as population expands and land price goes higher. Once time is lost, vacant lands are also lost. Amid soaring land price and absence of vacant land, it becomes extremely difficult to provide open space recreation. So, it is better to secure vacant lands for open space before density of population increases and land becomes scarce and pricier. For community center, intensive use of land should be made by making multiple use of the same space, for example, providing community center, ward councilor's office, clinic or any other use in the same building.

Strategy:

- Exploring khas /public land within the Paurashava and using the unused/vacant land for providing amenities, before density of population increases and land becomes scarce and dearer.

Table 7-8: Social Amenities and Community Facilities

Policy	Executing Agency
Policy-Amenity/1: Procurement of khas and other public land for park, playfield, community centre.	-Ministry of Land -DC Office, Joypurhat - Ministry of LGRD - Paurashava
Justification: Since above facilities are non-revenue earning, they should be procured at least cost.	

Policy	Executing Agency
Policy-Amenity/2: Land should be procured for open space facilities as quickly as possible, because when land value will be higher, cost of providing the facilities will also be very higher. Besides, with the growth of population, vacant land will disappear gradually, so no land will be available at strategic locations for providing open space facilities.	-Ministry of Land -DC Office, Joypurhat - Ministry of LGRD - Paurashava

7.3.2 Physical Infrastructure Sector

Transport

By far, transport is the most important means to revitalize an urban center. Intra and inter urban transportation facilities create economies of scale for prospective investors and enables easy and comfortable mobility of the residents. Easy and cheaper transportation of raw materials and finished goods create good investment climate for manufacturing enterprises that lead to development of the service sector firms. New employment generates and the non-basic sector expands leading to thriving urban center. To create transportation facilities, quality inter-Upazila and inter-District road network will have to be created that makes movement faster and easy. With good transport infrastructure, economic development may become attractive. Besides, quality of local roads will have to be upgraded to encourage people live in the town. Once population starts increasing, it will expand local consumer market and will attract new investments in consumer goods production.

Strategy:

- Creation of efficient inter-city and intra-town communication for easy transportation of goods and passengers.

Table 7-9: Policy for Transport Sector

Policy	Executing Agency
Policy-Transport/1: Development of efficient inter-city road network with standard road.	- Roads & Highways Department (RHD)
Justification: Increased inter-city mobility will increase business transactions and generate investment and employment.	
Policy-Transport/2: Promotion of efficient road transport facilities between urban centers.	- Bangladesh Road Transport Authority (BRTA) - Joypurhat District
Justification: Not only that communication is needed between urban centers, but to attract investment, emphasis must be laid on quality of roads built.	
Policy-Transport/3: Development of local road network through participatory approach.	- Paurashava - Local Government Engineering Department (LGED)
Justification: Development of roads will involve huge cost. Participatory development will enable cost sharing, which will reduce cost of road construction substantially.	

Utility Services

Utility services are the most essential parts of urban life. To make an urban center livable, there must be adequate provision for utility services. Utility services include water supply, solid waste management, power supply, sanitation and drainage. Except power supply, the rest are the responsibilities of the Paurashava.

Strategy:

- Attainment of self reliance in revenue collection and adoption of participatory approach to service provision to ensure better services and facilities to the people.

Table 7-10: Policy for Utility Services

Policy	Executing Agency
Policy-Utility/1: Exploration of alternative sources of water to ensure sustainable supply.	- LGED - Paurashava
Justification: Justification: Amid constant rise of urban population, it is time to explore alternative sources of water like, rain water harvesting and surface water supply.	
Policy-Utility/2: Involvement of beneficiaries in solid waste management.	- Paurashava - NGOs and CBOs
Justification: Involvement of beneficiaries in solid waste management will make the operation more effective and reduce financial responsibility of the Paurashava.	
Policy-Utility/3: Exploring re-use and recycling of waste materials to extract resources.	- Paurashava - NGOs and CBOs
Justification: Re-use and recycling of waste materials will produce resources and reduce cost of waste management.	
Policy-Utility/4: Publicity on the benefits of hygienic sanitation to motivate people and enable people to have easy access to sanitary materials.	- LGED - Paurashava - NGOs and CBOs
Justification: Motivation will encourage people to adopt healthy sanitation and reduce health risks.	
Policy-Utility/5: Protection of natural drainage system and preparation of hierarchical drainage network.	- LGED - Paurashava
Justification: Natural drainage systems are being grabbed and filled up, which increases the risk of water logging. Well planned hierarchical drainage network helps smooth drainage of storm and waste water.	

7.3.3 Environmental Issues

From environmental point of view Kalai Paurashava is not yet badly affected. There are some issues that must be taken care of. The issue of sanitation has already been dealt within the utility services section. Except cyclone, there is no natural hazard. There is no mentionable air, water or soil pollution in the Paurashava from any mentionable sources at present.

Natural Resources

The Paurashava is not endowed with many natural resources that can be conserved. Among the larger natural resources that are available, 162 number of ponds and natural drainage canals can be mentioned. and the natural khals need to be protected and conserved to ensure sustainability in drainage and water supply of the Paurashava.

Strategy:

- All khas land and canals should be vested with Paurashava for use in community interest.

Table 7-11: Policy for Natural Resources

Policy	Executing Agency
Policy-Nature /1: All khas lands within the Paurashava must be assessed and handed over to the Paurashava for use in community interest.	- Ministry of Land - Paurashava
Justification: This will prevent misuse of khas lands by political and powerful local people.	
Policy-Nature /2: All natural canals within the Paurashava must be vested with the Paurashava for maintenance and proper use as drainage canal.	- Ministry of Land - Paurashava - NGOs and CBOs
Justification: This will help prevent unauthorized occupation and filling of natural drainage.	

Chapter 8: Implementation Issues

This chapter deals with the issues of implementation of the Master Plan. Here, recommendations have been made about capacity building and resource mobilization for the implementation of the plan.

8.1 Institutional Capacity Building of the Paurashava

In the present context of spatial and legal jurisdiction of the Paurashava for planned development of its area, some recommendations are made here. Also, observing the financial and Institutional strength of individual stakeholders in relation to their liabilities and identifying their shortages and absence of any perfect coordinating body, some suggestions have been made as remedial measures as a whole.

- All urban local governments including Upazila level Paurashavas must be given more independence and autonomy to perform their responsibilities. At the same time, their accountability to the government and people regarding their performance has to be ensured. For this purpose the legal framework of the urban local governments has to be reviewed and updated. The legal provisions have to be consolidated and simplified and make them compatible to changing circumstances. Opportunities must be created in the Act allowing scope for privatization of service providing activities.
- To avoid duplication of development functions, there should be clear line of separation between central government and the urban local government.
- A double entry cash accounting system has to be introduced to modernize the accounting system. For this purpose, massive training programme has to be arranged for the relevant municipal staff.
- To improve revenue collection, the urban local governments should be given more power and responsibilities. Measures should be taken for strengthening the Paurashava administration for municipal development.
- Section-50 of the Local Government (Paurashava) Act2009 needs to be revised and more power should be given to the Executive Officer for appointment of employees.

It can not virtually function effectively as a Paurashava under such a stringent financial condition. To function, effectively, it must raise its revenue earning. But it is reported that the Paurashava can not collect all its holding tax from the citizens. Holding tax is the most important source of its own revenue earning. It must take care to ensure 100% recovery of holding tax. The Paurashava can not function effectively depending upon government grant only. The existing manpower position of the Engineering, Development control and Accounts should be substantially raised to handle future volume of work. Moreover, additional staff especially for the implementation of Master Plan will soon be required.

The present plan package imposes a large number of development projects on Kalai Paurashava for implementation. Paurashava will not only be the custodian of the plan, it will also directly implement much of the development projects. Besides, it will also be responsible for monitoring

and implementation of the development projects by other urban development and service giving agencies. This situation calls for strengthening of the existing capability of Paurashava.

8.1.1 Staffing and Training

As a traditional system of the Paurashava, engineer and secretary are appointed directly by the Ministry of Local Government and other staffs are appointed locally through the approval of the Ministry after the advertisement on the newspapers. In Kalai Paurashava, the revenue income is too low. That's why it is not capable to pay the salary of all the officials and staffs. The salary is recovered from the government grant and BMDF allocation. This is the main reason for under staffing of the Paurashava.

There is no proper arrangement for staff training. As a result, the staffs are mostly unskilled. They can not deliver proper service to the citizens. Besides, most of them are not qualified enough to render proper services.

8.1.2 Lack of Automation

Most works in the Paurashava are done manually. Such practice delays works and deprives the citizens from services. This is also a source of mal-practice and corruption. Modern office and working equipment should be installed. Use of modern technology will increase efficiency in planning and record keeping, finally expedite decision making process.

8.1.3 Town Planning Capacity

8.1.3.1 Institutional Framework

To rearrange the institutional framework for the Paurashavas recently the government has made a committee to reform the organogram of all the Paurashavas of Bangladesh. According to the clause no. 72-78 (Paurashava Officer & staff, provident fund etc) of Paurashava Act, 2009 and on the basis of the type and category of works, the committee suggested appropriate section/units/divisions within the Paurashava framework. Planning unit or division will be necessary to set sequentially as the authority can perform it's mandatory responsibility 'town development and control' well and serve the inhabitants presently as well as in the future. The planning unit/division may have some sections that are as follows:

Planning unit/Division:
a) IT Section
b) Planning Section
c) Beautification and recreation Section

According to the division and it's relevant sections, what so ever appropriate with the necessity and capacity over time, it is recommended to set up necessary manpower for each category of Paurashava. Possible scope of proposed planning unit/division is given bellow:

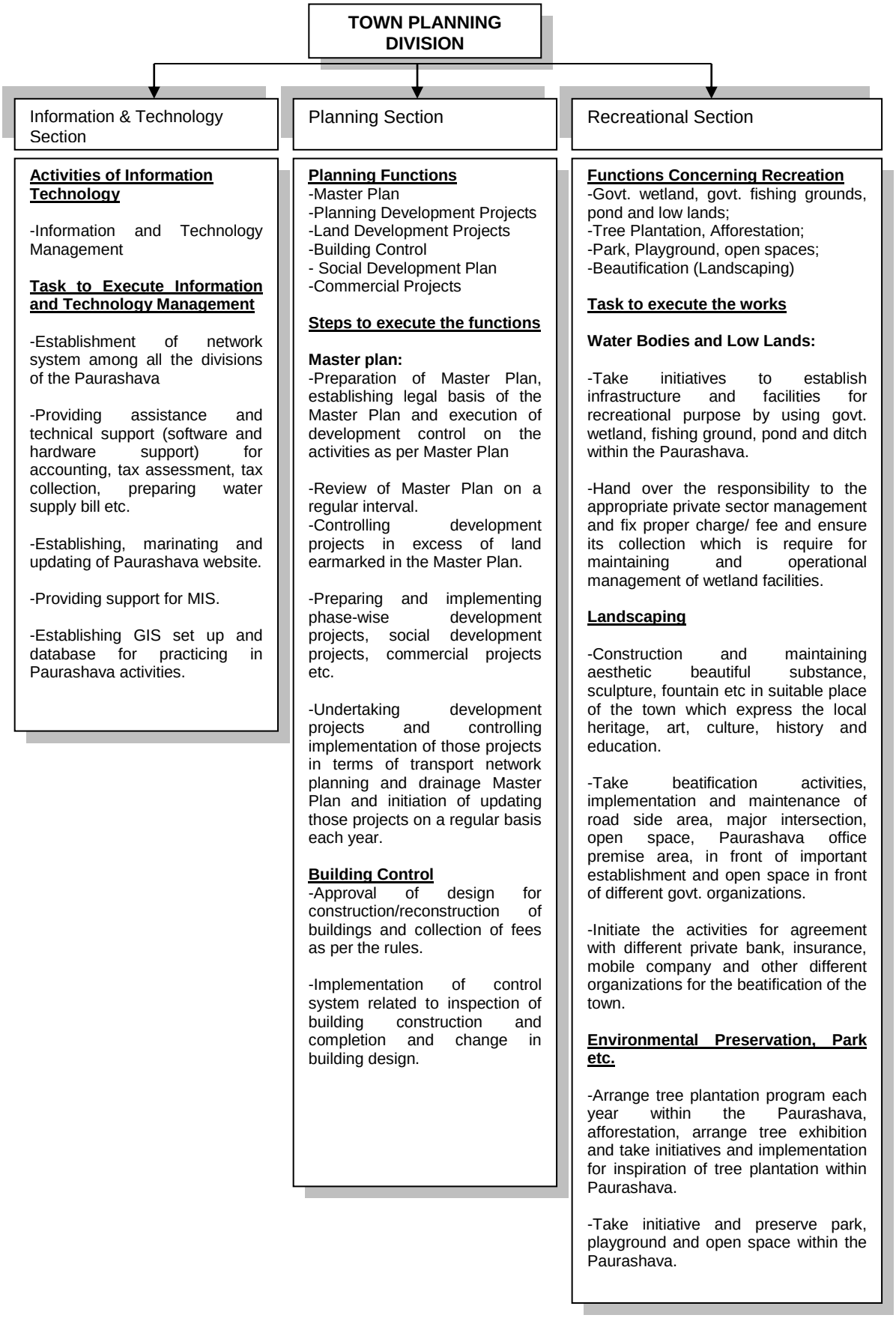


Fig 8-1: Scope of Work for Planning Division

8.1.3.2 Lack of Paurashava Town Planning Capacity

At present, the Paurashava has no town planning department or any appropriate manpower to prepare and implement the Master Plan. For proper implementation of the Master Plan for each Paurashava under UTIDP, establishment of a separate Planning Department is indispensable. The Paurashava must strengthen its capacity to implement its Master Plan when it will be completed. It will otherwise be in trouble for implementation, monitoring and updating the Master Plan.

Kalai is a 'B' class Paurashava. For the 'B' class Paurashava Government approved an organogram/ manpower requirement. If we compare the existing manpower with the approved organogram we find that there is a huge gap between the two. Many positions have been vacant since the inception of Paurashava. Out of total 130 numbers of allocated positions only 53 numbers are filled up. However, strengthening of the Town Planning Department is a pre-requisite for successful implementation of the Structure Plan. Following organogram of the Town Planning Department is proposed for staffing capacity building of this Unit.

8.1.1 Legal Aspects

The drive to establish strong urban local governance in the Paurashava is yet to be legalized. The governance programs at present are operated project wise based on the formulated policies of the implementing agencies of the national government. The Laws that the country inherited are mostly prepared during the colonial rule to serve its own interests. Even after independence from the British, the issue of good governance was not infused into the new Acts formulated.

8.1.2 Good Governance in Legal Provisions

There is hardly any Act where the elements of good governance are clearly visible. The consultant has identified some Acts, where some elements of good governance can be traced.

The Paurashava/Municipal Act/Ordinances prepared at different times since 1960's have iterated for the preparation of Master Plan by the Paurashava/Municipality for its planned development. So far urban local government Ordinances/Acts made in 1967, 1977, 2008 and 2009, all suggested for planned development. The Local Government (Paurashava) Act 2009 has made the provision of having a Master Plan prepared by a Paurashava within five years of its inception. The function of the Paurashava also includes that it ensures planned development following the rules of the Ordinance. But there is no provision for public participation in the Local Government (Paurashava) Act 2009. In all these legal documents, people's role has been ignored which is the violation of the norms of good governance.

The constitution of the Peoples' republic of Bangladesh clearly spells out that the Government should work to minimize the gap between urban and rural areas. A planned Paurashava development in that pursuit can provide necessary services to improve quality of life in both urban and rural areas within the Upazila.

8.1.3 Financial Issues

Governance in Kalai Paurashava

Financial governance refers to transparency and accountability of financial matters. All financial matters must be transparent to all. People must know about the policies and programs of the Paurashava, how much revenue is collected each year and the amount of expenditure made on annual development. They must also be answerable to the people on how the public money is being spent and accounts being maintained.

The Ministry of LGRD and Cooperative has undertaken a number of projects in respect of establishing governance in upgrading Paurashava accounts system, like, UGIIP, STIFPP. Computer and accessories are supplied under these projects for automation of the accounts system. Besides, trainings are also offered to the Paurashava accounts staff for enabling introduction of automation in accounts system. But all these services have not yet reached Paurashava.

Revenue Management

The Paurashava still follows a traditional management system in tax collection and revenue management though a scheme of computerized automotive financial system has already been introduced in this Paurashava. Assessment section is responsible to asses the tax of the Paurashava and tax collection, and license and bazar section are responsible to collect the tax of the Paurashava. The public is mainly informed about tax collection during the presentation of annual budget. They may, however, get information from the councilor or Paurashava accounts office.

Paurashava's Financial Capacity and Plan Execution

The main focus of Paurashava financial governance is to establish automation in entire financial management. This includes computerization of accounts system, holding tax management, and billing of different service charges. Software for above functions have been supplied and installed in the Paurashavas covered by financial automotive projects. The projects also provided training to the relevant staffs for functioning of the systems. With the implementation of these projects people can now instantly know about the status of their tax payment, bill payment, and licensing. This has not only made the functions of the Paurashava easy, but also has freed the citizens for paying bribe, and experiencing hassle.

The size of annual budgets of the Paurashavas indicates the poor financial status of the Paurashavas. With low income, Kalai Paurashava will have to depend substantially on the government funding for implementing the development projects. But the government has limitations of its resources. In such a situation, if the Paurashava can not raise its own revenue adequately, it will not be able to execute much of the development projects under the Master Plan.

8.1.4 Monitoring, Evaluation and Updating

Monitoring and evaluation is a very important part of plan implementation. Monitoring helps check if the plan is being implemented properly. It also measures the level of implementation of the plan. If the plan implementation is not on track, corrective measures can be taken to put execution on the track. After expiry of any plan, evaluation is made about the errors and omissions. Such evaluation helps take corrective measures in the next plan. Such monitoring and evaluation must be carried out from within the Paurashava. But Kalai Paurashava is not equipped with qualified manpower to make such evaluation. Monitoring and evaluation of a plan is essentially, the responsibility of qualified and experienced planners. As there is no planner in the Paurashava, monitoring of plan implementation will be seriously affected. However, plan evaluation can be accomplished by means of out sourcing as and when it is required.

8.1.5 Periodic Review and Updating

The plan package needs to be updated regularly to make it respond to the spatial changes over time. But such updating would require relevant technical professionals and requisite fund that are highly lacking in Kalai Paurashava. As there is no planner or planning department in the Paurashava, review and updating of the Master Plan will require service of senior level planners that Paurashava might not be able to provide. This service will have to be procured by out sourcing and the Paurashava is not even capable to accomplish this financially either. This will create problem when the plans or its components gets obsolete or need to be changed. Another problem would arise when the duration of plans ends. It is necessary that the entire plan document (including all planning and land use proposals) should be reviewed every 4th year of the plan period and will come into execution from the 5th year. The aim of the review will be to analyze the status of implementation of plan provisions, the changing physical growth pattern, infrastructure development, and the trend of public and private physical development including growth direction.

A new set of plans will have to be prepared replacing the old ones. This problem, however, can be overcome by undertaking another planning project by LGED. So, for regular updating and changes, and plan implementation monitoring, the Paurashava should immediately set up a planning devision with a number of planners and other staff. The section will not only look after planning, but will also be responsible for development control, estate management, and project preparation. Since the planners would be qualified and skilled in computer operation, they can also help achieving automation of the Paurashava functions.

8.2 Resource Mobilization

Resource mobilization will be one of the most challenging tasks in implementing the current plan package. Though the development proposals are said to be executed by a large number of development agencies, but it is beyond doubt that the heaviest burdens will have to be shouldered by the Paurashava. As a local government agency, it suffers from resource constraint due to low level of urbanization and investment by both public and private sectors. The land value will maintain perpetually low growth rate in the town. Therefore, prospect of mobilization of substantial resource from sale of serviced land is extremely meager. For the same reason, revenue earning from betterment fee, planning permission and other sources may also remain low. Paurashava is

heavily dependent on the government for executing its development projects as it is unable to collect sufficient revenue from its tax and non-tax sources. Therefore, it is clear that execution of development projects under the current plan will depend heavily on the government response to supply adequate fund. This situation calls for increasing revenue earning by generating new revenue sources.

8.3 Concluding Remarks

From the past experience, it has been observed that plans are prepared for organized development, but development control has been subject to negligence. In most cases, execution has been piece-meal. It is unfortunate that town planning has not yet become a part of our urban development culture. Individuals develop lands and construct buildings with a little respect for planned development, and the concerned authority is also unable to exercise full control on development. Some strict measures are necessary to make stakeholders follow up plans and development rules. Awareness is to be built among the people to follow the Master Plan provisions and plan. Government agencies must be compelled to follow plans. Existing laws in this regard must be updated incorporating provisions of plan execution.

Chapter 9: Urban Area Plan

This is the first chapter of Part- B that starts with Urban Area Plan. Urban Area Plan is the mid level plan that covers the existing Paurashava. It lays down the land use zoning plan and infrastructure development proposals at the town level. Land use planning is an important part of Master Plan ensuring that land is used efficiently for the benefit of economy, society and environment of Kalai Paurashava. This planning means the scientific, aesthetic, and orderly disposition of land, resources, facilities and services with a view to securing the physical, economic and social well-being of urban communities.

9.1 Goals and Objectives of Urban Area Plan

Urban Area Plan is the first phase illustration of the Structure Plan intended to be implemented over a time span of 10 years that includes 1st phase (1st-5th year) and 2nd phase (6th-10th year) of development programs. The Urban Area Plan has been prepared within the policy framework of the Structure Plan and aims to attain the overall project objectives. So there is a hierarchical relationship between the two. In fact, Urban Area Plan is the first phase detailed illustration of the policies and strategies of the structure plan.

The preparation of Master Plan for Kalai Paurashava is aimed towards its future development, and covers the areas that are likely to become urban in future. The Urban Area Plan is aimed to:

- determine the present and future functional structure of the town, including its land uses; and
- Provide infrastructure proposals for improving and guiding development of future urban area.

9.2 Methodology and Approach to Planning

The base map supporting for land use survey was obtained from the physical feature survey that contained all categories of physical features within the planning area (Chapter 3 of Survey Report). During physical feature survey, all structures and the functions of principal buildings were picked up and depicted on the map. The physical features were superimposed on a mouza map and printed for land use survey on the map. The map was carried to the field by investigators for detailed plot to plot land use survey (Chapter 4 of Survey Report). The field investigators carrying the map visited each and every plot and the structures therein and noted their uses in writing and marking them on the map with colour pencil. They also verified the land uses and put during the physical feature survey. Back in the office, the common land uses of plots were delineated in the map as per land use format given in the ToR. The delineated zones were then digitized and a new land use map was prepared for the entire planning area. After land use demarcation, field checking was done to correct possible errors.

Urban Land Use Plan is aimed to guide the physical development of town including its economic and social activities. This plan adheres to the policy directives spelled out in the Structure Plan. The current Urban Area Plan is akin to the traditional Master Plan approach prevalent in the

country that designates plot-to-plot use of land apart from infrastructure development proposals. Thus it will also serve as a development control mechanism/instrument. The Urban Area Plan is, therefore, more rigid than Structure Plan. Making a land use plan on a cadastral map makes the Urban Area Plan more rigid. Once the plan on a cadastral map is drawn and accepted by the government and formalized, it gains a formal status and thus becomes a binding for all concerned.

The objectives of the Urban Area Plan have been attained through:

- orderly location of various urban land uses;
- location of appropriate transportation and drainage network; and
- Orderly location of services and facilities.

9.2.1 Delineation of Planning Areas

For delineation of Master Plan area, it is necessary to identify the possible future urban growth locations. The objective of project area demarcation is to determine the boundary of the area and mark it on the map as well as in the field. Logic behind the delineation of the Planning area of Kalai Paurashava for the year 2031 has been done on the basis of the gazette notification of the Paurashava and after the reconnaissance survey within the area, the discussions with all groups of stakeholders, analyzing the present trend of developmental growth of the town. Cooperation of the Paurashava was more important in delineating the Paurashava area in the cadastral map and the future planning area boundary (Detail was given in Chapter 2, Section 2.4 of Survey Report). As conversant with local conditions & the future trend of development, valuable advices were received from the Poura Mayor and its engineers and other staffs. **Table 9-1** presents the detail about the mouzas, within the 9 wards of the Paurashava.

Table 9-1: List of Mouza Maps of Kalai Paurashava

Sl No	Paurashava	Mouza Name	J.L No	Sheet No	Mouza Type	Source
1	Kalai	Kathail	112	00	RS	DLRS
2	Kalai	Mulgram	109	00	RS	DLRS
3	Kalai	Purbo Sarail	108	00	RS	DLRS
4	Kalai	Dahra	110	00	RS	DLRS
5	Kalai	Kalai	111	01.02	RS	DLRS
6	Kalai	Aura	56	01,02	RS	DLRS
7	Kalai	Duronjo	55	00	RS	DLRS
8	Kalai	Thupsara	50	01	RS	DLRS
9	Kalai	Hatior	54	02	RS	DLRS

Source: DLRS, 2008

9.2.2 Content and Form of Urban Area Plan

The Urban Area Plan is presented in both map and textual format. The plan map is presented in 1:1980 or 1 inch to 165 feet scale, superimposed on latest cadastral/revenue map having plot boundaries within mouzas. The plan is accompanied by an explanatory report supported by necessary figures, maps and data. The report explains the various plan proposals and other

components of the plan. At present, the Urban Area Plan covers the total area of Structure Plan area of 3435.1 acres with a present population (2011) of 16464 of Kalai Paurashava.

The Urban Area Plan of the Master Plan of Kalai Paurashava contains several components. These are:

i) Land Use Plan;

ii) Transportation and Traffic Management Plan;

iii) Drainage and Environmental Management Plan and

iv) Proposals for Urban Services.

Chapter 10: Landuse Plan

The Land Use Plan is the main part of the Urban Area Plan and is planned for the period of first 10 years. The proposals in the Land Use Plan will be implemented through the 1st and 2nd phase development programs of the Master Plan. The 1st phase development projects are identified as priority projects and are listed in the Ward Action Plan for implementation within the first five years of the Master Plan.

10.1 Existing and Projected land use

This section describes the analysis of existing and proposed land uses and at the same time mentions estimation on the requirement of land for different land uses. It also lays down the land use zoning plan and infrastructure development proposals at the town level.

10.1.1 Existing Land Use

Map 10-1 illustrates how the land uses are distributed at present in the Paurashava area. The information helps the preparation of Master Plan providing background information for selection of areas of different land uses.

In the land use pattern of the Paurashava, 16 types of land uses are found. It is clearly evident from the table that agricultural land use (almost 79.10%) dominates the Paurashava area, followed by residential (10.23%), water bodies (4.90%), circulation network (1.08) and transport and government services and educational land use occupy same percentage of land (less than 0.5%). Paurashava has followed its major development along the Bogra-Joypurhat highway.

Table 10-1: Existing Land use Classification of Kalai Paurashava

No.	LANDUSE	Area in Acre	Area (%)
1	Agricultural	2717.23	79.10
2	Circulation Network	37.23	1.08
3	Commercial	13.30	0.39
4	Community Services	2.79	0.08
5	Education & Research	6.49	0.19
6	Forest Area	0	0.00
7	Government Services	2.67	0.08
8	Industrial/ Manufacturing Processing	45.01	1.31
9	Miscellaneous / Others	1.15	0.03
10	Mixed Use	80.55	2.34
11	Non Government Services	0.11	0.00
12	Recreational Facilities	4.81	0.14
13	Residential	351.52	10.23
14	Restricted Area	0	0.00
15	Service Activity	1.28	0.04
16	Transport and Communication	0.93	0.03
17	Urban Green Space	1.51	0.04
18	Vacant Land	0	0.00
19	Water body	168.47	4.90
Total		**3435.1**	**100**

Source: Land Use Survey, 2010

Map 10-1: Existing Land Use Map of Kalai Paurashava

10.1.1 Land Requirement Estimation

This section proposes land use zoning plan for different land uses of the future town. The estimations have been made according to the Planning Standard approved by the client. The category wise land allocations are provided below.

Housing

Housing is the most significant segment of urban development scenario. The future housing area need to be based on a recommended planning standard of 100-150 persons per acre. At present the net density of the Paurashava is 22.93 person/acre. With this standard, the estimation shows, the maximum land required to accommodate total projected population (22750) in the year 2031 will be 227.5 acres. But survey of existing land use has identified 351.52 acres of land is currently under housing use with a density of population (about 46.84 persons/acre). Actual 430.15 acre of land is proposed in the plan. The consultant considered the standard for general housing as 53 persons /acre. Table 10.2 shows the detail.

Table 10-2: Estimation of Housing Land Requirement

Use/Facility	Recommended Standard	Land in Acre		
		Estimation (2031)	Existing Land	Addl. Requirement
General Housing	150 persons/acre	151.67	351.52	Existing land is More than requirment
	100 persons/acre	227.50		

Commerce and Shopping

Market facilities are usually provided privately on commercial basis depending on the trend of sale of goods. However, for the sake of current planning, we can earmark land as per standard at appropriate location, where commercial facilities may be developed privately or publicly. Including existing commercial activities, the total commercial land in 2031 has been fixed at 26.53 acres. **Table 10-3** shows the detail.

Table 10-3: Estimation of Land Requirement for Commerce and Shopping

Use/Facility	Recommended Standard	Land in Acre		
		Estimation	Existing Land	Addl. Requirement
Wholesale	1.00 acre/ 10000 population	2.28	-	-
Neighborhood/Local	1.00 acre/per neighborhood Market	-	-	-
Retail Sale	1.0 acres/ 1000 population	22.75	-	-
Super Market	1.50 – 2.50 acres/per super market	1.50	-	-
Corner Shop		-	-	-
Total:		**26.53**	**13.3**	**13.23**

Industry

According to approved planning standard, the total land for industries is estimated to be 56.88 acres with 34.13 acres for small scale industries and 22.75 acres for cottage industries. **Table 10-4** shows the details.

Table 10-4: Estimation of Land Requirement for Industries

Use/Facility	Recommended Standard	Land in Acre		
		Existing Land	Estimation	Addl. Requirement
General	1.00 acres /1000 population	34.13	34.13	No additional land is required
Heavy	1.50 acres /1000 population	10.88	22.75	11.87
Total:		45.01	56.88	11.87

Education

Estimation of land according to standard indicates that there will be a land requirement of 32.99 acres to accommodate educational facilities by the year 2031. Existing land uses under various education facilities of Kalai Paurashava is 6.49. There will be need of additional 26.5 acres of land for education facilities. Details are shown in **Table 10-5**.

Table 10-5: Estimation of Land Requirement for Education Facilities

Use/Facility	Recommended Standard	Land in Acre		
		Estimation	Existing Land	Addl. Requirement
Nursery	0.5 acre/10,000 population	1.14	-	-
Primary School/ kindergarten	2.00 acres/5000 population	9.10	-	-
Secondary/High School	5.00 acres/ 20,000 population	5.69	-	-
College	10.00 acres/20,000 population	11.38	-	-
Vocational Training Centre	5 – 10 acres / Upazila	0.00	-	-
Other	5.00 acres/ 20,000 population	5.69	-	-
Total:		**32.99**	**6.49**	**26.5**

Health

Upazilla health complex is present in this Paurashava. In future, as the population and density increases, demand for local health facilities other than Health Complex will increase which currently use only 0.057 acre. So the Paurashava requires additional 10.65 acres of land for the Health center/Maternity clinics in future. Table **10-6** shows the detail.

Table 10-6: Estimation of Land Requirement for Health Facilities

Use/Facility	Recommended Standard	Land in Acre		
		Estimation	Existing Land	Addl. Requirement
Upazila health complex/ hospital	10 -20 acres/Upazila HQ	10.00	3.84	6.16
Health center/ Maternity clinic	1.00 acre/ 5,000 population	4.55	0.057	4.49
Total:		**14.55**	**3.9**	**10.65**

Administration

Estimation of land according to standard indicates that there will be a land requirement of 18 acres to accommodate administrative facilities by the year 2031. If we deduct 9.87 acres of existing land under various administrative facilities, additional 8.13 acres of land for these facilities will be required. **Table 10-7** shows the details.

Table 10-7: Estimation of Land Requirement for Administration

Use/Facility	Recommended Standard	Land in Acre		
		Estimation	Existing Land	Addl. Requirement
Upazila complex	15.00 acres	10.00	0.56	9.4
Paurashava office	3 – 5 acres	3.00	0.51	2.4
Others	10 acres/Upazila HQ	5.00	8.8	No additional land is required
Total:		**18**	**9.87**	**8.13**

Community Facilities

For various community facilities, the total land requirement has been fixed at 11.19 acres. About 0.57 acres have been earmarked for mosque, 1.14 acres for eidgah, 1.14 for Paurashava provided graveyard. No additional land is required for mosque, church and graveyard. **Table 10-8** shows the details.

Table 10-8: Estimation of Land Requirement for Community Facilities

Use/Facility	Recommended Standard	Land in Acre		
		Estimation	Existing Land	Addl. Requirement
Mosque/Church/Temple -	.5 acre /20,000 population	0.57	2.1	No additional land is required
Eidgah	1.0 acre/20,000 population	1.14	0.8	0.34
Graveyard	1.0 acre/20,000 population	1.14	0.73	0.41
Community center -	1.00 acre /20,000 population	1.14	0.3	0.84
Police Station -	3 – 5 acres/Upazila HQ	5.00	2.49	2.51
Police Box/outpost	1.00 acre/ 20,000 population	0.50	0	0.50
Fire Station -	3 – 5 acres/Upazila HQ	1.14	0.21	0.93

Use/Facility	Recommended Standard	Land in Acre		
		Estimation	Existing Land	Addl. Requirement
Post office	0.5 acre /20,000 population	0.57	0.42	0.15
Total:		**11.19**	**7.05**	**4.14**

Open Space/Recreational Facilities

Field survey shows no public park or play field in the town, except play grounds in the premises of educational institutions. The total land required for various open space recreation facilities recommended by client stands at 48.49 acres. The facilities include, play field/ground, parks of various categories and stadium/sport complex. **Table 10-9** shows the detail.

Table 10-9: Estimation of Land Requirement for Open Space/Recreational Facilities

Use/Facility	Recommended Standard	Land in Acre		
		Estimation	Existing Land	Addl. Requirement
Play field/Urban Green Space	3.00 acres/20,000 population	3.41	1.31	2.1
Park	1.0 acre /1000 population	22.75	0.00	22.75
Neighborhood park	1.00 acre /1000 population	22.75	0.00	22.75
Stadium/sports complex	5 - 10 acres/Upazila HQ		0	-
Cinema/Theatre	1.0 acre /20,000 population	1.14	0.2	0.94
Total:		**50.05**	**1.51**	**48.49**

Utilities

A number of utility establishments are required in a town to run services properly. The consultant, according to approved standard, has earmarked 1.14 acres for water supply installations, like, pump stations and other establishments related to water supply; and 1.14 acres have been fixed for gas related facilities. The total land requirement for dumping site is 1.14 acres. **Table 10-10** shows the details.

Table 10-10: Estimation of Land Requirement for Utilities

Use/Facility	Recommended Standard	Land in Acre		
		Estimation	Existing Land	Addl. Requirement
Water supply	1.00 acre /20,000 population	1.14	0.00	1.14
Gas	1.00 acre /20,000 population	1.14	0.00	1.14
Solid waste disposal site	1.00 acre /20,000 population	1.14	0.00	1.14
Waste transfer station	4– 10 acres/Upazila HQ	0.57	0.00	0.57
Electric sub-station	1.00 acre /20,000 population	1.14	0.00	1.14
Telephone exchange	1.00 acre/20,000 population	0.57	1.05	-

Use/Facility	Recommended Standard	Land in Acre		
		Estimation	Existing Land	Addl. Requirement
Total		**5.69**	**1.05**	**4.64**

Transport and Communication

Estimation of land according to standard indicates that there will be a land requirement of 3.59 acres to accommodate transport and communication facilities by the year 2031. If we deduct the already available 1.1 acres of existing land uses under various facilities, an additional 2.58 acres of land is required for this category of land use. **Table 10-11** shows the details.

Table 10-11: Estimation of Land Requirement for Transport and Communication

Use/Facility	Recommended Standard	Land in Acre		
		Estimation	Existing Land	Addl. Requirement
Bus terminal	1.00 acre /20,000 population	1.14	0.00	1.14
Truck terminal	0.50 acre /20,000 population	0.57	0.00	0.57
Launch/steamer terminal	1.00 acre /20,000 population	1.14	0.00	1.14
Railway station	4.00 acre / per Station	0.25	0.00	0.25
Baby taxi/tempo stand	0.25 acre /one baby taxi/tempo stand	0.25	1.1	0.25
Rickshaw/van stand	0.25 acre /one Rickshaw/van stand	0.25	0.00	0.25
Pessenger Shed		-	0.00	-
Total:		**3.59**	**1.1**	**2.58**

10.2 Land Use Proposals

Bangladesh is the most densely populated country in the world. The land area of the country remains static amid continuously increasing population. Such a situation calls for strict regulation to utilize its scarce land resources for non-agricultural purposes. Increase in urban population means more demand for houses, roads, schools, hospitals, factories, bazars, shops, business centers, offices and other service facilities. Providing all these facilities require land and that is at the cost of valuable agricultural land, as the country has hardly any fallow land to accommodate all these land uses. Paurashava is surrounded by valuable fertile agricultural land. Any urban expansion will cost net deduction of agricultural land that will consequently affect local food and cash crop production. A conservative and rational standard of space use and their proper application in planning, designing and development is, therefore, followed in the land use proposals.

10.2.1 Designation of Future Land Use

Designation of the future land uses in the Land use Plan is an important task of planning as it will ensure the compliance with the Structure Plan guidelines and provide the details of land use pattern along with transport and drainage network and utility lines. The existing uses and new proposals of land uses for future development have been identified and designated on the map for compliance by law. The land use categories with quantity of land required are based on the sectoral needs for now and in future. The implementation of the plan will require cooperation and

collaboration of relevant authorities and agencies, and the Paurashava being the custodian of the Plan will safeguard the status of the Plan..

10.2.2 Land Use Zoning

Development control is an essential part of urban planning. For development control certain procedures have to be followed for approval of designs of various categories of structures, establishments and land uses. The first condition is to secure land use permit according to approved zoning plan followed by approval of the design of proposed building/structure.

10.2.2.1 Types of Land Use Zoning

In land use zoning, the entire area of a town is divided into suitable land use zones to create congenial and livable environment and thereby enhance land value. In Bangladesh such land use zoning is incorporated as a part of the master plan / land use plan/urban area plan. Before submitting building plans for approval an applicant must secure land use permit from the Paurashava. For land use permit, an applicant's prospective use of structure must be compatible with the approved land use zone of the site. Land use zoning limits activities that can or cannot function on a land parcel by establishing a range of development options. Land use zoning is a legal instrument by application of which a Paurashava can control.

i) The height of building/structure,

ii) The area of a land parcel that must be left vacant, and

iii) The use of a buildings and land.

Zoning can be of three types, area zoning, density zoning and height zoning.

Area Zoning

By area zoning an area is divided into zones suitable for that particular area. The main objectives of such zoning are done mainly from environmental point of view that accrues other social benefits.

Density Zoning

The aim of the density zoning is to limit the size of population in any particular area by means of density control. The size of population has bearing on the capacity of designed utility facilities and amenities and traffic volume and crowding, especially in the residential areas. Such zoning is done to ensure a healthy and enjoyable community living.

Height Zoning

Height zoning restrict the height of buildings structures in any particular area. This zoning is aimed to promote the proper and sound development of areas. Height zoning is of particular importance in airport areas to ensue take off and landing of aircrafts.

Considering the existing level of development and development prospects, the consultant recommends to follow the area zoning only. Zoning is only a part of development control

regulations. A prospective developer in a Paurashava has to comply with other rules and regulations, like, Building Construction Rules, 1996 under Bangladesh National Building Construction Act 1952, Bangladesh National Building Code 1993 and other conditions of construction method, building safety and associated issues.

10.2.2.2 Classification of Land Use Zoning

After a detailed consultation between the client and the consultants of the project, the land use classification for the Paurashava Master Plan is finalized as shown in **Table 10-12**. **Map 10-2** and ***Appendix-2*** shows the Land Use Plan of Kalai Paurashava. .

Table 10-12: Proposed Land Use Categories for Urban Area Plan of Kalai Paurashava

Sl. #	Land Use Category	Remarks	Area (acre)	%
1.	Urban Residential Zone	Urban Residential area is a land use in which housing predominates. These include single family housing, multi-family residential, or mobile homes. Zoning for residential use may permit some services or work opportunities or may totally exclude business and industry. It may permit high density land use.	243.91	7.10
2.	Rural Settlement	Rural settlement includes the low dense residential area which is scattered and rural in nature. It may permit only low density uses. Aiming to control the growth in this zone, less service and facilities will be provided.	186.24	5.42
3.	Commercial Zone	The land used for commercial activities is considered as commercial land use. These activities include the buying and selling of goods and services in retail businesses, wholesale buying and selling, financial establishments, and wide variety of services that are broadly classified as "business". Even though these commercial activities use only a small amount of land, they are extremely important to a community's economy. Commercial land includes established markets and areas earmarked for markets.	32.39	0.94
4.	Mixed Use Zone	Mixed land use refers to the area without a dominant land use (Residential, commercial, industrial etc.).	18.42	0.53
5.	General Industrial Zone	Green and Orange A categories as per The Environment Conservation Rules, 1997	68.36	1.99
6.	Heavy Industrial Zone	Other toxic and pollutions Industries (Orange B and Red categories as per The Environment Conservation Rules, 1997)	1.59	0.05
7.	Government Office	All Government Offices except large scale service based offices as Civil Surgeon Office, DC Office, Police Box, Police Fari, Police Station, LGED Office, Paurashava Office, Settlement Office, Union Parishad Office, Upazila Headquarter, BADC Office, Fisheries Office, Ansar/VDP Office, Agriculture Office, Zila Parishad Office, Post Office, Telephone Exchange Office and Other Government Offices.	9.00	0.26
8.	Education & Research Zone	All kinds of educational institutes like Primary/ secondary/other Schools/ Colleges etc are mentioned to calculate the land use for education and research	18.70	0.54

Sl. #	Land Use Category	Remarks	Area (acre)	%
		purpose.		
9.	Agricultural Zone	Agricultural land denotes the land suitable for agricultural production, both crops and livestock. It is one of the main resources in agriculture. It includes productive land (single, double and triple cropped), seed bed, fisheries, poultry farm, dairy farm, nursery, horticulture etc.	2416.12	70.34
10.	Water body	Equal or More than 0.25 acre and justification by the consultant and wet land will merge with water body	116.78	3.41
11.	Open Space	Playground, Botanical Garden, Stadium, Zoo etc. (Facilities without or with minimum building structure)	25.70	0.75
12.	Recreational Facilities	Facilities other than those mentioned to Open Space and indoor based facilities with designated building structure i.e. Cinema Hall, Theater Hall etc.	0.17	0.01
13.	Circulation Network	Road and Rail communication	177.96	5.194
14.	Transportation Facilities	Under transport and communication land use both transport and communication services are considered. This category includes airport, bus terminal/ stand, ferry ghat, filling station, garage, launch terminal, post office, passenger shed, telephone exchange, ticket counter, transport office etc.	4.83	0.14
15.	Utility Services	Utility services include Overhead Tank ,Power Office/Control Room, Public Toilet, Sewerage Office, Waste Disposal ,Fire Service, Water Pump House, Water Reservoir, Water Treatment Plant etc.	4.62	0.14
16.	Health Services	This land will be used to provide health facility.	10.80	0.31
17.	Community Facilities	All community facilities including funeral places and other religious uses	8.91	0.26
18.	Historical and Heritage Site	The entire mentionable historical and heritage site.	0	0
19.	Restricted Area	A Restricted Area is an area where no one but certain people can enter. Here the areas which are not accessible for the general public except some high ranked personnel are considered as restricted area.	0	0
20.	Overlay Zone	If the consultant justify any area that should not be defined as other given definitions but the facility(s) may not be avoidable, they may use this category	Not applicable	
21.	Urban Deferred	Optional depending on the Paurashava and the Consultant's judgment	89.07	2.59
22.	Forest	Designated Forest Area	Not applicable	
23.	Beach	Sea Beach	Not applicable	
24.	Miscellaneous	Any other categories which are not related to above 23 categories.	1.56	0.05

Sl. #	Land Use Category	Remarks	Area (acre)	%
Total:			**3435.1**	**100**

According to the proposed land use zoning categories shown in table 10.12, the amount of land for each land use category was calculated.

In the sections below, the general definition of the use and description of associated permitted and conditionally permitted uses under each land use zone have been provided. The uses that are not listed here in any of the categories shall be treated as Miscellaneous Use for the corresponding land use category and shall not be permitted unless unanimously decided otherwise by the appropriate authority. In such situations, the use shall get permission in the category of New Use. The following is a short description of recommended land use zones. Land use plan of Paurashava is given in **Map 10-2** and ***Appendix-2***.

Urban Residential Area

Urban residential zone refers to all categories of urban residential areas, including exiting ones and the residential land use proposed under the present Master Plan. In total, this zone covers 243.91 acres of land delineated up to the year 2031, considering standard provided by LGED. Table A.1, Annexure- A shows the permitted use of urban residential area and conditional permission will be given to a number of other land uses as specified in Table A.2, Annexure- A. shows the planning schedule of Urban Residential Area in Kalai Paurashava.

Table 10-13: Proposed Housing Area in Kalai Paurashava

Type of Facilities	Ward No.	Mouza Name	Plot No.	Phase-wise development			Area in Acre
				First Phase (1st to 5th yr)	Second Phase (6th to 10th yr)	Beyond 10th year	
Housing Area	1,9	Kalai 111_02	702-737, 769-822,825,830,832	Land acquisition and developed basic infrastructure	Establish Industry	Ensure full functioning of industrial area	38.88

Rural Settlement

Most of the Paurashava has some rural characteristics. So in Urban Area Land use category for UTIDP Master Plan the residential settlements within the agricultural belt are categorized as rural settlements. These settlements have usually temporary type of structures. Paurashava is mostly rural in character. About 79.10% existing land use is in agriculture practice and most of the settlement situated surrounding or within this agricultural land. So in a manner to develop control of Kalai Paurashava some portion of land declare as rural settlement. This settlement occupies 186.24 acres of land, which comprises about 5.4% of the total land. The areas of rural settlement have some restrictions for non-agricultural development. Table A7, Annexure-A shows the permitted land use of rural settlement and Table A8, Annexure-A conditionally permitted use in this zone.

Industry

General Industrial Zone (**Table 10-13**) is intended to provide locations, where manufacturing and processing industries can be set up and function without creating hazards to surrounding land uses. There is scope to establish Green and Orange-A category industry as per mentioned in The Environmental Conservation Rule, 1997.As a small urban center, it is unlikely that any major industrial development will take place here in the near future. This zone has an area of 68.36 acres designated up to 2031. Though as per the planning standard provided by PMO office, Paurashava require 56.88 industrial lands (**Table 10-4**).

Table 10-14: New Development Proposal for General Industrial Area

Type of Facilities	Ward No.	Mouza Name	Plot No.	Phase-wise development			Area in Acre
				First Phase (1st to 5th yr)	Second Phase (6th to 10th yr)	Beyond 10th year	
Geneal Industrial Area	7	Mulgram (109_00)	905-921, 866-868, 932,933	Land acquisition and developed basic infrastructure	Establish Industry	Ensure full functioning of industrial area	17.16
		Dahra (110_00)	278,280,287-292				

Map 10-2: Land use Proposal for Kalai Paurashava

Again, as there is industrial agglomeration within the town, the industrial zone will be meant for new industries as well as expension of the existings. In this zone, a complex line of industrial and supporting non-industrial land uses will be permitted as per Table A.3, Annexure- A and conditional permission will be given to a number of other land uses as specified in Table A.4 and Annexure- A. **Table 10-13** shows new land use proposals for this type of activity in Kalai Paurashava. This land will be provided in the general industrial area.

Commercial Zone

The commercial zone is intended to provide locations, where commercial activities including retails and wholesale can be set up and function without creating hazards to surrounding land uses. This zone has an area of 32.39 acres (0.94%) designated up to 2031 and zone will allow co mmercial uses as listed in Table A.5, Annexure- A, and conditional uses as listed in Table A.6, Annexure- A. shows the planning schedule of Commercial Activity Area in Paurashava.

Table 10-15: New Land Proposal for Commercial Activities

Type of Facilities	Ward No.	Mouza Name	Plot No.	Phase-wise development			Area in Acre
				First Phase (1st to 5th yr)	Second Phase (6th to 10th yr)	Beyond 10th year	
Neighborhood market	7	Kalai 111_02	654,664,772	Land acquisition and establish	Continue the further development of the Primary school.		1.34
	3	Kalai 111_01	320, 329-333	Land acquisition and establish	Continue the further development of the Primary school.		1.18
	9	Kalai 111_02	756, 766, 769, 825	Land acquisition and establish	Continue the further development of the Primary school.		0.31
	2	Kalai 111_01, Kalai 111_01	516, 1182, 1190-1192, 1194	Land acquisition and establish	Continue the further development of the Primary school.		1.08
	4, 5	Aura 56_01	1044, 1362, 1167-1369, 1372			Land acquisition and establishment	0.33
	6	Purbo Sarail 108_00	472, 478-480			Land acquisition and establishment	0.44
	5	Aura_56_01	1229, 1232, 1217,9999	Land acquisition and establish	Continue the further development of the Primary school.		0.06
Cattle Market	1	Thupsara (50_01)	1176-1179, 1206, 1213-1218		Land acquisition and establish	Continue the further development of the Primary school.	2

Type of Facilities	Ward No.	Mouza Name	Plot No.	Phase-wise development			Area in Acre
				First Phase (1st to 5th yr)	Second Phase (6th to 10th yr)	Beyond 10th year	
Slaughter House	7	Dahra 110_00	122,123,124,134		Land acquisition and establish	Continue the further development of the Primary school.	1.6
Super Market	1	Kalai 111_01	100,265-267	Land acquisition and establish	Continue the further development of the Primary school.		2.5
Total							10.84

Mixed Use Area/Mixed Use Zone

Mixed use zones have been recommended to allow some flexibility in development. In a small town like, as the trend shows, an exclusive commercial land use is unlikely to function. This land use will allow flexibility of development, instead of restricting development. Total area for mixed uses has been put to 18.42 acres, including both, existing and proposed land uses. This zone will allow residential structures together with commercial uses as listed in Table A.11, Annexure-A, and conditional uses as listed in Table A.12, Annexure-A. Table 10.14 presents the proposed land uses and their phase-wise development proposals.

Table 10-16: New Land Proposal for Mixed Use Zone

Type of Facilities	Ward No.	Plot No.	Mouza Name	Area in Acre	Phase
Ward Center	1	87, 112, 115-117	Kalai 111_01	0.62	1st Phase
	2	547,548,570,572,575	Kalai 111_01	1.07	1st Phase
	3	12-18, 23, 24	Duronjo 55_00	0.77	1st Phase
	4	1044, 1371-1376	Aura 56_01	0.27	1st Phase
	5	1346, 1587-1595, 1600	Aura 56_01	0.71	1st Phase
	6	463, 467, 468, 472, 484	Purbo Sarail 108_00	0.18	1st Phase
	7	77, 153-157, 516-520, 530, 531, 936	Dahra 110_00, Mulgram 109_00	0.91	1st Phase
	8	1706, 1707, 126, 138, 139, 49, 50, 126, 128, 129	Kalai 111_02, kathail 112_00, Mulgram 109_00	0.42	1st Phase
	9	903, 905-909, 915	Kalai 111_02	0.47	1st Phase
Total				5.42	

Governmental Services

Administrative zone covers all kinds of government and non-government offices in the town. No additional government servies have been proposed as it is expected that existing government services would able to serve the purpose for next 20 years.

Education and Research Area

Institutional zone refers to mainly education, health and other social service facilities as listed in Table A.13, ***Annexure-A***, and conditional uses as listed in Table A.14, ***Annexure-A***. The total area under this use has been determined as 32.99 acres though the actual land use allocation for

this purpose is about 18.70 acres. Detail new land proposal for education and research is shown in **Table 10-14**. Total four primary schools and two secondary schools will be established in this land.

Table 10-17: New Land Proposal for Education and Research

Type of Facilities	Ward No.	Mouza Name	Plot No.	Phase-wise development			Area in Acre
				First Phase (1st to 5th yr)	Second Phase (6th to 10th yr)	Beyond 10th year	
Primary School	8	Mulgram 109_00	50, 51, 126-128	Land acquisition and establish	Continue the further development of the Primary school.		1.81
	1	Kalai 111_01	117, 118	Land acquisition and establish	Continue the further development of the Primary school.		0.88
	3	Duronjo 55_00	3, 5, 7, 8, 13, 16-18	Land acquisition and establish	Continue the further development of the Primary school.		0.89
	4	Aura 56_01	864-867, 869-876, 878-880, 884-887	Land acquisition and establish	Continue the further development of the Primary school.		1.08
Secondary School	7	Mulgram 109_00	505-513, 516, 519-530, 960	Land acquisition and establish	Continue the further development of the Primary school.		1.94
	6	Purbo Sarail 108_00	202, 242, 245			Land acquisition and establishment	0.6
Total							7.2

According to the standard additional 26.50 acres of land is required and the actual proposal is about 7.2 acres.

Agriculture Area/ Agricultural Zone

The Paurashava has a vast area of agricultural land that demands formation of a separate zone of, agriculture. Agriculture zone is primarily meant for agriculture; land uses related to it and land uses that support it. Detail of land use is presented in Table A.17, Annexure- A and conditional uses as listed in Table A.18, Annexure- A. The total area under this use has been estimated as 2416.12 acres that include existing and proposed land uses.

Water Body

The plan suggests preserving most of these water bodies for two purposes, first, to serve as source of water, second to serve as water retention area during monsoon. The ponds with an area equal to or More than 0.25 acres will be preserved as the water retention ponds. There will be permitted uses in this zone as stated in Table A.23, Annexure- A and some other uses may conditionally be permitted as stated in Table-A.24, Annexure- A.

Open Space/Recreational Facilities

This zone has been provided to meet the active and passive recreational needs of the people and at the same time, conserve the natural resources. The total area estimated for this zone stands at 50.05 acres. The details of permitted and conditional permits have been presented in Table A.19

Annexure- A, and conditional uses as listed in Table-A.20, Annexure- A. Table 10-16 shows the detail of new land proposal for open space proposal in Kalai Paurashava. There are five playgrounds, one stadium, one central park and five local parks will be established in this proposed open space.

Table 10-18: New Land Proposal for Open Space

Type of Facilities	Ward No.	Mouza Name	Plot No.	Phase-wise development			Area in Acre
				First Phase (1st to 5th yr)	Second Phase (6th to 10th yr)	Beyond 10th year	
Playground	6	Purbo Sarail 108_00	159, 245, 249, 456			Land acquisition and establishment	0.44
	5	Aura 56_01	1094, 1371, 1376, 1581-1586, 1593-1596			Land acquisition and establishment	0.47
	7	Mulgram 109_00	602-604, 612-620, 654, 782	Land acquisition and establishment	Maintaining the playground and improve facilities.		0.64
	3	Duronjo 55_00, Hatior 54_02	51-56, 1257, 1269		Land acquisition and establishment	Maintaining and improve facilities.	1.24
	9	Kalai 111_02	902, 910, 911, 914-916	Land acquisition and establishment	Maintaining the playground and improve facilities.		0.72
Stadium	1	Thupsara 50_01	390-392,408-416,419,427,428			Land acquisition and establishment	6.22
Central Park	3	Kalai 111_01	392-394	Land acquisition and establishment	Maintaining the playground and improve facilities.		7.99
		Hatior 54_02	1344-1348,1351-1353,1363-1366,1374-1376,1379-1382				
Neighborhood Park	2	Kalai 111_02	1112-1115,1121,1124,1126,1128,1285-1287,1291,1293,1308,1309		Land acquisition and establishment	Maintaining and improve facilities.	2.0
	4	Aura 56_01	728, 768-769, 771-778, 780, 782-785, 813		Land acquisition and establishment	Maintaining and improve facilities.	1.22
	8	Dahra 110_00	8, 9, 14, 15, 22, 25-27	Land acquisition and establishment	Maintaining the playground and improve facilities.		1.96
	6	Purbo Sarail	463, 467, 468, 472, 479,		Land	Maintainin	0.52

Type of Facilities	Ward No.	Mouza Name	Plot No.	Phase-wise development			Area in Acre
				First Phase (1st to 5th yr)	Second Phase (6th to 10th yr)	Beyond 10th year	
		108_00	484		acquisition and establishment	g the playground and improve facilities.	
Total							23.42

According to the standard additional 48.54 acres of land is needed up to 2031 but actually about 30 acres of land has been proposed.

Circulation Network

The road network is mainly considered as circulation network. National highway, pucca/ semi-pucca/ katcha road, footpath, flyover, over- bridge, underpass, bridge, culvert, railway, railway bridge all are include in circulation network. Total 177.96 acre land which covers 5.194% of total planning area of Kalai Paurashava has been indicated in this plan.

Transportation Facilities

Ttransportation facilities incorporate transport and communication services. For an example airport, bus terminal/ stand, ferry ghat, filling station, garage, launch terminal, post office, passenger shed, telephone exchange, ticket counter, transport office etc. Total 4.83 acres land (0.02% of total area) will be used for this purpose. Table 10-17 shows the new transportation facilities for Kalai Paurashava.

Table 10-19: New Transportation Facilities

Type of Facilities	Ward No.	Mouza Name	Plot No.	Phase-wise development			Area in Acre
				First Phase (1st to 5th yr)	Second Phase (6th to 10th yr)	Beyond 10th year	
Bus Terminal	1	Kalai 111_01	100, 264, 265		Land acquisition and establishment	Maintaining and improve facilities	0.75
Tempu Stand	1	Thupsara 50_01	1337, 1338, 1345		Land acquisition and establishment	Maintaining and improve facilities	0.06
	2	Kalai 111_01	471, 511, 512, 514, 515	Land acquisition and establishment	Maintaining the playground and improve facilities.		0.24
	2	Kalai 111_01	216, 217		Land acquisition and establishment	Maintaining and improve facilities	0.07
	8	Kalai 111_02	1694, 1695, 1697, 1698, 1700		Land acquisition and establishment	Maintaining and improve facilities	0.17

Type of Facilities	Ward No.	Mouza Name	Plot No.	Phase-wise development			Area in Acre
				First Phase (1st to 5th yr)	Second Phase (6th to 10th yr)	Beyond 10th year	
	4	Aura 56_01	1044	Land acquisition and establishment	Maintaining the ghat and improve facilities.		0.11
	3	Duronjo 55_00	14, 22, 23		Land acquisition and establishment	Maintaining and improve facilities	0.08
	1	Kalai 111_02	952, 953, 967		Land acquisition and establishment	Maintaining and improve facilities	0.03
Truck Terminal	6	Purbo Sarail 108_00	62-65,528,536-540		Land acquisition and establishment	Maintaining and improve facilities	2.42
Total							3.93

The existing land use for transportation purpose is very negligible less than one acre. According to the standard additional 2.49 acre of land is required and the proposal is in accordance with the standard.

Utility Services

It incorporated all utilities and service facilities except the health service. For an example water treatment plant, water reservoir, water pump house, public toilet, fire service, waste disposal, sewerage office, power office or control room and over head tank. In survey stage this type land use was define as service activity. Total 4.62 acres land which covers 0.17% total area of Kalai Paurashava. Total 05 waste transfer stations, one waste dumping station will be newly established to fulfill the desired need of Paurashava.

Table 10-20: New Land Use Proposal for Utility Services

Type of Facilities	Ward No.	Mouza Name	Plot No.	Phase-wise development			Area in Acre
				First Phase (1st to 5th yr)	Second Phase (6th to 10th yr)	Beyond 10th year	
Waste Transfer Station	3	Hatior 54_02	1403, 1404, 1408	Land acquisition and establishment	Maintaining and improve facilities		0.57
	2	Kalai 111_01	300-309	Land acquisition and establishment	Maintaining and improve facilities		0.33
	2	Kalai 111_01, Kalai 111_01	215, 217, 214, 1044, 1045	Land acquisition and establishment	Maintaining and improve facilities		0.29
	8	Kalai 111_02	1683, 1694	Land acquisition and establishment	Maintaining and improve facilities		0.36
	5	Aura 56_01	1346, 1348	Land acquisition and establishment	Maintaining and improve facilities		0.13

Type of Facilities	Ward No.	Mouza Name	Plot No.	Phase-wise development			Area in Acre
				First Phase (1st to 5th yr)	Second Phase (6th to 10th yr)	Beyond 10th year	
Waste Dumping Ground	6	Purbo Sarail 108_00	492-497, 577, 578, 627, 628	Land acquisition and establishment	Maintaining and improve facilities		2.08
Total							3.76

The existing land use comprises of one acre for utility services and the proposed land use is about 4 acres which is compatible according to the standared.

Health Services

The Paurashava is suffering from the adequate health services; though the upazilla health complex is present in the Paurashava premises. Total 10.80 acres land has been fixed up to 2031 for this service

Table 10-21: New Land Use Proposal for Health Services

Type of Facilities	Ward No.	Mouza Name	Plot No.	Phase-wise development			Area in Acre
				First Phase (1st to 5th yr)	Second Phase (6th to 10th yr)	Beyond 10th year	
Community Clinic	3	Kalai 111_01	312, 313, 320, 330	Land acquisition and establishment	Maintaining and improve facilities		0.66
	5	Aura 56_01	1073, 1088, 1091-1095	Land acquisition and establishment	Maintaining and improve facilities		0.36
	3	Duronjo 55_00, Hatior 54_02	2, 3, 8-14, 1281, 1315	Land acquisition and establishment	Maintaining the playground and improve facilities.		1.81
Hospital	2	Kalai 111_01	528, 547, 572, 574-577	Land acquisition and establishment	Maintaining and improve facilities		1.43
	8	Dahra 110_00	26,27,29-31	Land acquisition and establishment	Maintaining and improve facilities		2.8
Total							7.06

The existing land use for health service purpose is about four acre. According to the standard additional 10.65 acres of land is required. As some community clinic may be provided into the ward centers, so only 5.25 acres of land has been proposed in this context.

Community Facilities

Community services include community centre, club house, other community services etc. In additionally all funeral places and other religious uses incorporated in this category. Total 8.91 acres land which covers .25% of total planning area will be used for this purpose.

Table 10-22: New Land Use Proposal for Community Facilities

Type of Facilities	Ward No.	Mouza Name	Plot No.	Phase-wise development			Area in Acre
				First Phase (1st to 5th yr)	Second Phase (6th to 10th yr)	Beyond 10th year	
Community Center	2	Kalai 111_01, Kalai 111_02	515, 516, 1189, 1190	Land acquisition and establishment	Maintaining and improve facilities		0.58
Eidgah	8	Dahra 110_00	28-30, 47	Land acquisition and establishment	Maintaining and improve facilities		2.23
Graveyard	8	Dahra 110_00	48,50,51	Land acquisition and establishment	Maintaining and improve facilities		1.32
Temple	4	Aura 56_01	702, 707, 710, 711, 714	Land acquisition and establishment	Maintaining and improve facilities		0.38
Crematory	4	Aura 56_01	641, 715-717, 705, 708, 709	Land acquisition and establishment	Maintaining and improve facilities		0.82
Total							5.33

Restricted Area

A Restricted Area is an area where no one but certain people can enter. Here the areas which are not accessible for the general public except some high ranked personnel are considered as restricted area. No land for restricted purposed in this plan for Kalai Paurashava.

Urban Deferred

The Urban Deferred refers to lands lying outside of the urban growth boundary and identified as Urban Reserve. The total area under this use has been proposed as 89.07 (3.31%) acres that include existing and proposed land uses. The following are permitted Uses within the Urban Reserve (UR) Zone:

- Agriculture, Livestock based

- Agriculture, Vegetation based (mushroom farms shall not be permitted)
- Existing facilities up to the date of gazette notification of the Master Plan. Condition is that, no further extension will be permitted.

10.2.3 Land Use Permission

One of the major purposes of land use zoning is to restrict an area for a particular use meant for the zone. This is intended to maintain a disciplined land use distribution and development. But there are many uses other than the use meant for the zone that are considered for permit in the zone. Sometimes such applications are accommodated to support or assist the area, with conditions imposed in giving land use permit, sometimes strict restrictions are maintained by refusal of applications. Detailed lists of permissible and conditionally permissible uses have been provided in Annexure-A according to land use categories. The list has been developed with ideas borrowed from the recommendations made by the consultants under the recently completed DAP Project of RAJUK. It is required that permit procedures mentioned in Annexure-A are officially adopted through incorporation in the Building Construction Rules under Section 18 of the Bangladesh National Building Construction Act 1952.

10.3 Plan Implementation Strategies

This section deals with the issues of implementation of land use plan. Discussion is made on development regulation and recommendation on implementation, monitoring and evaluation of urban land use plan.

10.3.1 Land Development Regulations to implement the Land Use Plan

Urban planning regulations are necessary for the smooth functioning of land use plan. The land use regulations impact on planned development and result in social benefits and costs depending on their nature and the specific contexts in which they are applied. Careful reforms of these regulations can result in a lower cost for urban development and for housing. An additional benefit could be in terms of a more functional spatial organization of the town. Regulations and processes that facilitate land availability and uses for planned development at affordable costs need to be continued. Regulatory and process reforms can lead to:

- more compact towns, containment of urban sprawl, more efficient urban forms,
- less costly urban infrastructure,
- more market-friendly development of urban land;
- more intensely used central areas, better efficiency of public transportation systems and decrease in trip length and transportation costs;
- less violations in zoning, sub-division and building regulations, and reduction in non-conforming and non-compatible uses and slums;

- reduction in difference between what is allowed under regulations and what is financially feasible due to land use reforms leading to reduced opportunities for corruption;
- generally lower land prices in city/town but higher prices in some prime commercial and business districts driven by market forces;
- average urban population densities likely to stay constant as more efficient land use consumption.

The following measures of Land Development Regulations should strictly be followed for the proper implementation of the Land use Plan.

a. Restriction on Use of Land Contrary to the Master Plan

No person shall use any land for any purpose other than that laid down in the land use zoning of the Master Plan approved by the Government. All future developments and constructions, both public and private within the area of Structure Plan shall be in conformity with the Master Plan approved by the Government. No compensation shall be payable to any person owing to demolition of any construction developed in violation of the Master Plan provisions.

b. Building Permission and Construction Approval

Development control mechanism will be one of the major plan implementation instruments to be carried out through the Building Construction Rules under Section 18 of the Building Construction Act 1952 and the land use provisions of the Master Plan.

c. Building Permission in Proposed Development Areas

The Master Plan proposes a number of development projects. Many of the lands under these development projects are under private ownership. No development in these lands by their owners will be allowed. They will remain in the present form till they are taken over by the respective authority for development or the development project is abandoned.

d. Parking in Commercial and Mixed Use Areas

For parking, BC Rules, 1996 has specific provisions for housing and commercial areas. But no provision has been suggested for mixed use areas. According to the rules for commercial area, 23 sq.m areas, has to be reserved for every 200 sq.m of commercial space. The consultant suggests that for mixed areas, BC Rules, 1996 meant for commercial area should also be applied to the mixed areas under the current plan.

f. Rules for Realization of Betterment Fee

The Ordinance enables Paurashava to charge betterment fees on land owners or any other person having interest in it for an increase in land value due to execution of any development scheme by the Authority. The Authority should develop appropriate procedures in this regard and get them approved to start charging betterment fee. Due to failure of execution of the powers of charging betterment fee, all benefits of land value enhancement due to Paurashava development projects goes to the land owner at the cost of the community. So it is not irrational for the road developer to demand a share of the benefit accruing to the land owner following road development.

g. Planning Rules for Real Estate Companies

With the increase in population, there will be further rise of land based real estate activities. But there is no provision in the Local Government (Paurashava) Act to control the activities of real estate companies. It is needed that infrastructure and services provided in the housing plans of the real estate projects be standardized to secure interest of the buyers. Strict vigilance is needed against any fraudulent practices that might affect public interest.

However, any control imposed on the housing companies must be imbued with a positive approach, so that it does not affect the housing promotion activities of the private sector. The intention would be to allow them function under certain control that would secure public interest and at the same time will not discourage private investment in housing. The infrastructure, services and facilities provided in a housing project must be standardized. Road width and the land allocated for community facilities must be adequate to meet requirements of the future inhabitants. The infrastructure provided therein must follow minimum standard as some day these housing estates would become parts of the future town and the infrastructure provided therein would be used by a wide range of population of the town.

To control apartment development, the national rules under BC Act 1952 will be applied. The rules for land based real estate projects exist for Dhaka only. In anticipation of expansion of real estate projects, there is an urgent need to prepare a set of rules for small towns. The real estate companies seeking approval for their housing project layout plan must fulfill certain conditions as set in the rules. The set of rules is clearly described in the Private Residential Land Development Rule-2004.

h. Minimum Road Width

Building Construction Rules, 1996, should be amended in the following way by incorporating the minimum road width standard.

To ease future traffic movement, it is necessary to keep provision for wider roads in the present plan. It is an uphill task to widen roads after development has taken place along the road. So it is wiser to reserve wider right of way for new roads now. Building Construction Rules, 1996 has determined the minimum road width as 12 -10 ft. for private roads, though this law is still not applicable for municipalities. The consultants feel that this standard is not enough in view of future increase in population density and traffic. For safeguarding and easing future traffic movement the consultants have set the minimum width for any road for common use as 20 ft. or 6 meter and 16 ft. or 4.77 meter for private roads. However, in the built up areas, where development has already blocked the scope for developing such wide roads, the consultant recommends the minimum road width provisions of BC Rules, 1996. The new road width provision will be applicable in new areas. In the areas, where there already exist roads of less than 20 ft., the land owners on either side of the road will equally share the space needed to increase the road width to 20 ft. The land owners must leave the space vacant for taking it over by the Paurashava for widening of the road at some later date. No proposal for construction should be permitted on the vacant space reserved for road widening though the land will remain under its current ownership till it is taken over by the authority. In the light of the above recommendations, necessary amendment will have to be brought in the BC Rules, 1996 applicable to the secondary and small towns only.

i. Low Land, Pond and Drainage Path

No low land that retains water for certain period of the year can be filled up and no obstruction to natural or man made drainage system shall be allowed. Prior permission of Paurashava will be required for filling up of any low lands. The Paurashava shall accord such permission based on prevailing laws. All ponds should not be allowed to be filled up as they are a good source of urban water supply as well as serve as open space. As per The Act (36 of 2000) for Conservation of Play field, Open space, Park and Natural Water Reservoir in Mega City, Divisional Town, District Town and Paurashavas of Bangladesh, the use of these water bodies can not be changed without prior permission of the authority.

j. Security Areas - Cantonment, BDR, Police Stations

BDR, Police, etc. areas have to be safe guarded from any possible incompatible development.

k. Radio, Television, Water Treatment and Pump Station and Power Station Sites

The key point installations including radio, television, water treatment and pump station and power station sites will have to be safeguarded from any possible undesirable development around these areas that can endanger their security. No building except vegetation should be allowed within 183 meters around the transmission towers.

10.3.2 Implementation, Monitoring and Evaluation of the Land Use Plan

Monitoring and evaluation is a very important part of plan implementation. Monitoring helps check if the plan is being implemented properly. It also measures the level of implementation of the plan. If the plan implementation is not on track, corrective measures can be taken to put the execution on track. After expiry of any plan, evaluation is made about the errors and omissions. Such evaluation helps take corrective measures in the next plan. Such monitoring and evaluation must be carried out from within the Paurashava. But Kalai Paurashava is not equipped with qualified manpower to make such evaluation. Monitoring and evaluation of a plan is essentially, the responsibility of qualified and experienced planners. As there is no planner in the Paurashava, its monitoring of plan implementation will be seriously affected. However, plan evaluation can be accomplished by means of out sourcing.

Updating of Plans

The plan package needs to be updated regularly to make it respond to the spatial changes over time. But such updating would require relevant technical professional and fund that are highly lacking in Paurashava. There is no planner or planning department in the Paurashava. Updating would require service of senior level planners that Paurashava would not be able to provide. This service will have to be procured by out sourcing and the Paurashava is not even capable to accomplish this financially either. This will create problem when the plans or its components gets obsolete or need to be changed. Another problem would arise when the duration of plans ends. A new set of plans would have to be prepared replacing the old ones. This problem, however, can be overcome by undertaking another planning project by LGED. So, for regular updating and changes and plan implementation monitoring, the Paurashava should immediately move for setting up a planning department with planner(s) and other staff. The department will not only look after planning, but will also be responsible for development control, estate management and project

preparation. Since the planners would be qualified and skilled in computer operation, they can also help achieving automation of the Paurashava functions.

Chapter 11: Traffic and Transportation Management Plan

11.1 Introduction

11.1.1 General

The transportation system directs the urban development pattern. The performance oftransportation system largely influences the economy and social progress of an area. It provides mobility to people, goods and services to their destination. It has linkages with other sectors ofdevelopment and for a sustainable development of any area, its traffic and transportation system should be adequately addressed. The current chapter of the report is about Transportation and Traffic Management Plan covering the scope of improvement of the existing network and systemand plan proposals for new development. The proposals on improvement and new developmentare made for the project area up to 2031. The report also provides the purpose and the role of Transportation and Traffic Management Plan and its relation with Structure Plan and Land UsePlan.

11.1.2 Approach and Methodology

Transport study provides special attention to urban transportation planning as it greatly influences the location decisions and travel behavior of people, goods and services. Transportation is critical for the efficiency of towns contributing to their productivity and economic growth. A good network of roads & other transportation mode coupled with an efficient transport management system makes a substantial contribution to the "working efficiency" of cities and towns and enables them to become catalysts for social and economic development. On the other hand, the impact of a poorly designed urban transport system is manifested in terms of traffic congestion, delays, accidents, high energy consumption, high pollution of the environment and inequitable access to services. A well-planned transportation system results in orderly urban growth, greater use of urban public transport, lower vehicular pollution, and shorter auto trips.

Standard methodology was followed for traffic study in the project area. An introduction meeting was held at Paurashava and the Paurashava authority recommended Wednesday as local Hat day and others as regular day to conduct transport survey. With reference to their observations, survey time was set from 6:00 AM to 12:00 PM for those two days when traffic movements were frequent.

In order to identify the major causes of the congestion and the nature of the problem on transportation networks, a number of tasks were undertaken. Those tasks included traffic volume counting at the directions, speed and delay studies, Origin-Destination (O-D) survey at major traffic generating intersections and consultation with the stakeholders regarding the generated problems. The volume and movement pattern of people and goods within the planning area were collected through a series of volume and O-D surveys.

In addition to collect information on volume and pattern of traffic movement by traffic survey, the Consultant accommodates certain important questions regarding people's attitude and preferences.

The volume counts were conducted at four points in a node. For this, Manual counting method was followed to conduct the traffic volume survey and data was recorded in prescribed formats (**Table 11-1**). Details methodology of the work is shown in a flow chart (***Fig 11-1***) below.

Table 11-1: Sample Size and Location Number According to Surveys

Types of Survey	Sample Size/Locations
Volume count	three links and one node
O-D survey	321Samples at three location for internal-external movement

Details methodology of the work is shown in a flow chart (***Fig 11-1***) below.

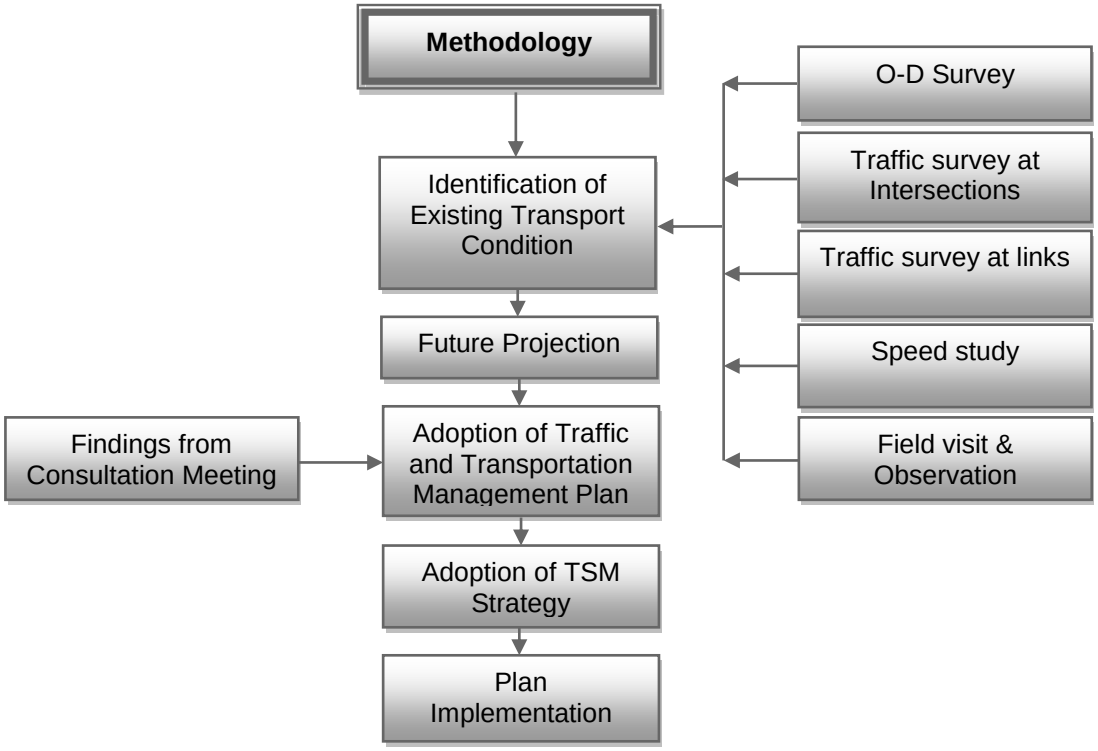


Fig 11-1: Flow Chart of the Methodology

11.2 Existing Conditions of Transportation Facilities

11.2.1 Roadway Characteristics and Functional Classification

The planning area covers 3435.1 acres and road length is 55.14 km. There are only one important road intersections named Kalai Bazar intersection linkages with other secondary roads. The areas towards the east are predominantly rural with little commercial development towards Purbo Sarail and are generally free from annual flooding. The road network and hierarchy within the Paurashava boundary is relatively better established. There remains no railway facility in this Paurashava.

The roads of the Paurashava belong to number of agencies. Local Government Engineering Department (LGED) responsible for construction and maintenance of Upazila and Union roads and Paurashava responsible for construction and maintenance of roads within the Paurashava area. Existing transportation system is dominated by road network catering to the passenger service and freight transport (**Table 11-2**).

Table 11-2: Road status in Kalai Paurashava

Type of Road	Length (km)	Percentage (%)
Pucca	26.64	48.31
Katcha	11.72	21.25
Semi-pucca	16.77	30.41
Total	55.14	100.00

Source: Transportation Survey of Kalai Paurashava by AQUA, 2010.

The road network provides access to various places within the study area and connects various parts of the country following bus routes. Major trips of vehicles are generated from, within the Paurashava, Bazar Mour, and Khellal road area. Existing transportation system is dominated by road network catering to the passenger service and freight transport.

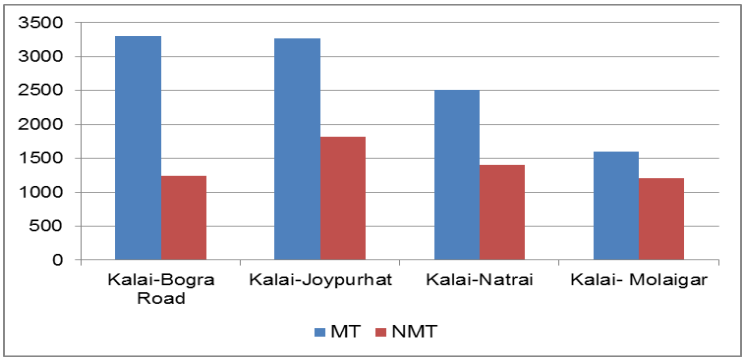
The major routes which connect Paurashava are:

- Kalai – Joypurhat
- Kalai – Bogra
- Kalai – Mokumbla
- Kalai - Mafrae

Apart from major roads, a large number of local roads having width varying from 10 ft. to 20ft width, provide access to individual houses and establishments and connect them to major roads.

11.2.2 Modal Share of Vehicular Traffic

Though Kalai Paurashava is a small town, Motorized Transport (NMT) is currently dominating inthe town's internal traffic. The traffic volume survey at Kalai bazar intersection presents that almost 34% traffic is NMT. The highest number of MT moves through Kalai to Bogra direction, the number of MT is about 3298 and it shares 30.89% of total mortorized traffic movements through this direction. The detailed scenario was described in Chapter 5, Section 5.3.5 ofKalai Survey Report. Figure 10.1 shows the directional vehicular composition of Bagur intersection.



Source: Traffic Volume Survey, 20010

Fig 11-2: Directional Composition of MT and NMT Composition at Upazilla Intersection

It is clearly evident from the survey that majority of the people choose motorized vehicle to go their desired destinations and hence MT is the most widely used transport mode for Kalai like most of the other Paurashavas. Two types of NMT dominate whole status of the modal choice namely, van and bycicle, covering 21.85% and 12.79% of the total transport moderespectively. In case of MT Motor Cycle which covers 24.19% of total traffic volume.Figure 5.8 shows the details of modal choice of the poura people.

11.2.3 Intensity of Traffic Volume

In order to investigate the nature of traffic movement and assess the volume of traffic theconsultant has Chaitalir Mour Intersection as the only major roadintersection with in the Project Area for conducting the traffic volume survey. The consultant has designed a standard format for traffic volume survey (approved by LGED). Traffic volume surveyshows more than 16349 traffic move through the intersection. Among these 5673.5 NMT and 1067.5 are MT vehicles.

11.2.4 Level of Service: Degree of Traffic Congestion and Delay

11.2.4.1 Traffic Congestation

Traffic conflict is common and frequent in towns, where there is combination of transport vehicles-slow and fast-on the streets. Major conflict and congestions occur in the places, where intensity oftraffic movement is high, on street parking is made and on street loading or unloading of goodsare taken place. The consultant studied the traffic movement all over the town and has identifiedthree main points, where the traffic congestion is the highest. These are located at Kalair Bazar Intersection, Khetlal Road. At thesepoints, the slow moving vehicles like, byclicle and vans come in conflict with motor vehicles, creating traffic congestion. As the number of slow moving vehicles is higher, the conflicts areusually frequent.

11.2.4.2 Delay

The traffic delays in Kalai town is caused by the interaction of various factors, such as congestion, inadequacy of carriageway widths, mixed traffic conditions, parked vehicles andheavy pedestrian flow and such delays are called congestion delays or operational delays andare difficult to measure precisely. It is observed that peak period takes on an average 10-15%excess time than off-peak period due to congestion, narrow road and improper design of Kalai Bazar intersection.

11.2.5 Facilities for Pedestrians

The town does not have any footpath anywhere. In small towns like Kalai, footpaths areusually absent, as it is given least priority in development program.

11.2.6 Analysis of Existing Deficiencies

Like any other town, Kalai has also transportation deficiencies, which are identified from two different sources. Firstly, by reconnaissance survey of the town, field observation interview of passenger and operator and secondly, by means of household sample survey.

11.2.6.1 Roadway Capacity Deficiencies

Primary Road (Regional Road)

The Bogra-Joypurhat Road is known as primary road as per Paurashava, length is 4.7 km and average width 5.87 meter. As it is the main highway which passess through the Paurashava, it has been proposed to wide the ROW upto 80 feet. The ROW of the existing primary road in the Paurashava is lower than the standard (ROW) recommended. Moreover, in hat day and non-hat day, highest volume of traffic flows on the primary road and it is about 500 to 900 PCU/hours.

Secondary Road:

There are several major secondary roads are in the Paurashava named Aura Road, length is 1.7 km and average width 3.29 meter, Mulgram Road, length is 0.45 km and average width 4.06 meter and Mulgram Road, length is 1.32 km and average width 3.8 meter. Besides Police Station Road and Duronjo Road are also secondary roads.

Road standard (ROW) recommended is 30 feet to 60 feet, proves that the ROW of the existing secondary roads in the Paurashava is lower than the standard (ROW) recommended. Moreover, in hat day and non-hat day, highest volume of traffic flows on those secondary roads is about 390 PCU/hour.

Tertiary Road:

In the Paurashava, some major tertiary roads have been identified and among them Kalai Girls' High School Road, length is 0.6 km and average width 4.45 meter and some unnamed roads are mentionable.

Road standard (ROW) recommended for tertiary road is 20 feet, proves that the ROW of existing tertiary roads in the Paurashava is lower than the standard (ROW) recommended. Moreover, in hat day and non-hat day, highest volume of traffic flows on those tertiary roads is about 400 PCU/hour.

Access road:

Road standard (ROW) recommended may be imposed on access road and it is upto 20 feet. In the Paurashava, all access roads are less than 12 feet and most of them are using as footway. Non-motorized vehicles named Van sometimes use those walkways.

Narrow Road Width

Narrow widths of roads and poor maintenance have marked by most respondents as major road problems in the town. From the survey, it has found that there are various problems in connection

with transport such as problem of narrow road, and damaged during rainy season etc. This will cause traffic on the street will rise and will create serious traffic congestion on the narrow streets. The project area is served by 55.14 kilometers of roads. When asked about the problem of roads, they pointed to narrow width of roads, flooding of roads during monsoon, poor condition of roads due to lack of maintenance, traffic congestion at particular points of the town.

When asked about the problem of roads, most households respondents answered affirmative (Household survey, 2010). Indicating to major road problems, they pointed to narrow road; broken roads due to poor maintenance, flooding of roads during monsoon, and traffic congestion.

Map 11-1: Width of some Major Roads in Kalai Paurashava

Traffic Conflict

Traffic conflict is common and frequent in towns where there is admixture of transport vehicles – slow and fast – in the streets. Areas of conflict occur at point where the intensity of traffic movement is high. The consultant studied the traffic movement in all over the town and identified one main point where the traffic conflict is highest, which Kalai Bazar Road Intersection. At this point the slow moving vehicles, like, rickshaw and vans come in conflict with motor vehicles, creating traffic congestion. As the slow mobbing vehicles are higher, the conflict is usually frequent.

The identified reasons for traffic conflict are improper intersection design, parking of vehicles on the street, waiting of operators on the roads looking for possible passengers, absence of traffic signal, disobedience of traffic rules etc.

11.2.6.2 Operational, Safety, Signal and other Deficiencies

Traffic management system is absent in the Paurashava. No operational system yet being imposed on traffic movement.

Due to the minimum PCU/hr. both in hat and non-hat day, availability of non-motorized vehicles and absent of available built-up area, road safety exists naturally in the Paurashava.

Traffic signaling system is totally absent in the Paurashava. Generally, traffic signaling system will not be needed up to the limit of the planning period. On some specific point of primary and secondary roads, traffic signaling will be needed.

11.2.7 Condition of other mode of transport (Rail/Water/Air)

There exits no rail way within the Paurashava. There is no air transport facility. Long distance water travel is also not possible.

11.3 Future Projections

Road design standards are prescribed in the section 21 of the Public Roads Act, 2004. The regulations of the sections are:

1. The Government may declare design standards for roads by publication in the Official Gazette.

2. The road design standards shall set out design requirements for roadways and road-related areas including structures located on roadways or road-related areas.

3. A road authority shall comply with the road standards when carrying out works on a roadway, road-related area or when installing, modifying or maintaining a structure on a roadway or road-related area.

4. Despite sub-section (3), a road authority is not required to comply with the road standards if:

    a. The road authority is carrying out maintenance and, in the view of the road authority; it would not be practicable to comply with the road design standards.

    b. The Government has, in writing, exempted the road authority from complying with the road design standards in relation to the works or structure.

    c. The Government may revoke or amend road design standards in the same manner as a declaration.

The Urban Area Plan for Dhaka City has recommended road standards with the consideration of traffic volumes, which were not undertaken in conjunction with the Dhaka Integrated Transport Study (DITS). A wide range of standards was suggested for various classes of roads, ranging from 4 meters to 24 meters, as mentioned below. The required right of way (ROW) is also indicated:

- Main Road 24.0 meter (78 ft) ROW
- Arterial Road 14.5 meter (47.5 ft) ROW
- Collector Road 13.0 meter (42.6 ft) ROW
- Access Road 9.0 meter (29.5 ft) ROW
- Access Road 6.0 meter (19.7 ft) ROW
- Non-motorized Road 4.0 meter (13.4 ft) ROW
- Footpath 2.5 meter (8.2 ft) ROW

In order to promote development of all roads in a systematic manner, new road standards were recommended for both built up areas, as well as for less built-up areas. These will replace the old standards, which were included in the Dhaka Metropolitan Development Plan (DMDP). The standards, when adopted will facilitate earmarking the right of way (ROW) for all major roads. The details of these standards used in this plan are indicated in **Table 11-3** below.

Table 11-3: Recommended Planning Standard of LGED

Types of Road	Recommended width
Paurashava Primary Roads	150-100 feet
Paurashava Secondary Roads	100-60 feet
Local Roads	40-20 feet

Source: PMO, UTIDP, LGED**.**

11.3.1 Travel Demand Forecasting for Next 20 Years

Existing road network is quite enough for accommodating present volume of traffic. The study area is rural in nature. Most of the roads are katcha and needs to be constructed as pucca or at least semi-pucca. Katcha roads become clayey in the rainy season and bring immense sufferings for the users. As a result, social, cultural and economic activities are disrupted significantly at that time. A very limited uses of small boats are found for transportation of goods within the short distance

particularly on hat day. Rail service is absent. Due to the absence of effective alternatives, passengers and goods movement of the study area is largely dependent on road transportation. This dependency will be calculated according to the increase of accessibility, consideration of the missing links, volume of traffic movement, bulk density of the area and economic importance of the area. Growth direction is also a considerable component for the demand analysis of the road.

11.3.2 Transportation Network Considered

The growth of transport networks obviously affects the social and economic activities that an area can support; yet the dynamics of how such growth occurs is one of the least understood areas in transport, geography, and planning. Transport network changes are treated exclusively as the result of top-down decision-making. Changes to the transport network are rather the result of numerous small decisions (and some large ones) by property owners, firms, developers, towns, cities, counters, and MPOs in response to market conditions and policy initiatives. Understanding how markets and policies translate into facilities on the ground is essential for scientific understanding and improving forecasting, planning, policymaking, and evaluation.

11.4 Transportation Development plan

The current chapter of the report is about Transport Development Plan covering its developmentplan proposals and management of the proposed project area up to the year 2031. The reportdescribes existing transportation facilities and consultant's proposal on the important facilitiessuch as, bus terminal, truck terminal, rickshaw/van stands, baby taxi/tempo stands andpassenger sheds for local bus users. Many of the proposals may now seem to be premature, butwill be necessary in future. If their executions are delayed, land may not be available in future forproviding such facilities. Appendix-3 shows the road network plan of Kalai Paurashava.

11.4.1 Plans for Road Network Development

The standards are meant for use by UTIDP, LGED and other planning and developmentagencies. The standards have been adopted by the consultants to draw up the transportationdevelopment plan. Following are the suggested planning standards (Table 11.4) for road network development. These road hierarchies are proposed based on the functional linkage of the road of Kalai Paurashava.

Table 11-4: Recommended Planning Standard of Kalai Paurashava

Road Network Proposal	
	Width
Paurashava primary roads	ROW 80ft
Paurashava secondary roads	ROW 30 -60ft
Tertiary Road	ROW 20ft
Access Road/ Local Road	ROW less than 20ft

Source: Proposed by Consulting Firm

Neighborhood and Local Road

The right of way (RoW) of all neighborhoods (mahallah) roads may be in between 15 ft. to 20 ftwide depending on their functions.

Standard Road Design

All urban roads should have flexible pavements. The road intersection should be designed toallow easy movement of vehicles. At bridge, the road design should provide for an adequate sightdistance and a smooth riding.

Functions of Roads

Each category of road has its particular functions to perform. Access road carries traffic frombuildings to the collector road and collector road carries traffic to the major road and vice versa. Inreality, however, it is almost impossible to maintain this hierarchical use of roads except in anentirely planned area. However, functions will not be dependent on the road width, rather on thelocation of the road, surrounding land use and the link it is providing or the volume of traffic it iscarrying. Thus a 40 feet wide secondary road can become a major road due to its strategiclocation and the purpose it is serving.

11.4.1.1 Road Network Plan

Planning standard is a fundamental tool for formulation of any planning perspective including transport plan. The suggested planning standards of road width for UTIDP are illustrated in **Table-11-3**. The standards are meant for use by UTIDP, LGED and other planning and development agencies. The standards have been adopted by the consultants to draw up the current series of plans. An integrated road network plan has been prepared commensurating the planning standards and considering the convenient movement of all vehicular and pedestrian traffic. Three types of road, such as Paurashava Primary Road, Paurashava Secondary Road and Local Road are proposed designating a unique ID No. to each road for the purpose of identifying them in map. The road network plan along with transportation management plan is presented in **Map 11-2** below.

11.4.1.2 Proposal for improvement of the existing road networks

Most of the roads in Kalai Paurashava are very narrow and it creates tremendous transportationproblem. To improve this situation about 45.18 km road is proposed for widening in the transport development plan. The highest 17.74 km road is proposed for widening up to 20 ft, which will function as Tertiary Road. Then 9.04 km road is proposed for widening up to 30 ft, which will function as secondary raod. Again 12.86 % (5.8 km) road isproposed as Seondary road and is proposed for widening from 40 ft. Finally 5.5 km of road is proposed for widening 80 ft, which will function as primary road. Table 10.4 shows thesummary of road widening proposal

Table 11-5: Road Widening Proposal in Kalai Paurashava

Proposed ID	Existing Width (m)	Proposed Width (ft)	Length (m)	Type
WRK433	1.67	80	5497.351	Primary
WRK318	1.67	60	1255.758	Secondary
WRK2	1.67	60	940.380	Secondary
WRK276	1.67	60	835.549	Secondary
WRK276	1.67	60	660.643	Secondary
WRK319	1.23	60	555.778	Secondary
WRK425	1.67	40	1801.372	Secondary
WRK103	1.67	40	550.977	Secondary
WRK18	1.67	40	542.828	Secondary
WRK321	1.67	30	1558.662	Secondary
WRK424	2.71	30	895.973	Secondary
WRK11	1.67	30	816.309	Secondary
WRK75	1.67	30	671.082	Secondary
WRK265	1.67	20	563.418	Tertiary

** Road length≥ 500 meter incorporated here. Detail was given in Appendix and Ward Action Plan.

Source: Upazila Towns Infrastructure Development Project and Proposed by Consulting Firm
Detailed has been shown on Appindix

Map 11-2: Proposed Road map of Kalai Paurashava

11.4.1.1 List of Proposed new roads

To improve existing transportation system about 19.7 km new road is in the transport development plan. The highest 7.7 km (39.38%) new road is proposed with 20ft right of way (RoW), which will function as tertiary road. Then 5.8 km (29.38%) new road isproposed with 30 ft RoW, which will function as secondary road. Table 11.7 shows the summary of road widening proposal.

Table 11-6: Summary of Road Proposals in Kalai Paurashava

Road Type	Length (in km)	Percentage
Primary Road	5.50	7.13
Secondary Road	33.87	43.94
Tertiary Road	24.67	32.00
Access Road	13.05	16.93
Total	77.09	100.00

Table 11-7: List of New Roads in Kalai Paurashava

Road ID	Road Type	RoW in ft	Length in Meter
NRK451	Secondary	60	1120.940
NRK486	Secondary	60	931.574
NRK463	Secondary	60	515.910
NRK487	Secondary	60	475.910
NRK435	Secondary	60	387.312
NRK464	Secondary	60	385.090
NRK484	Secondary	60	355.715
NRK463	Secondary	60	321.894
NRK435	Secondary	60	231.335
NRK486	Secondary	60	140.250
NRK462	Secondary	60	130.255
NRK485	Secondary	60	65.172
NRK492	Secondary	60	17.050
NRK482	Secondary	40	509.041
NRK483	Secondary	40	337.336
NRK465	Secondary	40	237.253
NRK494	Secondary	30	821.359
NRK478	Secondary	30	715.776
NRK504	Secondary	30	669.963
NRK504	Secondary	30	481.116
NRK475	Secondary	30	403.950
NRK494	Secondary	30	355.746
NRK478	Secondary	30	299.847
NRK445	Secondary	30	251.761
NRK451	Secondary	30	233.249
NRK451	Secondary	30	220.993
NRK477	Secondary	30	218.276

NRK454	Secondary	30	198.928
NRK455	Secondary	30	160.583
NRK501	Secondary	30	153.782
NRK477	Secondary	30	150.251
NRK470	Secondary	30	129.324
NRK474	Secondary	30	96.544
NRK506	Secondary	30	79.232
NRK474	Secondary	30	68.573
NRK446	Secondary	30	35.151
NRK504	Secondary	30	33.543
NRK479	Tertiary	20	446.128
NRK442	Tertiary	20	443.962
NRK450	Tertiary	20	429.974
NRK447	Tertiary	20	371.306
NRK449	Tertiary	20	370.746
NRK498	Tertiary	20	362.274
NRK460	Tertiary	20	342.915
NRK473	Tertiary	20	285.269
NRK472	Tertiary	20	262.619
NRK499	Tertiary	20	253.147
NRK444	Tertiary	20	252.065
NRK447	Tertiary	20	238.565
NRK481	Tertiary	20	233.757
NRK480	Tertiary	20	223.453
NRK457	Tertiary	20	217.474
NRK436	Tertiary	20	212.767
NRK469	Tertiary	20	192.746
NRK452	Tertiary	20	163.761
NRK461	Tertiary	20	153.454
NRK476	Tertiary	20	150.409
NRK456	Tertiary	20	138.234
NRK448	Tertiary	20	128.080
NRK453	Tertiary	20	122.776
NRK441	Tertiary	20	118.925
NRK458	Tertiary	20	115.796
NRK468	Tertiary	20	106.052
NRK459	Tertiary	20	102.756
NRK443	Tertiary	20	98.657
NRK439	Tertiary	20	77.293
NRK466	Tertiary	20	68.742
NRK437	Tertiary	20	67.018
NRK467	Tertiary	20	59.994
NRK440	Tertiary	20	58.610
NRK438	Tertiary	20	57.003
NRK481	Tertiary	20	39.167
NRK476	Tertiary	20	36.630
NRK471	Tertiary	20	23.094
NRK456	Tertiary	20	10.464
NRK473	Tertiary	20	0.160

11.4.2 Plan for Transportation Facilities

11.4.2.1 Transportation Facilities Plan

Following are the suggested planning standards (Table 11.9) for transport facilities plan. Thestandards are meant for use by UTIDP, LGED and other planning and development agencies.The standards have been adopted by the consultants to draw up the transportation developmentplan.

Table 11-8: List of Proposed Transportation Facilities

Type of Facilities	Ward No.	Mouza Name	Plot No.	Area in Acre
Bus Terminal	1	Kalai 111_01	100, 264, 265	0.75
Tempu Stand	1	Thupsara 50_01	1337, 1338, 1345	0.06
	2	Kalai 111_01	471, 511, 512, 514, 515	0.24
	2	Kalai 111_01	216, 217	0.07
	8	Kalai 111_02	1694, 1695, 1697, 1698, 1700	0.17
	4	Aura 56_01	1044	0.11
	3	Duronjo 55_00	14, 22, 23	0.08
	1	Kalai 111_02	952, 953, 967	0.03
Truck Terminal	6	Purbo Sarail 108_00	62-65,528,536-540	2.42
Total				3.93

11.4.2.2 Parking and Terminal Facilities

There is no parking facilities provided in Kalai Paurashava. People are habituated for parking beside the roads. This parking practice occupied considerable spaces and reduces the effective road width. Particularly in bazaar area where a number of markets exist the parking problem become acute during weekly hat days. If it is possible to integrate parking area for tempo, rickshaw, van, etc. near to Bazar area the congestion problem will be solved.

In order to mitigate the traffic congestion and traffic conflict at the Bazar area one parking area is proposed at the north side of Kalai Paurashava (**Map 11-2**). On-street parking shall be prohibited on all roads within the Bazar area except at places where it is specifically permitted for parking.

Adequate terminal facilities will be provided at the bus and truck terminal for the convenience and comfort of the commuters.

The bus terminal should have to accommodate the following services:

- Ticket Counter
- Passenger-shed
- Workshop
- Cleaning and washing facility

- Loading and unloading place
- Bus parking space
- Toilet facility
- Waiting room

Proposed facilities accommodate in the truck terminal complex:

- Workshop
- Cleaning and washing
- Loading and unloading place
- Truck parking space
- Toilet facility

11.4.2.3 Development of Facilities for Pedestrians, Bicycles and Rickshaws

Footpath may refer to sidewalk, which runs along vehicular roads. It is a separate lane exclusively designed for the purpose of pedestrian movement. The footpath is quite safe and free from any accident. Unfortunately, there is no footpath besides any road of Paurashava.

The transportation system within residential neighborhoods should favor pedestrian movement and discourage vehicular through traffic in both new and existing neighborhoods. A pedestrian system that utilizes neighborhood streets and paths to link the residents with the commercial and school functions serving the area will be encouraged.

The provision of separate bicycle or rickshaw lane is not a requisite for a low level of non-motorized traffic movement pattern, which is prevalent in any Upazila level small town like Paurashava.

11.4.2.4 Other Transportation Facilities

Traffic Signs and Signals

Traffic signs and signals are required in order to provide for the safe and orderly movement of motorized and non-motorized traffic and pedestrians. These provide information about routes, directions, destinations and points of interest. They also provide information on regulations, which apply to specific locations or at specific times, and warn of hazards, which may not be evident. When a traffic sign is correctly used, the majority of motorists will comply with the posted regulation or warning, and drive in a safe and orderly manner. In order to minimize the rate of traffic conflict the following signs and signals should be provided at the key location considering the prevailing traffic situation and traffic management option.

Table 11-9: Traffic Control Facilities in Kalai Paurashava

Traffic Control System sub-division		Present	Remarks
Traffic Signs (Traffic signs are devices placed along, beside, or above a highway, roadway, pathway, or other route to guide, warn, and regulate the flow of traffic, including motor vehicles, bicycles, pedestrians and other travellers.)	Regulatory	None	Should be Installed
	Warning	None	Should be Installed
	Marker	None	Should be Installed
	Guide & Informational Signs	None	Should be Installed
	Others	None	Should be Installed
Traffic Signals (Traffic signals are electrically operated traffic control devices which alternately direct traffic to stop and to proceed.)		None	Should be Installed
Traffic Police control Hour (Under this system, a person or a group of persons according to law by local/national authorities facilitate the movement of traffic and to prevent and/or report any breach of road traffic regulations on roadway.)		None	Should be Installed

11.4.3 Waterway Development/Improvement Options

There is no existing waterway network within the vicinity of the Kalai Paurashava and there is no proposal for its establishment from higher authority. Thus, waterway development option is not applicable at Kalai Paurashava.

11.4.4 Railway Development Option

As no railway connentivity is absent in Kalai Paurashava and as the railway network establishment is dependable on Bangladesh Railway Authority, so no proposal has been made in this context.

11.5 Transportation System Management Strategy (TSM)

Traffic Management for Kalai Paurashava is not just to consideration of vehicle movement rather considering the suitability to walk comfortably, to ride bicycle, distance consideration, easy access to market, parking facilities, etc. Traffic management context for a local Town can be reconsidered as the following Figure:

11.5.1 Strategies for Facility Operations

- **Creation of major linkage**

As the town grows and the traffic intensifies on the streets, an efficient network of roads has to be built based on major east-west link. This would ensure direct connection between different curial nodes of the network and help reduce both travel length and time. This is a nonstop process and will be closely in interaction with the spatial development policies for the Town.

- **Lane-based traffic management**

Determining number of lanes on every street and their individual capacity and rooting the traffic management and any future expansion on that capacity assessment. Lanes can be designated for different modes. Use of every segment of the road has to be pre-designed and clearly defined e.g. movement, parking, pedestrian crossing etc.

- **Promote use of FFT (Fuel Free Transport) and discourage FDT (Fuel Dependent Transport)**

Use of fossil fuel and harmful emissions are a major environmental issue all over the world. That's where FFT can play a vital role. Modes like walking, bicycling are in general called 'green transport' for their environmental friendliness. Promotion of these means of mobility can eliminate long-term negative impacts of fuel-based vehicles and enhance health and safety of the inhabitants.

- **Promote Plantation on the Walking way besides of the Roads**

Embankment cum Roads and other major roads have been proposed for promoting plantation with street furniture.

- **Providing Properly Designed Pedestrian Ways**

Kalai Paurashava has no provisions of pedestrian ways, which is one of the major crucial problems for the Town in Transport sector. All necessary facilities should be provided for the pedestrians. A designed pedestrian ways must be integrated closely with other transportation elements so that walking becomes a recognized mode and becomes a pleasure and a place for brief social gatherings for the Paurashava dwellers.

- **Road space allocation:**

Road space should be allocated among different mode and use based on the hierarchy of the road and its adjacent land-use. This is essential for safety and effectiveness of the road.

- **Development & availability of Public Transport (PT)**

This should form the major share of the motorized vehicle. PT has to be available within comfortable walking distance from any part of the Paurashava. Maintenance of an efficient public transport provides a cheap and accessible solution for mass movement.

- **Preserve and utilize natural network (adjacent River/ Khals) as Transport Corridors**

Establishing the network of Khals and River as vital corridors of transportation, especially for goods movement would create a viable alternative to road transport and also help preserve this traditional mode. Though Water transport is usually cheap and as goods delivery, it is not possible in case of Kalai as major khals or rivers are absent in this Paurashava.

- **Minimizing Transfer Times**

The present deficiencies in the inter-modal integration of the transport system are economically unsustainable in the long run. The current systems are time consuming to travel by more than one mode for the Town of Kalai Paurashava.

- **Integrating the Management of Land Use and Transportation in Kalai Paurashava**

The growth of the Town still concentrated to the core part of the area adjacent to the bazaar area which is just North Portion of the Municipality. To bring out a proper traffic and transport design core part of the town have to manage with high consideration and the semi core and fringe area should have to design for future projection basis.

11.5.2 Strategies for Traffic Flow and Safety

The following strategies have been identified for Traffic flow and safety

- **Avoid dispersed and scattered development patterns**

Dispersed and scattered type of development promotes 'sprawl' and increases for travel. It raises the need for more and more transport corridors inducing ever greater traffic.

- **Consider traffic impact of land use and occupancy of structure while giving building construction and land use permit**

Kind of use for the any structure has to be clearly defined. 'Transportation Clearance' should be given considering the structure size and proposed use and has to be a compulsory criterion for receiving building permit.

- **Effective road network design has to consider for the mixed land-use areas that provide both places to live and work**

Mixed land use provides the commercial base for supporting viable public transit. For providing effective road network design the study has been proposed the road cross section according to the road categories.

- **Widening the existing Roads**

All existing Roads have to be widening according to the Land use Importance.

- **Provide parallel service roads along the National Highway and Ensure less Use of this Highway from Local Purposes**

Direct connection of over access roads, cattle using, haphazard way passenger/ vehicle over-crossing, adjacent tea shops/vegetable markets etc should be avoided. For this purpose service roads have been proposed for the High way to save from over connection of local roads and other high way related services.

- **Separate lane for NMT**

Provisions of Separate lane for NMT will help to avoid traffic jam and conflicts.

- **Pedestrian First**

All the roads of the Paurashava necessary facilities should be provided for the pedestrians. A designed pedestrian ways must be integrated closely with other transportation elements so that

walking becomes a recognized mode and becomes a pleasure and a place for brief social gatherings for the city dwellers.

- **Parking Provision**

Auto Rickshaw, Rickshaw stoppage will be provided on the suitable place for the present need and also for growing future demand. Set up Rickshaw or Auto Rickshaw stops on street corners and other suitable locations.

11.5.3 Strategies for Traffic Management

The following strategies have been identified for Traffic Management

- **Formulate a Local Area Traffic Management Unit (LATMU)**

Designing, modelling and at last managing traffic and Transport is not an easy task. It needs important decisions of policy makers from both Public and Administrative representatives. For the Upazila Towns Mayor is the principle for taking any decisions whereas traffic and Transport related decisions require a Coordination Board where high official's opinion is very much important. For this purpose a small Town Transport Planning and management unit is require to manage traffic and transport situations.

- **Integrating the Management of Land Use and Transportation in Kalai Paurashava**

As transport is basically a function of land use, any proposed development should be examined with respect to the traffic impact it has on the locality. Kind of use for the any structure has to be clearly defined. 'Transportation Clearance' should be given considering the structure size and proposed use and has to be a compulsory criterion for receiving building permit.

The growth of the Town still concentrated to the core part of the area adjacent to the bazaar area which is just North Portion of the Municipality. To bring out a proper traffic and transport design core part of the town have to manage with high consideration and the semi core and fringe area should have to design for future projection basis. Mixed land-use creates vibrant, lively neighbourhoods/communities and reduces the need for longer distance travel and commuting. Short distances travel also encourages use of sustainable alternatives like walking and bicycling. Mixed land use provides the commercial base for supporting viable public transit. This would also imply restricting development of new strictly single-use zones (like residential, commercial etc.)

Dispersed and scattered type of development promotes 'sprawl' and increases for travel. It raises the need for more and more transport corridors inducing ever greater traffic. Therefore, avoiding and discouraging this kind of development by various policy measures would help reduce creating new trips.

- **Developing an Integrated Transportation System**

As there is no transport studies have conducted before for the Upazila Towns, no serious effort has been made for the functional integration of different modes of transport. However, it is well

known that without effective integration of transportation systems, economic benefit, convenience and comfort from transportation services cannot be derived.

- **Avoid dispersed and scattered development patterns**

Dispersed and scattered type of development promotes 'sprawl' and increases for travel. It raises the need for more and more transport corridors inducing ever greater traffic. Therefore, avoiding and discouraging this kind of development by various policy measures would help reduce creating new trips.

- **Need for Integration between Modes**

The main challenge in the area is to identify and link together the most appropriate modes for any journey. Unfortunately the existing modes (BUS -Try Auto Rickshaw -NMT) are acting independently of each other. As a result the passengers suffer due to the lack of inter-connection and scheduling and freight traffic faces delays and increased costs particularly when it is carried by waterways from outstations for destinations inside of the Paurashava. There is an urgent need for integration between modes for economic reasons and for convenience and comfort of the passengers. Traffic management is the It encompasses traffic engineering, but also includes policy making, planning and consultation processes and that's why a traffic management unit has to be launched. One traffic management unit will launch which will be under the Upazila Parishad and must be merged with the Paurashava for regulation, organization, guidance and control of all kinds of stationary and moving road users, and vehicles, including pedestrians, cyclists, motorcyclists, truck and cars, respecting the needs of abutting land uses.

- **Aspects of Access Control**

Maximum use should be made of the existing infrastructure before new roads are contemplated. In moving towards areas of vehicle restrictions and the management of demand a number of measures will be necessary in order to reduce congestion and pollution in the core part of the Town.

- **Minimizing Transfer Times**

The present deficiencies in the inter-modal integration of the transport system are economically unsustainable in the long run. The current systems are time consuming to travel by more than one mode for the Town of Kalai Paurashava.

11.6 Plan Implementation Strategies

11.6.1 Regulations to Implement the Transportation Plan

There is no specific policy provided for the local urban traffic and transport management for the small town of Bangladesh though there exists National Land Transport policy for Bangladesh. For this purposes to implement the transport plan national land transport policy can be followed. Again a traffic transport management authority must have to provide merge with Paurashava urban planning sector to manage transport related development and implementation.

The roles of the municipality will be largely unchanged. Their functions will still be to provide essential services for the population including in the transport sector – public transport, traffic

management signal systems, parking control and management and street lighting. The development of transport systems and infrastructure within the municipalities will be in accordance with the Structure Plan that will be provided under the Master Plan.

- **Effective co-ordination in transport**

Better coordination to be established between the Upazila Parishad and Departments under its control; & regulations will be formulated to achieve the goal of creating better working links between the Government and the public and private sectors. A committee has to develop to monitor the entire development project of the Paurashava to analysis about transport sector violation.

Government to promote clearer objectives and responsibilities for each sector in order to create more integrated working relationships.

- **Promoting the role of the transport users**

The Government will examine how best the interests of users can be represented within the existing national government and local authority system; The Government will establish a user role within its transport planning process.

- **Transport users should pay for the costs of services**

The Government makes arrangements to realize cost of transport operation and road maintenance from road users through new fiscal policies; to protect public interest, the Government will regulate tariffs for passenger and goods both in road and rail transport.

- **Subsidies for transport services**

The government should allow subsidy to the transport sector only on consideration of public interest.

11.6.2 Implementation, Monitoring, Evaluation and Coordination of the Plan

In Urban area planning the most significant role will be played by Paurashava planning Department. The Planning Department will carry out the entire work of project initiation and plan formulation. These works are complicated and time consuming, and require multidisciplinary professionals. But there is no provision of Planning Department in Kalai Paurashava. It is not possibly by the existing Paurashava personnel to undertake UAP programme after discharging all its regular office functions. This would necessitate strengthening of the institutional capacity of the traffic and transport Planning Department. Under the reorganized organogram of the Planning Department, a Planning Department can be created to deal with all affairs of area planning for the ‘B’ category Paurashava.

Under the current government policy regarding public sector agencies, it is unlikely that a major reshuffling can be achieved in improvement of existing manpower position of the Planning Department. As a result a large part of the planning process may have to be done through private consultancy.

According to the Local Government (Paurashava) Act 2009, Paurashava will, in the prescribed manner, prepare and execute a Road Maintenance and Development Program. A Paurashava also maintain the measures on Street lighting, street watering, traffic control, and public vehicles. They will maintain such public streets and other means of public communication as may be necessary for the comfort and convenience of the inhabitants of the municipality and of the visitors thereto.

Chapter 12: Drainage and Environmental Management Plan

A. Drainage Plan

12.1 Introduction

The purpose of the Drainage Plan is to make an assessment of the present drainage facilities and the scope for future development within 3435.1 acres study area of the Kalai Paurashava that consists of partially developed commercial, residential area and infrastructure. The purpose of the survey was to gather information available and use them at the time of the preparation of the drainage Plan that shall act as a guiding document for designing of drains in future. This Drainage Plan shall be a planning tool and shall be used as a guideline for Kalai Paurashava that shall be responsible for the approval of drainage improvements. In the past, the term drainage included only the hydrologic and hydraulic aspects for discharge of storm runoff. Perhaps the most pressing challenge that now a days we face include the management of our water resources and flood hazard, maintain a continuous supply of water for industrial, agricultural, transportation, recreation, and potable water for present and future generations. The Drainage Plan aspects shall also include the flood and water resources management and pollution abatement. The Drainage Plan will propose improvements necessary to the major drainage systems to accommodate storm runoff of the Kalai Paurashava. This planning process will consider both structural and nonstructural techniques to reduce the effect of the storm runoff which may be summarized as follows:

- Improvements to major drainage outfalls
- Improvement of the drainage network
- Management of available water resources
- Conservation of existing natural drainage channels

12.1.1 Goals and Objectives

Following are the overall objectives of the drainage plan of Kalai Paurashava:

- To allow smooth drainage of storm water and the waste water of the town.
- To develop a comprehensive drainage network with area coverage and capacity.
- To prevent encroachment to natural drainage system.
- To create awareness about disposing of solid waste in the drainage system.

12.1.2 Methodology and Approach to Planning

Preparation of the Drainage Plan involves (I) analyzing the existing conditions related to drainage facilities and the flood management (II) identifying major drainage outfalls and on the basis of the outfalls splitting the total drainage area into a number of drainage zones (III) defining all pertinent design criteria and (IV) defining drainage facility requirements and sizing.

The drains are designed to collect excess rainfall that comes as surface runoff from urban area, convey the runoff and finally discharge them to outfalls. The design of drains involves hydrological computations of rainfall intensity, its frequency of occurrence, duration etc., and the total runoff of a particular catchment area. The US Soil Conservation Service (SCS) method shall be used as an alternative of the Modified Rational Method for larger catchment areas.

In Modified Rational Method, the overall watershed is divided into zones that contribute to hydraulically significant points of concentration. The boundary of the zones is established based upon local topographic boundaries such as streets, existing drainage systems, etc., using good engineering practice.

Method Used

Storm and used water: The drains are designed to collect excess rainfall that comes as surface runoff from urban area, convey the runoff and finally discharge them to outfalls. The design of drains involves hydrological computations of rainfall intensity, its frequency of occurrence, duration etc., and the total run off of a particular area. The modified rational method shall be used for calculation of peak runoff for a definite frequency and duration from particular drainage basin. One limitation of this method is that it cannot be used for catchment area greater than 320 acres. The Natural Resources Conservation Service (NRCS) method formerly the US Soil Conservation Service (SCS) method shall be used.

In Modified Rational Method, the overall watershed is divided into zones that contribute to hydraulically significant points of concentration. The boundary of the zones is established based upon local topographic boundaries such as streets, existing drainage systems, etc., using good engineering practice. The design flow rate by Modified Rational Formula is –

Q = CsCr IA

Where:

Q	=	Design runoff flow rate (cfs)
I	=	Rainfall intensity (in/hr)
Cs	=	Storage coefficient
Cr	=	Runoff coefficient
A	=	Drainage area (acres)

Rainfall Intensity (I): The rainfall intensity is the average rainfall rate for a particular drainage basin or sub-basin. The intensity is selected on the basis of the design rainfall duration and return period. The return period is established by design standards as a design parameter. Rainfall intensity with 5 years return period is generally employed for design of primary drains and canal improvement. Rainfall intensity with 3 years return period is employed for design of secondary drains. The design duration is equal to the time of concentration for the drainage area under consideration. Time of concentration is a critical parameter both for the Modified Rational Equation and SCS method. Time of concentration is generally defined as the longest runoff travel time for contributing flow to reach the outlet or design point, or other point of interest. It is frequently calculated along the longest flow path physically.

Estimating the time of concentration involves identification of an appropriate flow path or paths and estimating runoff travel times along the flow paths. Where post-development conditions include significant pervious surfaces, the time of concentration for just impervious portions of the basin may be required to calculate and compare peak flow response for the basin as a whole against that of the more rapidly-draining impervious surfaces alone. The Time of Concentration composed of the Initial Time of Concentration, sometimes referred to as the Inlet Time or Time of Entry and the Travel Time. Initial Time of Concentration is that time required for runoff to travel from the most remote point in the drainage area to the first point of concentration. This can be determined using the Ki pitch equation. The Initial Time of Concentration must be five minutes or longer. In instances where Initial Times of Concentration are estimated to be shorter than five minutes, five minutes shall be applied.

The second part of the Time of Concentration is the Travel Time that takes the flow to travel along the drain. Channel flow occurs in channels carrying integrated flows, pipes (flowing partially full), and streams. Where storage is not significant, Travel Times can be estimated by applying Manning's Equation, and using estimates of channel characteristics and appropriate roughness values for pipe, channel, or stream features as tabulated in **Table-12-1**.

Table 12-1: Storage Coefficients for flat land

Characteristics of surface	Storage Coefficient		
	Slope < 1: 1000	Slope < 1: 500	Slope < 1: 300
Residential urban	0.70	0.80	0.90
Commercial	0.80	0.90	1.00
Industrial	0.70	0.80	0.90
Residential Rural nature	0.60	0.70	0.80
Agricultural	0.50	0.60	0.70
Forest/woodland	0.30	0.40	0.50
Aquatic land	0.30	0.40	0.50
Paved area/road	0.80	0.90	1.00

Source: Countywide Comprehensive Plan (Master Drainage Plan) Exhibit-VIII

V= [1.49/n] [R 2/3] [S 1/2]

Where

V = Velocity of flow, feet/second
N = Manning's roughness coefficient for channel flow
S = Slope, feet/foot
R = Hydraulic radius, feet

And

T t = V / (60L)

Where

T t = Travel time, minutes
V = Velocity, feet/second
L = Length, feet

Storage Coefficient (Cs): Due to very flat topography of Bangladesh, the runoff is significantly slow. The rainfall after evaporation and infiltration accumulates first in the depressions, until these have been reached their capacity and then runoff. To take these effects a storage coefficient is used. The value of the storage coefficient is based on average ground slope and the nature of the ground surface. Some of the storage coefficients are listed in **Table-12-2**.

Table 12-2: Modified Rational Method Runoff Coefficients

Land use designation	Runoff Coefficient C_r
Residential rural	0.30
Residential semi urban	0.40
Residential urban	0.50~0.60
Apartment professional	0.70
Neighborhood Commercial	0.85
Community Commercial	0.85
Industrial	0.70~0.75
Slum area	0.50~0.55
Agricultural exclusive	0.25
Forest and watershed	0.20~0.25
Public facilities	0.3~0.60
Forest/ woodland	0.25
Paved area/road	0.99

Source: Countywide Comprehensive Plan (Master Drainage Plan) Exhibit-VIII

Catchment Area:

The size and shape of the catchment or sub-catchment for each drain shall be determined by plan metering topographic maps and by field survey. In determining the total runoff of a catchment area the following assumptions to be made:

a. The peak rate of runoff at any point is a direct function of the average rainfall for the time of concentration to that point.

b. The recurrence interval of the peak discharge is same as the recurrence interval of the average rainfall intensity.

c. The Time of Concentration is the time required for the runoff to become established and flow from the most distant point of the drainage area to the point of discharge.

Projection

In implementing various infrastructures for development, drainage is generally given less priority and is normally considered to be the last or final steps for development. Such scenario is particularly true for Bangladesh; although different types of drainage infrastructures are among others by far the heaviest impact on physical infrastructure network. As a result, physical environment, health, hygiene and standard of living suffer seriously. In development projects, Government, Semi-government and Public sector allocated funds are mostly spent on buildings, roads and other more visible infrastructures and drainage comes as the last item of development. By the time, drainage development begins to start, there appears shortage of fund, consequently as a matter of policy-do little or do-nothing situation appears and as eyewash very little is done for drainage development. In case of urban development, if drainage is not given priority, sufferings of the inhabitants will continuously increase with the passage of time. Drainage development for

urbanization should start with drains. Drains can be classified as Plot drains, Block drains, Tertiary drains, Secondary drains and Primary drains. Other natural drainage infrastructure is lowland, outfall areas, khals and rivers. Man-made drains are Plot, Block, Tertiary, Secondary and Primary drains and others are natural drainage infrastructures. In planning for drainage network, care will be given on road network in terms of conflict of drainage and waterways with roads. In the following and subsequent sections major element, their principle, purpose and function of drainage infrastructures are discussed and presented in lower to higher order which will be considered as a method for drainage plan.

Plot Drains

Plot drains are provided around a building on a plot. In most cases, the drain is made of bricks and is rectangular in shape that can carry storm water generated in the plot and from the building. Plot drain is connected to the Block or Mohallah drain.

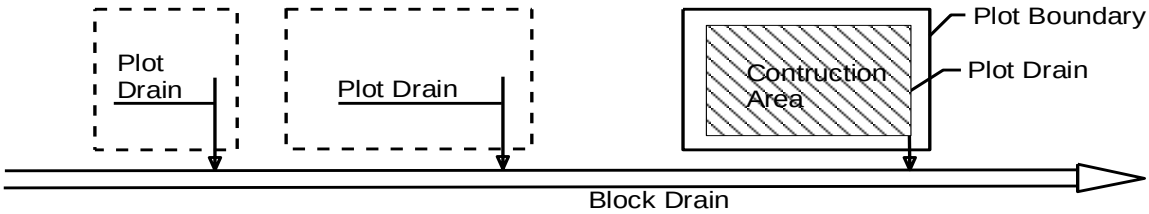


Fig 12-1: A sketch showing plot and block drain

Block Drain

Block drain is provided at the outside of a block that accommodates several buildings of the block. The block drains are made of bricks like plot drains but bigger in size so that it can serve the storm water generated within the block and the buildings and open areas within the block. Sometimes the block drain may serve few neighboring blocks or Mohallahs. Block drains carry storm water coming from the plot drains. Shape of the block drain is also rectangular, bigger than plot drains and its bottom is lower than plot drain. Sketch of the plot drain also shows the block or Mohallah drain under plot drain.

Other Drainage Related Infrastructures

In order to facilitate or mitigate drainage issues some infrastructures are provided or used, these are namely

i. Bridges, culverts, box culverts
ii. Drainage sluices, pipe sluices, siphons
iii. Flood protection embankments and flood walls
iv. Sluice gates, Regulators, Navigation lock
v. Flood protection and drainage structures.

i. Bridges, Culverts and Box Culverts

These structures are provided at places wherever roads cross the drainage network system. Such structures are built on the roads to free passage of drainage water and sometimes to provide navigation/ boat passages. Consequently the conflict between drainage and road networks is mitigated. Figures below show bridge and culverts in such system.

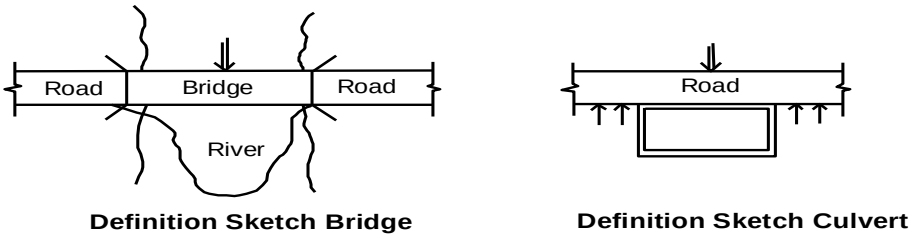


Fig 12-2: Bridge and culvert

ii. Drainage sluices, pipe sluices and siphons

Drainage sluices, pipe sluices and siphons are provided on the embankments. Embankments protect the area from floods coming from outside rivers and make the project area flood free. However storm water from rainfall-runoff within the area causes localized flood, drainage congestion and submergence. A sketch below shows a few of such structures.

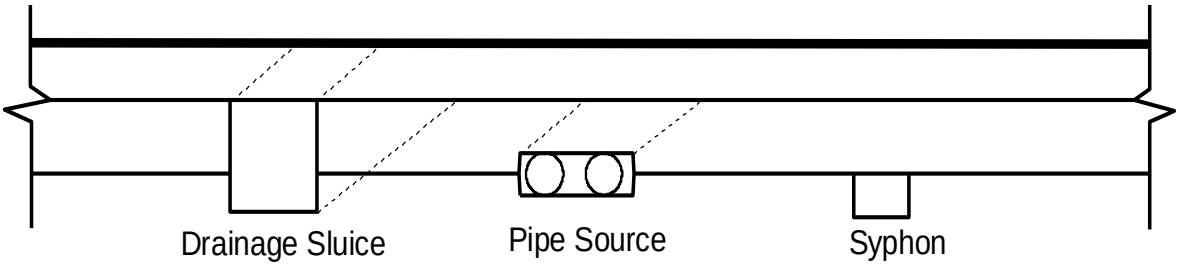


Fig 12-3: A schematic view of Drainage sluice, pipe sluice and siphon on embankment which relieve drainage congestion.

A schematic view of Drainage sluice, pipe sluice and siphon on embankment which relieve drainage congestion.

Primary Drain

Primary drains are also called main drains. Primary drains cover larger storm drainage area than tertiary and secondary drains. Sometimes primary drain bears local name. In ascending order its position is third. Its cross-section is larger than other types; carrying capacity is high and is constructed of brick, cement concrete and sometimes reinforced concrete. Primary drains may be of earthen structure provided sufficient land is available and land value is low. Contributing drainage water comes from tertiary and secondary drains. Primary drains discharge its drainage water to outfall, natural khal, river or large lowland area / Beels.

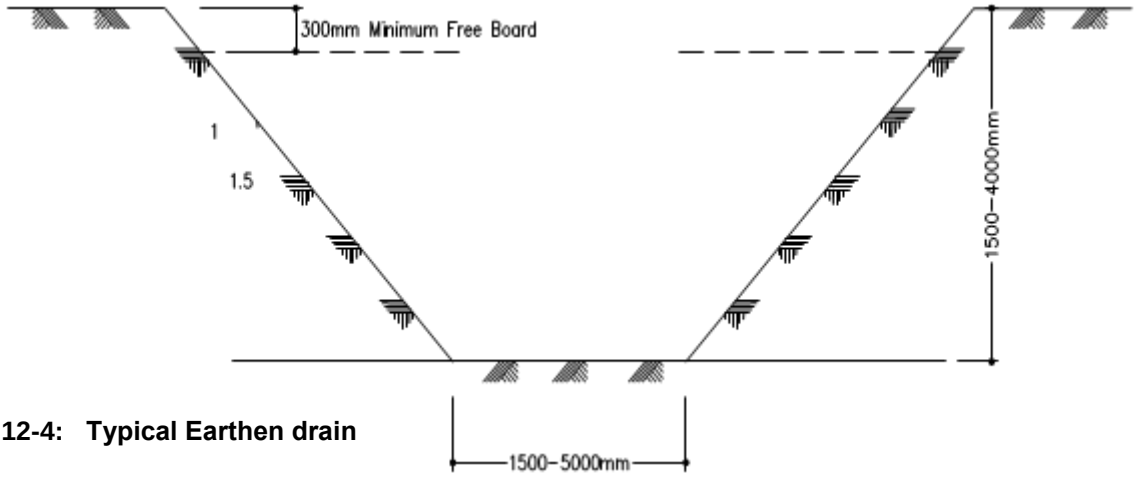


Fig 12-4: Typical Earthen drain

Secondary Drain

Secondary drains collect discharge from tertiary drains. One secondary drain may receive drainage discharges from several tertiary drains in its course. Size and capacity of secondary drain is much bigger than tertiary drains; its catchment area is much bigger than tertiary drain. Like tertiary drain, it may run parallel to bigger roads. Secondary drains may run along and through the middle of its storm water contributing area.

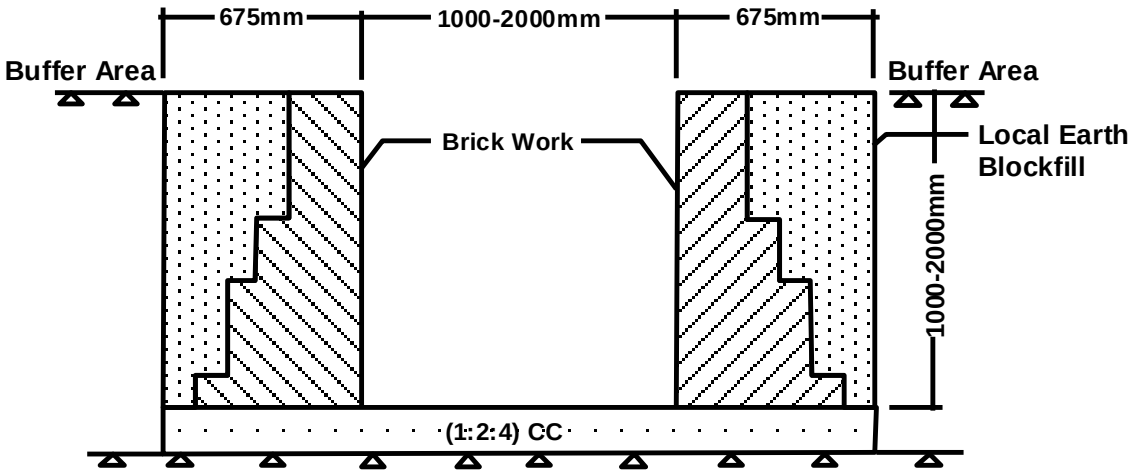


Fig 12-5: A Typical Secondary Drain

Tertiary Drain

Tertiary drain carry run-off or storm water received from the above mentioned plot drains and block or Mohallah drains. Their catchment area or storm water contributing area is bigger than Mohallah drains. In most Paurashava areas it is difficult to find such naming or classifications. However, such classifications can be seen in references. Tertiary drains generally are the under jurisdiction of Paurashava. Those drains or drainage networks are constructed and maintained directly by the Paurashava.

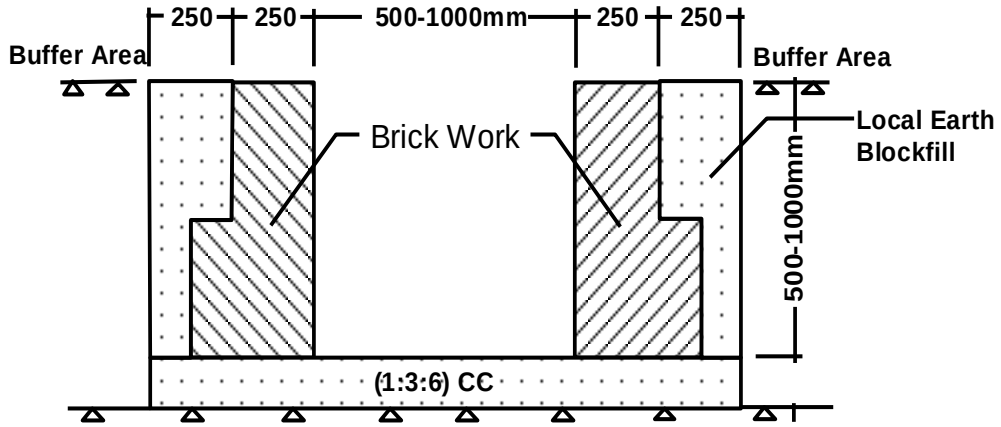


Fig 12-6: A Typical Tertiary Drain

Reservoirs

Large tanks, ponds, Dighis, lakes, etc. serve as immediate detention areas for storm water. Those structures are man-made and also natural; may be privately owned or government-owned or khas land. These structures function as drainage relief and source of water for emergency use, fisheries, duckeries, environment and nature preservation. For every mouza such reservoir is available. Physical feature survey maps and field survey maps (tank, pond and reservoir) show the existence of reservoirs and database shows their dimensions. Those structures should not be disturbed or removed by physical interventions by fillings or other means rather should be properly maintained and preserved.

Quaternary Drain

Quaternary Drains had to be introduced in this particular project due to the complexity of the existing system. These drains are the smallest parts of a large drainage system. It takes the discharge of a small area to a tertiary drain. These are the smallest drains considering the depth and width.

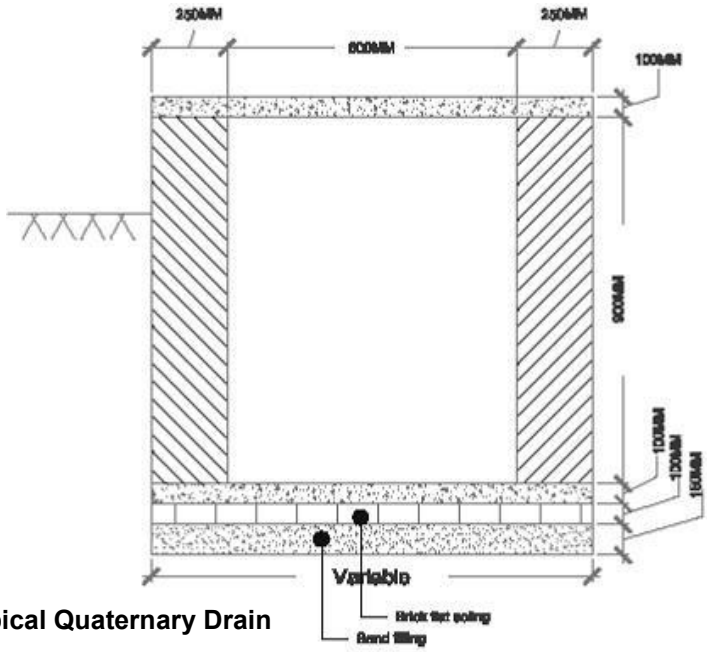


Fig 12-7: A Typical Quaternary Drain

Other kinds of drainage infrastructure are lowland, outfall areas, khals and rivers. Man made drains are Plot, Block, Tertiary, Secondary and Primary drains and others are natural drainage infrastructures. In planning for drainage network, care should be given for road network in terms of conflict of drainage and waterways with roads. In the following and subsequent sections major element, their principle, purpose and function are discussed and presented in lower to higher order.

Drainage Khals and Waterways

Khals and waterways are natural channels and act as drainage elements. In every mouza more or less such natural channel, khals and waterways carry the excess storm water to the connecting river lying further in the down stream. Sometimes old and silted-up khals are re-excavated to improve drainage efficiency. Most of the natural khals carry the local storm water particularly runoff from the Mouza / Mouzas those it passes through. Khals are narrow and deep in cross-sections; on the other hand waterways are shallow and wider. Physical feature survey maps, field survey maps (river, khal / drainage) show the drainage khals and waterways and their database shows the dimensions.

12.2 Existing Drainage Network

12.2.1 Introduction

For the preparation of Drainage Plan, survey started through field reconnaissance and review of available document related to the study area. The Kalai Paurashava and its adjacent area have been visited several times to identify the sources of flooding, existing drainage pattern, flood flow pattern and geographical position of the study area. Field trips have also been carried out to identify the infrastructures, rivers, canals, beels, ponds etc., those required to be surveyed for preparation of maps. It is investigated whether any Drainage Plan has been prepared by any other agency. The Mayor of Kalai Paurashava informed that no such plan has been prepared earlier.

12.2.1 Existing Drainage System/Network

The drainage system of the Kalai Paurashava has been surveyed and classified into three categories: (i) unlined natural canals and khals acting as primary drains, (ii) beels playing important role in acting as retention ponds and (iii) brick masonry secondary and tertiary drains and earthen shallow secondary drains. The natural primary drains of the Kalai Paurashava have emerged as a natural process following the natural slope of the ground, for the flow of storm runoff without human intervention.

Natural Drainage System:

The natural drainage network is composed with 654 water bodies in Kalai Paurashava out of which 499 are ponds and 152 are ditches and one lake. Total area devoted to water bodies in Kalai Paurashava is around 168.72 acres though in master plan total 117.3 acre has been determined to conserve as water body.

There are natural drainage systems along roadside and the linkage between natural and man-made drainage system in somewhere. The existing two canals in north and south part of the Paurashava provide opportunity of natural drainage system.

There are linkages between natural and man-made drainage system. But how much effective and active the linkage is with the poorly maintained man-made drains is a question. Almost half of the depth of the man-made drain is filled with solid garbage's; as a result, the channel is not properly functioning (**Table 12-3**).

Table 12-3: Existing natural drainage network of Kalai Paurashava

Ward No.	Ward (Acre)	Ward wise Water body (Acre)	Ward wise Water body (%)
1	561.487	28.46	16.87
2	191.118	18.99	11.26
3	453.827	27.16	16.10
4	422.369	17.35	10.28
5	382.891	13.43	7.96
6	359.253	8.30	4.92
7	438.365	16.64	9.86
8	356.813	19.76	11.71
9	268.941	18.64	11.05
Total	3435.1	**168.72**	100

Source: Physical Feature Survey, 2010.

Man-made Drains

The following table shows the ward-wise drainage coverage and type on the basis of construction pattern in Kalai Paurashava. From the table it is seen there exists only Pucca drains in Kalai Paurashava. The table also indicates that there is limited amount of drainage in Kalai Paurashava. In this Paurashava there is only 12.34 km drain. Uncovered drains are mostly in existence with poor condition. Detail statistics of existing man-made drainage network is shown in the **Table-12-4**.

Table 12-4: Type of drain in Kalai Paurashava

Ward No	Length(km)		Total Length (km)
	Pucca	Katcha	
1	1.65	0.00	1.65
2	3.07	0.00	3.07
3	0.14	0.00	0.14
4	0.97	0.00	0.97
5	1.54	0.00	1.54
6	0.31	0.00	0.31
7	1.10	0.00	1.10
8	1.15	0.00	1.15
9	2.42	0.00	2.42
Total	12.34	0.00	12.34

Source: Drainage and Environmental Survey in Kalai Paurashava, 2010

In Kalai there are no mentionable long drains with designated outfall. Only the following five drains can be considered as large drain compared to other drains (**Table 12-5**).

Table 12-5: Location, start and end of some drains in Kalai Paurashava

Sl No	Location	Type	Ward No	Length (m)	Width (m)	Start	End (Outfall)
1	Along Bogra-Joypurhat Road	Pucca	2	829.41	1.8	Bazar Road	Karcha Road adjacent

Sl No	Location	Type	Ward No	Length (m)	Width (m)	Start	End (Outfall)
							manufacturing factory
2	Across Khetlal Road	Pucca	1, 9	303.92	.7	Mollah Bari	Another drain
3	Across Mulgram Road	Pucca	2	412.25	1.8	Intersection of Mulgram and Bogra-Joypurhat intersection	Grocery Shop
4	Across Khetlal Road	Pucca	9	168	.8	High School	Encompass with School campus
5	Along Aura Road	Pucca	5	139	.8	Mosque	Across the road

Source: Drainage and Environmental Survey in Kalai Paurashava, 2010

In this Paurashava there is 12.34 km drain. These drains are constructed by the Paurashava.

12.2.2 Analysis on land level (Topography)

Land Levels/Spot Levels

The Total Station (TS) based surveys were conducted for measuring the spot levels/land levels of the project area (Northing, Easting, Elevation or RL). Later on these spot levels were used for generating the contour of the project area. In general the spot levels on the land were taken approximately at 10 meter intervals.

Maximum level of Kalai Paurashava is 26.8 m and lowest point is recorded as 20.3 m and both the highest and lowest point is located at ward 8. Average elevation of Kalai Paurashava area is derived as 24.2 m. Average spot height gives the indication of relative of various wards. It seen that ward 1, 2 and 9 are comparatively high land area .Details statistical summary of land levels survey are shown in **Table 12-6** and **Table 12-7** below.

Table 12-6: Summary of Spot Level Data of Kalai Paurashava

No.	Spot Unit	Value
1	Total Spot Number	15100
2	Maximum Height	26.796 m
3	Minimum Height	20.252 m
4	Average Spot Height	24.190 m
5	Standard Deviation	0.276261 m

Source: Topographic Survey in Kalai Paurashava, 2010

Table 12-7: Characteristics of Land Levels of Kalai Paurashava

Ward No	Land Level Characteristics
Ward no 01	High
Ward no 02	High
Ward no 03	High
Ward no 04	High with small low part
Ward no 05	High with small low part
Ward no 06	High with small low part

Ward No	Land Level Characteristics
Ward no 07	High
Ward no 08	High with small low part
Ward no 09	High

Source: Derived from Topographic Survey Data of Kalai Paurashava, 2010

General Contour Descriptions

Paurashava is situated in a high land area. More interpretation can be derived from a Surface Analysis. In the following there are two maps. The first **Map 12-1** shows the contour description and **Map 12-2** surface analysis of Kalai Paurashava. From the surface analysis map it can be found that the the discrepancy between low and high land of the poura area is very nominal. From the surface analysis map it is found that government service lands are usually higer than other lands and agricultural lands are low land.

Table 12-8: Land Use Category with Spot Heights (mPWD) in Kalai Paurashava

Landuse	Min	Max	Mean
Agriculture	22.764	26.796	24.14
Circulation network	23.857	25.37	24.69
Commercial	23.883	25.374	24.63
Community Service	24.163	25.106	24.63
Education and Research	24.233	24.775	24.47
Governmental Services	24.886	25.22	25.00
Manufacturing and Processing Activity	23.936	25.192	24.57
Miscellaneous	24.132	24.642	24.32
Mixed Use	24.079	25.372	24.61
Recreational Facilities	24.194	24.925	24.46
Residential	22.667	25.339	24.45
Service Activity	24.694	24.995	24.85
Transport & Communication	24.479	24.884	24.67
Urban Green Space	24.095	25.075	24.56
Water Body	20.252	25.303	24.29

Source: Topographic Survey in Kalai Paurashava, 2010

Map 12-1: Contour Map of Kalai Paurashava

12.2.3 Analysis of peak runoff and identification of drainage outfalls

The size and shape of the catchments or sub-catchments for each drain shall be determined by planimeter from topographic maps and by field survey. In determining the total runoff of a catchment area the following assumptions to be made:

- The peak rate of runoff at any point is a direct function of the average rainfall intensity for the Time of Concentration to that point.
- The recurrence interval of the peak discharge is same as the recurrence interval of the average rainfall intensity.
- The Time of Concentration is the time required for the runoff to become established and flow from the most distant point of the drainage area to the point of discharge.

Regarding runoff discharge it has been observed that there is several numbers of khals passing through the Kalai Paurashava. Those are the only natural drainage channels which receives part of the runoff volume from part of the town.

Some of the drains are working properly but most of them are temporarily connected to ditches or discharging to paddy field. These drains have been constructed in an unplanned way and without considering proper outfalls. The drains are constructed as piece meal, no proper size and gradient has been maintained. As a result, with the expansion of township some of them already have to abandon. The common run-off coefficients of different types of areas are listed in **Table 12-5** below.

Table 12-9: Common Run – off coefficients for Different Types of Area

Type of Drainage Area		Run-off Coefficient: C
Business	Downtown areas	0.70 – 0.95
	Neighborhood area	0.50 – 0.70
Residential	Single – family areas	0.30 – 0.50
	Multi – units, detached	0.40 – 0.60
	Multi – units, attached	0.60 – 0.75
	Suburban	0.25 – 0.40
	Apartment dwelling areas	0.50 – 0.70
Industrial	Light areas	0.50 – 0.80
	Heavy areas	0.60 – 0.90
	Parks, cemeteries, playgrounds	0.10 – 0.35
	Rail road yard areas	0.20 – 0.40
	Unimproved areas	0.10 – 0.30
	Streets; Driveways and roofs	0.10 – 0.95
Lawns	Sandy soil, flat, 2%	0.05 – 0.10
	Sandy soil, avg, 2 – 7%	0.10 – 0.15
	Sandy soil, steep, 7%	0.15 – 0.20
	Heavy soil, flat, 2%	0.13 – 0.17
	Heavy soil, avg, 2 – 7%	0.18 – 0.22
	Heavy soil, steep, 7%	0.25 – 0.35

Source: Handbook of Hydrology, by - David R. Maidment

12.3 Plans for Drainage Management and Flood Control

12.3.1 Plan for Drain Network Development

Sustainable drainage network system, an alternative to conventional drainage is introduced to mimic natural drainage, with the aim of reducing flooding and improving the quality of water draining from urban surfaces (runoff). A comprehensive drainage network is developed leaving the existing beels and khals to remain their natural form. To solve the overall drainage problem of the Kalai Paurashava a Drainage Plan has to prepare as integral part of Paurashava Master Plan. During preparation of land use plan special emphasis to be given to retain the existing water bodies. Special attention to be given to protect the khash lands of khals and beel from illegal encroachment and no circumstances it shall be allowed to change their nature. As part of the Drainage Plan the Paurashava to be divided into several drainage zones. Run off from each drainage zones shall reach to the primary drains. The existing tertiary drains those will match with the proposed network will be rehabilitated, those not have to abandon.

12.3.1.1 Drain Network Plan

The activity for the relevant authority will be assisted by the preparation of the drainage master plan for the Paurashava which details the necessary corridors, plot sizes and generalized locations for:

- Primary canal / khal (new and improved).
- Storage ponds.
- Silt traps.
- River embankment.

Initially, the Paurashava will encourage implementation of the first phase recommendation of the drainage master plan. A brief summary of the proposals to be undertaken in Phase-1 is given below. Reference should be made to the Map for identification of the drainage areas referred in the text.

Phase-1 (Storm water drainage)

- Local improvements and the removal of obstacles from existing canals in drainage areas marked as 1, 3, 4, 6 and 9. Works to include:
  - Redesign of hydraulically inefficient bends, entrances and exists.
  - Rising and / or widening of bridges and culverts to give unobstructed flows.
  - Returning the channels to a uniform cross-section by removal of encroaching properties and structures.
  - Raising crossings over roadside channels to adjacent properties above the flood level of the waterway.
- Construction of silt traps in drainage areas. Minimum size of the plot required to house these silt traps in 20 meters by 20 meters.
- Improvements of primary canals in drainage areas.
- Improvements of secondary and tertiary canals in drainage areas.

- Construction of missing canals (new) in drainage areas.
- Construction of new secondary and tertiary canals in drainage areas.
- The provision of flood control regulators in drainage areas.

Phase-2 (Rain water and household drainage)

- Construction of surface drain linked with the residences, may be covered or uncovered.
- Provide linkages with secondary and tertiary drains.
- Out-fall of such drains may be nearby canals and low-lands.
- For discharging of rainwater from commercial areas, covered surface drain may be constructed and they will be linked with the secondary and tertiary canals.

12.3.1.2 Proposal for Improvement of the Existing Drainage Networks

Based on the results of drainage study it is recommended for the existing drain that:

- Rehabilitate broken drains;
- Cover the open drains based on budget allocation.
- Fencing off some of the channels to prevent dumping of refuse.
- Construction of new channels and rehabilitation of old ones with enough drainage head.
- Construct a new pump drainage network for the area towards khal.
- Remove all un-authorized structures, which developed on drainage structures.

In order to drain out the anticipated future peak runoff to be generated from rainfall due to increase in impervious land cover as well as built-up areas and to mitigate the vulnerability of rainfall induced flooding and water logging, some existing secondary drains have been identified for improvement. The details of improvement of identified existing drains are shown in **Table 12-10**.

Table 12-10: List of Drains for Proposed Improvement

Sl No	Location	Type	Ward No	Length (m)	Width (m)	Start	End (Outfall)	Proposed Width (m)
1	Along Bogra-Joypurhat Road	Pucca	2	829.41	1.8	Bazar Road	Karcha Road adjacent	2.2
2	Across Khetlal Road	Pucca	1 and	303.92	.7	Mollah Bari	Another drain	1.8
3	Across Mulgram Road	Pucca	2	412.25	1.8	Intersection of Mulgram and	Grocery Shop	2.2
4	Across Khetlal Road	Pucca	9	168	.8	High School	Encompass with School	1.8
5	Along Aura Road	Pucca	5	139	.8	Mosque	Across the road	1.8

Source: Drainage and Environmental Survey in Kalai Paurashava, 2010

Drainage corridors: If a drainage network has to be installed, the drainage originating throughout the Paurashava would be carried by means of surface drains and culverts. These should be accommodated within road reserves.

General location required: For sewerage treatment plant, large plot will be needed, preferably on outskirts of the Paurashava. For sewerage pumping station, small plots throughout the Paurashava will be needed and a system should be introduced.

Maintaining of land slope: Important component of the drainage network is land slope, which was not maintained during the construction of existing drains. The slope of the Paurashava is found towards east and southeast. Slope of all drains should maintain this direction.

12.3.1.1 List of Proposed New Drains

For effective functioning of existing drainage network, some new drains have been proposed in the project area which is listed in **Table 12-11**. The list has been prepared based of analysis of topographic map, existing drainage network, field visits and consultation with the Paurashava officials and local people. A complete drainage master plan of 148 Paurashavas is currently preparing by DPHE. has fall under this project. So the detail drainage master plan should get prior consideration while implementing this plan.

The proposed drains along with existing drains and other drainage infrastructures are shown in ***Map 12-3***.

Table 12-11: Proposal of New Drains

Pro_ID	TYpe	LENGTH_MET	Phase	Pro_Width
KD25	Primary	1972.71	Third Phase	3
KD29	Primary	990.83	Third Phase	3
KD46	Primary	2909.62	Third Phase	3
KD66	Primary	1468.85	Third Phase	3
KD82	Primary	948.19	Third Phase	3
KD127	Primary	1273.31	Third Phase	3
KD30	Secondary	1177.04	First Phase	2
KD33	Secondary	1010.95	First Phase	2
KD43	Secondary	607.51	First Phase	2
KD63	Secondary	735.86	First Phase	2
KD70	Secondary	1362.75	First Phase	2
KD74	Secondary	1154.87	First Phase	2
KD75	Secondary	2168.32	First Phase	2
KD81	Secondary	855.88	First Phase	2
KD86	Secondary	1138.28	First Phase	2
KD102	Secondary	592.77	First Phase	2
KD106	Secondary	1035.68	First Phase	2
KD111	Secondary	1117.07	First Phase	2
KD1	Secondary	685.07	First Phase	2
KD3	Tertiary	508.64	Second Phase	1
KD6	Tertiary	920.34	Second Phase	1
KD7	Tertiary	456.48	Second Phase	1
KD11	Tertiary	934.09	Second Phase	1
KD12	Tertiary	451.66	Second Phase	1
KD16	Tertiary	350.16	Second Phase	1
KD17	Tertiary	413.00	Second Phase	1
KD21	Tertiary	282.30	Second Phase	1
KD23	Tertiary	379.51	Second Phase	1
KD24	Tertiary	373.24	Second Phase	1
KD26	Tertiary	272.99	Second Phase	1
KD28	Tertiary	293.43	Second Phase	1
KD31	Tertiary	568.78	Second Phase	1
KD35	Tertiary	322.14	Second Phase	1
KD36	Tertiary	318.14	Second Phase	1
KD37	Tertiary	390.65	Second Phase	1
KD39	Tertiary	265.29	Second Phase	1
KD40	Tertiary	502.64	Second Phase	1
KD42	Tertiary	290.69	Second Phase	1

Pro_ID	TYpe	LENGTH_MET	Phase	Pro_Width
KD50	Tertiary	479.19	Second Phase	1
KD52	Tertiary	441.37	Second Phase	1
KD54	Tertiary	472.28	Second Phase	1
KD57	Tertiary	315.76	Second Phase	1
KD59	Tertiary	373.05	Second Phase	1
KD60	Tertiary	557.44	Second Phase	1
KD61	Tertiary	414.86	Second Phase	1
KD62	Tertiary	395.15	Second Phase	1
KD67	Tertiary	308.58	Second Phase	1
KD71	Tertiary	309.44	Second Phase	1
KD72	Tertiary	317.40	Second Phase	1
KD73	Tertiary	1333.44	Second Phase	1
KD78	Tertiary	251.54	Second Phase	1
KD80	Tertiary	310.93	Second Phase	1
KD83	Tertiary	502.13	Second Phase	1
KD87	Tertiary	609.56	First Phase	1
KD89	Tertiary	486.30	Second Phase	1
KD90	Tertiary	396.03	Second Phase	1
KD91	Tertiary	688.53	Second Phase	1
KD92	Tertiary	672.86	Second Phase	1
KD93	Tertiary	391.70	Second Phase	1
KD96	Tertiary	345.49	Second Phase	1
KD97	Tertiary	490.18	Second Phase	1
KD99	Tertiary	379.34	Second Phase	1
KD100	Tertiary	854.90	Second Phase	1
KD103	Tertiary	756.75	Second Phase	1
KD109	Tertiary	410.29	Second Phase	1
KD110	Tertiary	712.17	Second Phase	1
KD114	Tertiary	508.60	Second Phase	1
KD115	Tertiary	285.27	Second Phase	1
KD116	Tertiary	290.86	Second Phase	1
KD117	Tertiary	283.90	Second Phase	1
KD122	Tertiary	448.62	Second Phase	1
KD2	Tertiary	434.14	Second Phase	1
KD32	Tertiary	292.82	Second Phase	1
KD32	Tertiary	372.30	Second Phase	1

Source: Drainage and Environmental Management Plan of Kalai Paurashava

Map 12-2: Drainage Plan Map of Kalai Paurashava

12.4 Plan Implementation Strategies

Kalai Paurashava is affected frequently by rainfall run-off due to inability of the existing secondary and tertiary drains to drain out the run-off efficiently. There are inadequate no of secondary and tertiary drains in Kalai Paurashava. Presently due to lack of adequate no of secondary and tertiary drains, most of the areas of the Paurashava are subjected to water logging during the intensive rainfall in the monsoon period. The existing secondary and tertiary drains may be improved and its different component needs to link with an overall integrated system. The existing borrow pit along the highway, secondary and tertiary drains are observed to suffer from continued negligence in respect of maintenance, clearing, removal of blocking etc.

The existing borrow pit/ drains will be incorporated into the proposed system to the extent to achieve available drainage system for the Paurashava. The drainage management plan of the Paurashava has been prepared for the peak monsoon period when the drainage system stands critical and drainage problem develops due to blocking, inadequate section of the khals and obstruction in the drainage path. Therefore, adequate numbers of new secondary and tertiary drains have to be constructed, following a systemic drainage network.

12.4.1 Regulations to implement the Drainage and Flood Plan

In preparing drainage management plan, the flowing design approach has been presented in this report. In the design approach, the Consultants have considered the practical aspects of desired results, cost efficiency, durability including ease of construction and maintenance. Visible social improvements for the urban population are considered to be the most important and mitigation of the annual flooding damage is considered to be the greatest tangible benefit. Reduction of diseases, infant Morrtality and increase of life span are considered to be the greatest intangible benefits.

In line with these considerations, the following broad approach has been adopted in preparing the drainage management plan for Kalai Paurashava.

Channel Improvement

Canal and channel improvement means the improvement and re-excavation of existing open channels. The existing all Khals need excavation and removal of all illegal structure along the path.

Land Acquisition

New land acquisition has to be kept to as absolute minimum due to the high cost and time required for acquisition. New land acquisition is negligible as most of the proposed drains passes through land owned by Paurashava or Khas land.

Storing and Detention Ponds

Existing borrow pits, ponds, low pockets within the urban areas and agricultural low lands within the fringe area, all ac as retention ponds and all these serve to delay the peak floods during heavy storms. The retention areas also recharge the aquifer water level. In the absence of internal storage areas within the Paurashava area, the existing ponds (>= 0.25 acre) , proposed retention

area, low pockets etc. continue to serve as reservoir in the coming years and the Paurashava should endeavour to remain these low lands in the future.

Drainage System Capacity

The drainage systems (tertiary and secondary drain) has been designed to handle the average runoff for 1.1 year recurrence interval for tertiary drain and 2 years recurrence interval for secondary drain from peak storms without overflowing considering the estimated development level as up to the year 2031. This means that fully built-up areas will be designed for the present situation, while areas, which are not fully built-up, will have excess capacity to handle rainfall of greater intensity during the developing period.

Drainage Channel Sections

The drainage system has been designed to handle the average annual run-off from peak storms with 100mm freeboard for tertiary drain and 150mm freeboard for secondary drain overtopping.

Three standard open channel sections are proposed to be used for the works, as shown in the following table. The rectangular pucca Type-1 drain is suitable for collection of run-off from medium size catchments areas and is proposed to be used for tertiary roadside drains and secondary drains in congested areas. Type-1 drain may be constructed from brick or reinforced concrete, as most appropriate and economical one.

The trapezoidal section of drain Type-2 and 3 are suitable for collection of run- off from medium and large catchments areas, and are to be used for secondary and primary drains in unconstructed areas. Drain Type- 2 is proposed to be pucca drain using nominal reinforced concrete with cement plaster surface to improve its flow characteristics and durability, add to reduce the long term costs of cleaning and maintenance. Drain Type-1 is also proposed to be a pucca drain using brick work lining, but may initially be constructed as an earthen (Katcha) drain suitable for future upgrading depending on the availability of land, flow requirements and cost. The bottoms of drains Type-2 and 3 are to be redesigned with a transverse slope of 1:8 (V: H) to keep the flow velocity as high as possible during the dry season.

Construction criteria and locations to be used are shown in the following **Table 12-12**.

Table 12-12: List of Construction Criteria and Locations

Sl. No.	Type of Drain	Construction Criteria	Locations to be Used
1.	Type- 1	Lined, Brick work	Tertiary and secondary improvement on the existing drains
2.	Type- 2	Lined, Brick	Secondary and primary drains
3.	Type- 3	Lined, Katcha Drain	Primary katcha drains

Trash Rack and Sumps

Trash racks and sumps are normally used to prevent debris (silt/ solid wastes) from entering into the drainage systems where major problems could occur as a result of debris accumulation. Trash racks and sumps are considered appropriate for the Paurashava situation. In the drainage management plan, locations for trash racks and sumps along the major road network will identify during preparation of final plan.

Preventive Maintenance Program

For the proper functioning of the drainage system, it is essential to have an appropriate maintenance program. The program must include inspection, enforcement, cleaning and repair. The frequency of inspection and cleaning will be dependent on the season of the year with more frequent inspection and cleaning at the start of the rainy season and on the importance of the drain. The maintenance programs are:

a) Inspection

- Open pucca drains - monthly in general; weekly in market areas
- Covered pucca drains - monthly with drains opened in February
- Kutcha drains - monthly
- All drains - following first heavy rainfall in year

b) Cleaning

- Open pucca drains - as required
- Covered pucca drains - in February when opened
- Kutcha drains and culverts - January to February prior to rains
- All drains - as revealed by inspection

The inspections will also show where repairs are required and where encroachment into the drain and deliberate blocking of the drain is taking place. Appropriate action to enforce the regulations must be initiated immediately. The cleaning of permanently closed pucca drains and small culverts is difficult and time consuming. New drains should have removable covers to facilitate cleaning.

Responsibility of development and construction of khal/drains rests with Engineering Department whereas; the responsibility of cleaning and conservancy of drains is falls under the conservancy section under health department. Operation and maintenance of drains of the Paurashava involve the set vices in the following areas.

- Conservancy (Cleaning of drains)
- Mosquito killing
- Solid waste management
- Structural maintenance of drains

It is essential that the Paurashava should develop a routine preventive maintenance program for the drainage system. The structural improvements to be taken up under the project will provide a sustainable benefit. A failure to develop the capacity and methods related to preventative maintenance program will entirely eliminate the benefits of the program in the long run.

Though the needs and methods must ultimately be identified by the personnel responsible for the maintenance, it is suggested that the following guidelines should be followed for initial development of the staffing and equipment for a preventive maintenance program:

- drain should be cleaned once per month, but not less frequently than once per three month;
- task objective for I cleaner/sweeper should be 50m of primary / secondary drains, per day;
- supervisors should be provided at the rate of 1 Jamader for-each 10 sweepers, and I sanitary inspector for each 4 Jamaders;
- adequate equipment should be provided for efficient operations of cleaning crews, including wheel barrows and miscellaneous hand tools for each drain cleaner, 3 ton dump truck for waste transport and disposal.

Based on this, standard drain cleaning crews consisting of 51 cleaners, 5 Jamaders and 2 sanitary inspectors will be adequate to carry out the routine preventive maintenance operation required to keep the system in good operating condition.

12.4.2 Implementation, Monitoring, Evaluation & Coordination of the Plan

In some specific area of Kalai Paurashava, there are some scattered low-lying areas which are subjected to water-logging during and after heavy rainfall in a year between July and August normally for 30-40 days. The depth of stagnant water varies between 0.25 m to 0.35m and usually lasts for 4.00 to 6.00 hours. The water—logging situation is likely to further aggravate in the years to come with increasing urbanization. The primary causes of this water-logging are as follows:

- Lack of cleaning and maintenance of the khals/drains
- Unplanned and under designed existing drainage system
- Obstruction and encroachments in the khals/ drains
- Lack of construction and integration of tertiary, secondary drains and primary khals
- Due to non-existence of drains in different places.

In order to address the above mentioned problem the following proposals have been made in the drainage master plan:

- The proposed drainage system for Kalai Paurashava has been planned with a view to discharges most, of the storm run-off in the Jamuneswary River and khals by gravity flow and no pumping is necessary.
- Under the provision of proposed drainage master plan, major khals constitute the storm water run-off delivery system and have been defined as the primary khals. Timely undertaking of the drainage master plan including study is considered a timely venture to know the drainage issues within Kalai Paurashava and to formulate and investment project to reduce sufferings of the Paurashava residents.
- The proposed drainage management plan is justified technically, economically and socially. The priority program is recommended for implementation considering the present serious drainage problems faced by the Paurashava residents. The project after

implementation will mitigate the major drainage problems in the core and semi-core area where the density of population varies from high to medium.

- The proposed drainage master plan is likely to be co-coordinated with other utility providing organizations to avoid over-lapping and duplication. As such, very close co-ordination with DPHE, BWDB and other utility organizations should be maintained during the project implementation so that, disruption does not take place in utility services.
- It is recommended that cadre cost of the first phase of the project priority program is funded as grant financing to Paurashava by ADB because the Paurashava is not in a position to implement this project from their own resources.
- The revenue collection of Kalai Paurashava is moderate. The Kalai Paurashava authority' is unable to make assessment of tax timely. Paurashava shall have to improve significantly in revenue collection and the efficient financial management so that the Kalai Paurashava can properly maintain the drainage system including the control of environmental sanitation.
- Financial sustainability is possible by increasing revenue collection efficiency with activities like more arrear collection & re-assessment of taxes in regular intervals. Re-assessment in every 5 years is recommended. Re-assessment process should commence sufficiently in advance so that appeal process could be completed prior to the effective date. Distress warrants against big-defaulters both in terms of amount due and years overdue may be executed in order to achieve good Governance & financial sustainability.

B. Environmental Management Plan

12.5 Introduction

Improvement of the environmental system has been identified as one of the highest priority needs of the Paurashava authority as well as the resident. This is an essential part for the future development of the urban areas. The main objectives of the environmental study are to assess the existing environmental condition in the Kalai Paurashava and to identify the future requirements of the control over environmentally critical and vulnerable areas and living things.

12.5.1 Goals and Objectives

Following are the overall objectives of environmental management plan:

- To create a sustainable living environment.
- To create awareness among citizens about livable environment.

12.5.2 Methodology and Approach to Planning

The environmental management plan consists of the Supplementary Living Environment Survey, the Comprehensive Ecological Survey and the Water Quality Survey. The Supplementary Living Environment includes water supply, land pollution, sewerage and sanitation, solid waste management, and resettlement of population due to construction of canals and primary drains. The Comprehensive Ecological Survey aims at facilitating comprehensive environmental assessment by subsequent urbanization and implementation of the drainage on the ecological elements of fauna and flora, agricultural and aqua cultural resources etc. The Water Quality Survey is the sampling and analysis of surface water from rivers, natural canals, ponds etc., and from ground water. These are required to be done to ensure necessary urban environment enhancement measures. Moreover, an overall evaluation of environmental condition due to urbanization with flood management and drainage is required in order to justify the necessity of the Drainage Plan. In planning process special attention required to reduce the insect breeding areas, and preserve and management of natural drainage area.

12.6 Existing Environmental Condition

12.6.1 Introduction

The urban environment of the Kalai Paurashava includes both build and natural environment. Build environment includes waste management, water, air quality, energy usage, transport network, slum improvement, and disaster mitigation. The urbanization where the build environment overburdens the natural environment cannot be sustainable. But urbanization is vital for countries economic growth. Urban centers concentrate services, infrastructure, labor, knowledge, entrepreneurship and markets.

So in every phase of planning processes all these environmental issues will be evaluated and proper measure will be taken to minimize the adverse environmental impacts on land pollution, water and air quality, biodiversity resources and marine resources by energy usage, transport network, waste management, slum improvement, disaster mitigation etc.

12.6.2 Geo-morphology

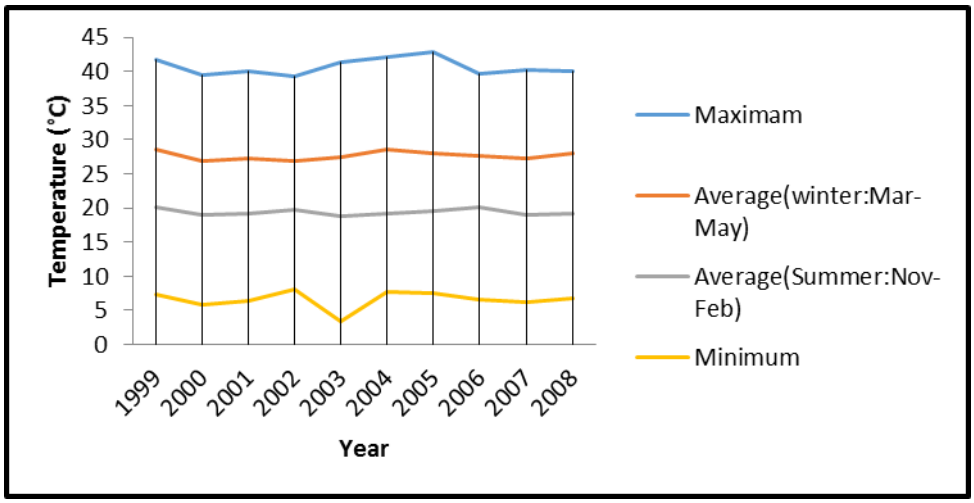
Geological condition

It is known from the agricultural officer of Upazila that there are several types of soils in this area. According to agricultural office at Kalai there is 2/3 of the soil is loomy soil. Besides, doash and sandy soil are also found there.

Morphological condition

Temperature

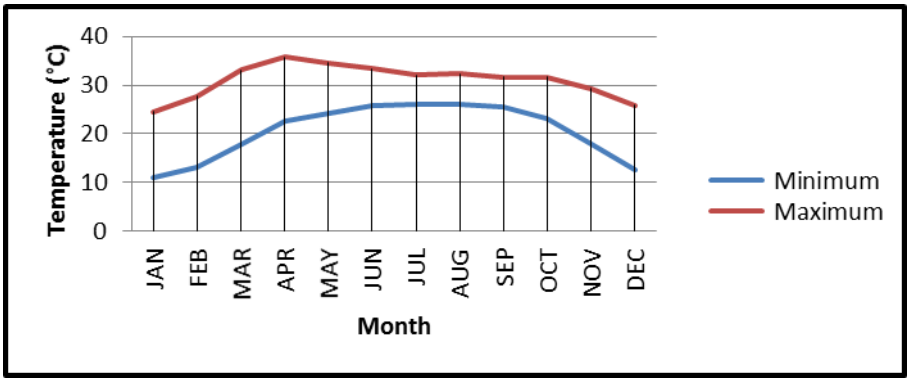
Temperature is a measurement of the average kinetic energy of the molecules in an object or system and can be measured with a thermometer or a calorimeter. It is a means of determining the internal energy contained within the system. The following figure shows the temperature characteristics of last 10 years in Kalai Paurashava. From the figure it is seen that maximum temperature has an increasing trend over the years.



Source: Based on Data from Bangladesh Meteorological Department, Dhaka, 2009

Fig 12-8: Temperature characteristics of last 10 years in Kalai Paurashava

The following figure shows the Normal Maximum and Minimum Temperature Characteristics across the year in Kalai Paurashava. From the figure it is seen that there exist maximum temperature in the month of April. It is also observed that in the mid-year (from April to October) the temperature is higher compared to other section of the year.

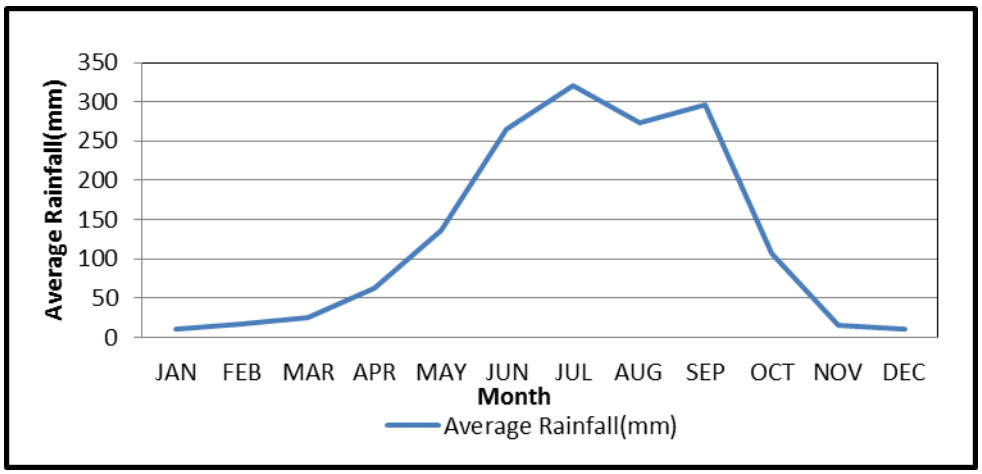


Source: Based on Data from Bangladesh Meteorological Department, Dhaka, 2009

Fig 12-9: Normal Maximum and Minimum Temperature Characteristics across the year in Kalai Paurashava

Rainfall

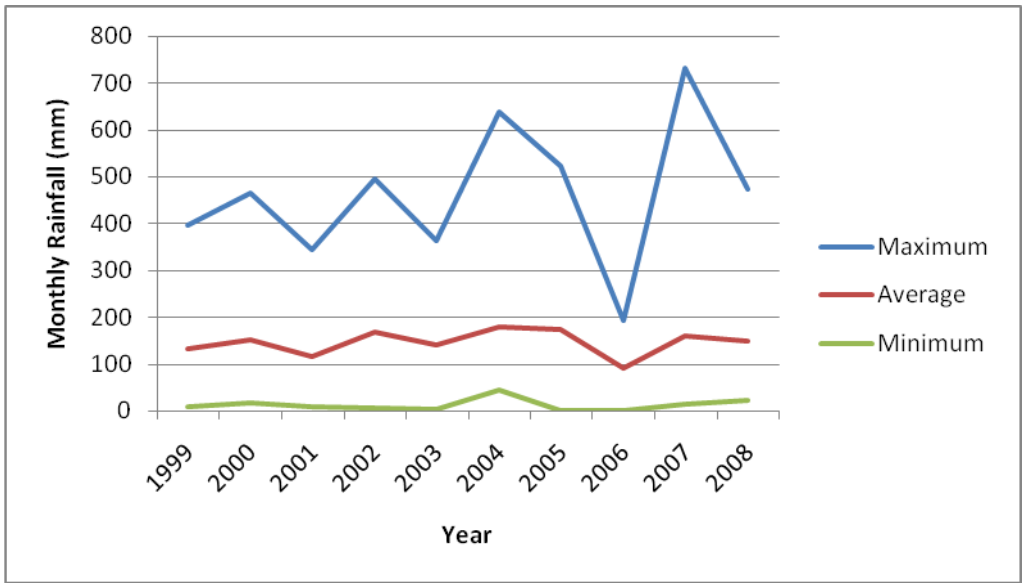
Rainfall is the amount of precipitation of any type, primarily liquid. It is usually the amount that is measured by a rain gauge. The following figure shows the Average Rainfall Characteristics across the year in Kalai Paurashava. From the figure it is seen that the highest rainfall occurs mainly in the month of June, July and August.



Source: Based on Data from Bangladesh Meteorological Department, Dhaka, 2009

Fig 12-10: Average Rainfall Characteristics across the year in Kalai Paurashava

The following figure shows the rainfall characteristics of last 10 years in Kalai Paurashava. From the figure it is seen that maximum rainfall has an increasing trend over the years and it becomes highest in the year 2007.

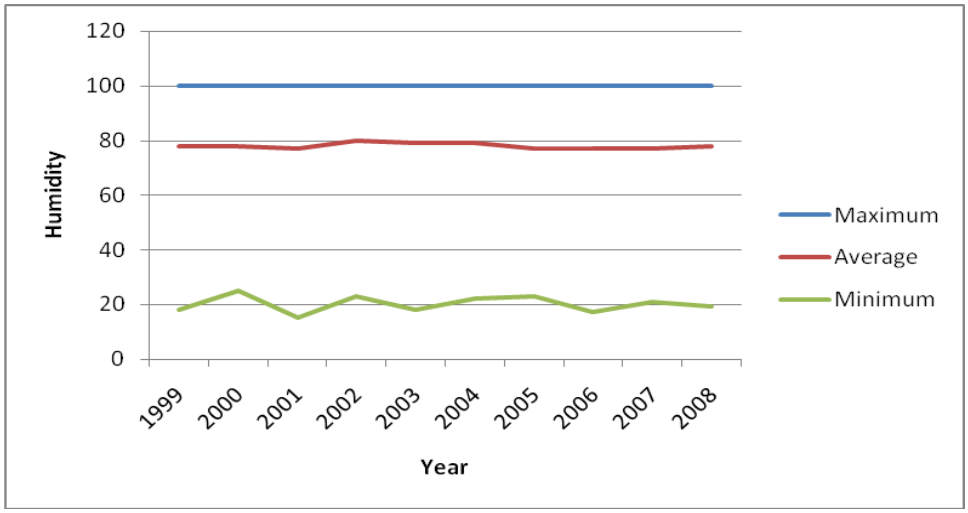


Source: Based on Data from Bangladesh Meteorological Department, Dhaka, 2009

Fig 12-11: Rainfall Characteristics for last 10 years in Kalai Paurashava

Humidity

The following figure shows the humidity characteristics of last 10 years in Kalai Paurashava. From the figure it is seen that there is no much change in humidity in Kalai over the years.



Source: Based on Data from Bangladesh Meteorological Department, Dhaka, 2009

Fig 12-12: Humidity characteristics of last 10 years in Kalai Paurashava

12.6.3 Solid Waste and Garbage disposal

The solid waste and garbage disposal of Kalai Paurashava includes house hold waste, industrial waste, kitchen market waste, clinic/hospital waste, latrine waste, brickfield waste and fertilizer/chemical related waste.

Total daily generation of solid waste from Kalai Paurashava is estimated to be 13.39 Metric Tones (considering a generation rate of 0.25 kg/person/day) (Source: WasteConcern, 2008). The household waste is thrown by the people to roadside drains or open spaces adjacent to their houses. The garbage from kitchen market and untreated hospital waste from UHC disposed to open space by the side of the road, drain or ditch and polluting living environment which is a great threat to human health.

12.6.4 Waste Management System

It has been observed that the solid waste management in the Kalai Paurashava is not well managed. Solid waste is generated from kitchen markets, Upazila Health Complex (UHC), many schools, colleges, offices and, small and cottage industries within the Kalai Paurashava. The Kalai Paurashava has no solid waste disposal system as well as no transfer station. The Paurashava has only three temporary cleaner engaged for cleaning the Paurashava office building only. It has one dump truck, one pull cart but no dustbin. The solid waste management coverage is only a part of the total area.

12.6.5 Pollutions

12.6.5.1 Water

Water pollution is the presence of pollutants, particles or contaminants in water beyond the level which is desirable for drinking. Saltwater encroachment associated with over drafting of aquifers or natural leaching deposits are natural sources of groundwater pollution. Most concern over groundwater contamination has centered on pollution associated with human activities. Human groundwater contamination can be related to waste disposal (private sewage disposal systems, land disposal of solid waste, municipal wastewater, wastewater impoundments, land spreading of sludge, brine disposal from the petroleum industry, mine wastes, deep-well disposal of liquid wastes, animal feedlot wastes, and radioactive wastes).

In Kalai Paurashava there is no significant level of ground water pollution. Here both groundwater and surface water are free from significant pollutant. One of the main reasons behind this is the absence of industrial effluents in this area and the presence of Jamuneswary River. Besides the generation of solid waste and municipal waste water is not a huge amount. It can be mentioned that several years ago a very little amount of arsenic was identified in ground water although which falls under acceptable level.

12.6.5.2 Air

Air pollution is the introduction of chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or damages the natural environment into the atmosphere. An air pollutant is known as a substance in the air that can cause harm to humans and the environment. Pollutants can be in the form of solid particles, liquid droplets, or

gases. In addition, they may be natural or man-made. Sources for air pollution include stationary sources such as smoke stacks of power plants, manufacturing facilities and waste incinerators, as well as furnaces and other types of fuel-burning heating devices, mobile sources such as motor vehicles and other sources such as chemicals, dust and fumes from agricultural and industrial processing.

In Kalai Paurashava some sorts of pollutant are found to be exposed in the air causing air pollution. For instance, emissions from vehicle exhausts of old and poorly maintained buses and trucks, loading, unloading, and carrying of sand and soil without any dust preventive measures are found within the Paurashava. But the amount of pollution is insignificant and within acceptable level. It can be mentioned that within this Paurashava area there is no brick field which is the vital source of air pollution. There are 06 saw mill and 08 rice mill which expose some amount of air pollutant.

12.6.5.3 Sound

Sound pollution is a type of energy pollution in which distracting, irritating, or damaging sounds are freely audible. It is displeasing human, animal or machine-created sound that disrupts the activity or balance of human or animal life. The source of most outdoor sound pollution is mainly construction and transportation systems, including motor vehicle noise, aircraft noise and rail noise. Indoor and outdoor sound pollution sources include car alarms, emergency service sirens, mechanical equipment, fireworks, compressed air horns, grounds keeping equipment, barking dogs, appliances, lighting hum, audio entertainment systems, electric megaphones, and loud people. In Kalai Paurashava, the source of sound pollution is found to be little. In this Paurashava there is a little incident of much construction work. The movement of motorized vehicle is also less. So sound pollution in this Paurashava is not significant and disturbing.

12.6.5.4 Arsenic

Ground water pollution has been found to be a critical problem in Paurashava under Bagmara upazilla and the surrounding areas. The main problems relate to the high iron content, which is in the range 0.4-3.5 mg l^{-1} in the RCC area ad 0.23-7.12 mg l^{-1}outside the RCC area, both of which exceed the national drinking water standards for iron of 0.3-1.0 mg l^{-1}. The level of manganese was also found to be high, ranging from 0.1-1.52 mg l^{-1}in the RCC area to 0.23-2.40 mg l^{-1}outside the area, and exceeding the drinking water standard of 0.1 mg l^{-1}. High levels of arsenic contamination were also reported in some areas.

Surface water quality is similarly poor because untreated urban effluent is discharged through various drains into the khals (canals) and beels (seasonal ponds), and ultimately to the agricultural fields to the north, which according to the RDA report, is affecting agriculture and human health (ibid). Tests have shown that the water in surface water bodies in the area, including the Jamuneswary rivers, some beels and ponds, exceeds the national standards for drinking water for Bangladesh of 50 or less total coli form number/100 (TCN/100), having fecal coli form bacteria counts of 70-400 number/100. Tests for iron, chloride and

manganese showed that: the concentration of chloride is within limits; the Padma is within the drinking water limits for iron during the rainy season but not the summer, whist the Baraonai exceeds it in both seasons; manganese is within limits in samples collected from the Padma in the dry season but exceeded limits in almost all locations in the rainy season.

12.6.6 Natural Calamities and Localized Hazards

12.6.6.1 Cyclone

In Kalai Cyclone is not a regular phenomenon. In fact till now no record is found regarding the occurrence of Cyclone passing through this Paurashava. It can be mentioned that in 1998 a Cyclone passed through the middle part of Upazila. The affected villages were Baoikhola and Doeal. Many houses, agricultural crops, trees were destroyed due to that Cyclone. Some animals were died. But no human death occurred in that Cyclone. In this Paurashava there is no Cyclone shelter because the incident of Cyclone is not regular.

12.6.6.2 River Erosion

Being one of the major floodplain areas of the country Kalai Town annually experiences riverbank erosion hazard due to sudden and rapid channel shifting. Consequently, valuable cultivable land is lost; also village settlements, markets and towns are destroyed.

In the local channels of the mighty Jamuneswary River have episodically and capriciously wandered across the landscape, eroding their banks, destroying everything in their paths and accreting land elsewhere.

It can be mentioned that the Kalai Paurashava, being situated apart from the Jamuneswary River, till not destroyed by the River bank erosion. But if the River bank of the Jamuneswary River continues to erode then within a few years the River will reach at Kalai Paurashava destroying the properties in this Paurashava.

12.6.6.3 Flood

Kalai is located within the flood plain of Jamuneswary River. Most of the areas of Kalai Paurashava are comparatively highly elevated and mostly free from annual flooding. The fringe areas of the Paurashava such as Muthrapur, Sultanpur and Nurpur are of low lying. Though the area is not subject to annual flooding, it was inundated during the flood of 1988. The town is protected by embankment along the Padma and not subject to annual flooding. Flooding in the area usually occurs due to the over flow of the River Jamuneswary.The existing drains cannot discharge the huge volume of storm water efficiently to the defined out falls. Because of prevailing such situation, local flooding occurs in many places of the Paurashava.

It can be mentioned that some portion of the western part of the Paurashava falls outside the embankment. In this side the flood is annual phenomenon. The people in this area have to suffer a lot due to annual flood. Sometimes the flood water reaches into their houses.

12.6.6.4 Earth Quake

Like Cyclone, Earth Quake in this area is not a regular phenomenon. Although several Earth Quake were observed in this area over the past decades but the intensity was very low and damages occurred due to Earth Quake.

12.6.6.5 Water Logging

Inundation occurs in some parts of the Paurashava due to localized storm that is affecting the drainage system of the Paurashava and creating a worse environment for the residents living in those areas.

The depth of inundation and duration varies from place of place. However, it is ranged from 0.5m to 2.5m in depth and the duration of water logging varies from 6 hrs to 20 hrs and even it lasts for several days. The reasons for water logging are as follows:

a) Absence of planned drainage system.
b) Absence of integrated drainage network of tertiary and secondary drains with primary drainage system.
c) Existing drains with low discharge capacity.
d) Indiscriminate disposal of solid waste into the drainage system that reduces the flow capacity of the whole system.
e) Lack of proper initiative for cleaning and maintenance of existing drainage system.

It is known from the local people that the Paurashava authority did not take any substantial initiative to remove or to reduce the problem of water logging.

12.6.6.6 Fire Hazard

In this Paurashava no mentionable fire hazard occurred in the last decade.

12.7 Plans for Environmental Management and Pollution Control

12.7.1 Proposals for Environmental Issues

12.7.1.1 Solid waste management Plan

Solid waste management is not yet an environmental problem in the town because of low density of population and low consumption rate. But in future population will rise and density will increase.

So, solid waste will pose a major environmental problem in future. It is better to take precautionary measures now to avoid any future hazard.

A waste disposal ground is proposed at East corner of Ward-6 for final dumping of solid waste in order to ensure a habitable environment and to keep the urban environment free from pollution. To solve the solid waste management problem door to door collection program should be introduced. The Paurashava authority along with NGO's and CBO's will collect wastes from the households and storage points daily. The van will move into the wards and whistle to announce its arrival. The same vehicle will cover other institutions, societies, complexes. Thus the system will cover the whole town and finally they will dump the wastes to the proposed waste disposal ground. A minimum charge will be fixed by the Paurashava authority for waste collection to the inhabitants. The total process is exposed under **Fig 12-12**.

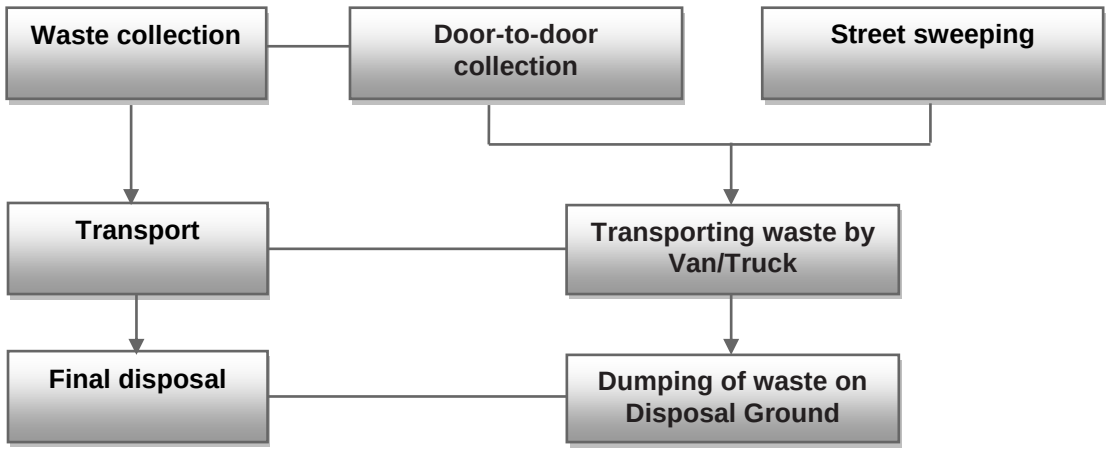


Fig 12-13: Overview of the Solid Waste Management Plan

12.7.1.2 Plan for Protecting Open Space, Wet-Land and Relevant Features

Parks and Recreational Places

A few play fields are the main recreational sites in the area. However, with implementation of this plan, new open space, playground, parks, lake, etc. will provide more leisure places for the people.

Enhancement Activities:

- Ensure new open space, playground, parks, increasing facilities to visit the river bank etc. to increase recreational facilities in the Paurashava area.
- Develop khal side as walking area with properly designed modern facilities to attract outside visitors also.

Responsible Organizations: Paurashava, Bangladesh Parjatan Corporation

Loss of Wetlands

Wetlands are mainly affected first by the urbanization process. Earth filling fills up the ponds, low land, khals. Waste water affects the aquatic ecosystem and makes the ponds, khals unproductive and as a result the aquatic plants, fishes and animals have to die or migrate to other places. Suitable urban facility attracts more residential development with the cost of filling of low cost

wetland. There is no strict regulation on earth filling of ponds. However, Wetlands Conversation Act exists in Bangladesh, which is applicable only to natural beels and khals. Number of ponds in Kalai Paurashava is reduced every year to accommodate housing and commercial structures. Wetlands play an important role as a reservoir of rain and flood water. They are also important to maintain the balance of ecosystems and for replenishing the ground water level through seepage.

Mitigation:

- Cutting of drainage outlets to the khals and ponds.
- Avoiding wetlands during road alignment fixation.
- Stopping housing estate, industries and other development works in wetlands through earth filling.
- Stopping earth filling of ponds in Paurashava area through creation of public awareness.
- Strict implementation of The Act (36 of 2000) for Conservation of Play field, Open space, Park and Natural Water Reservoir in Mega City, Divisional Town, District Town and Paurashavas of Bangladesh.

Responsible Organizations: Paurashava, DOE and NG

12.7.1.3 Proposals for Pollution Control

12.7.1.3.1 Industrial

Industrialization is not prominent economic sector in Kalai Paurashava. With implementation of this project and establishment of Industrial Zone nearby with road, drainage, water, gas, electricity and telephone facilities will attract the promoter and NBRs to invest here and help in industrialization in the project area.

Enhancement Activities:

- Arrangement for gas pipe line in the industrial zone.
- Arrangement for water, electricity, telephone, fire-service and drainage facility in industrial zone.
- Arrangement for soft-loan for agro-industry, garments, electronics, IT etc.
- Strengthening the activities of Shilpa and Banik Samity (KSBS).
- Invite the national and foreign investors to visit and invest in industrial zone.
- Initiate the local entrepreneurs through incentives for industrialization.
- The existing brick fields can continue next 10 year and after that they have to relocate outside the Paurashava boundary. The existing brick field must follow Brick manufacturing (Control) Act, 1989.
- Any new brick field cannot permit in the Paurashava area.

Responsible Organizations: Board of Investment, Banks, Shilpa and Banik Samity

12.7.1.3.2 Air/Water/Land/Sound

Noise Pollution

Noise is unacceptable level of sound that creates annoyance, hampers mental and physical peace and may induce severe damage to the health. Along with the increasing degree of air and water pollution, noise pollution is also emerging as a new threat to the inhabitants of Paurashava.

Motorized traffic is one of the major sources of noise pollution in urban areas. Although there are many sources of noise, which include industries, construction works and indiscriminate use of loud speakers, motorized traffic is the principal source of creating noise in urban areas. With the increase in the number of motorized vehicles in the city, the hazard of noise pollution has increased and exceeded the level of tolerance. The noisiest area in Kalai Paurashava is Bogra-Joypurhat Road bazar area.

Exposure to high level of noise may cause severe stress on the auditory and nervous system of the city dwellers, particularly the children. Regular exposure to loud noise damages the hearing capability and has adverse effects on health, like increasing mental stress and blood pressure and sleeplessness, resulting in poor work performance. With expansion of urban area, the noise pollution will be increased for increasing motor vehicles, market places, industries etc.

Mitigation:

- Stop using hydraulic horn in buses, trucks and other motor vehicles.
- Declare some areas like hospitals, schools, parks, etc. as silent zone.
- Strict implementation of law.
- To control abnormally high noise from saw mill the old machines should be repaired or replaced.
- Foundation of machines should be specially prepared to reduce noise.
- Special type of silencer may be attached with the machines to reduce noise.
- Welding and blacksmith workshops can be fenced with classes to protect the passersby from possible pollution effects.
- People constantly working in welding and blacksmith workshops should wear earplugs and glasses. Regular medical checkups can be carried out to identify possible health problems.

Responsible Organizations: Paurashava, BRTA, Upazila Health Complex, Motor Owners Association and Labor Unions, etc.

Air Pollution

Almost all the project area has the same level of air quality. As from the standard of The Environment Conservation Rules, 1997 (ECR, 1997) the air quality of the category “Residential and rural” has the density of different air particles in the project area as follows:

- Suspended Particulate Maters (SPM) = 200 microgram per cusec meter,
- Sulpher-dioxide = 80 microgram per cusec meter,
- Carbon Monoxide = 2000 microgram per cusec meter and
- Oxides nitrogen = 80 microgram per cusec meter.

Mitigation:

- Use catalytic converter in buses, trucks, taxis and tempos.
- Use CNG instead of petrol.

- Set up 120 ft. high stack in brickfields and use filter to reduce the CO, SO2 and NO2 gases in atmosphere.
- Stop the operation of brick-fields which have grown near the homesteads, bazars and growth centers.
- Impose ban on movement of stone and sand carrying trucks using the tertiary and access roads.

Responsible Organizations: Paurashava, DOE, BRTA, DC office, Motor Owner and Labor Unions, etc.

Drainage Congestion

Drainage congestion may increase further with the present trend of development. Faulty design, slope problem in head and tail area, solid-waste and rubbish dumping, encroachment and un-authorized structures, siltation, lack of renovation and re-excavation are the main causes of drainage congestion. As a result discharge of new drainage network will create severe drainage problem in Paurashava area, particularly in monsoon period.

Mitigation:

- Excavation of the primary drainage networks specially the existing and the proposed khals.
- Re-excavate the water retention and detention area with link khals proposed in the master plan.
- Remove all un-authorized structures, developed on drainage structures.
- Make proper drainage network in new area considering the slope and local topographical condition.
- Strictly prohibit the people in dumping of rubbish and solid waste in drain.
- Regular cleaning and maintenance by the concerned authorities.

Responsible Organizations: Paurashava, LGED

Surface Water Pollution

The surface water quality of khals, ponds and ditches are polluted in respect of pH, turbidity and coliform bacteria with national standard. The present pollution level of these sites is found to be low except coliform bacteria. The main causes of surface water pollution are industrial wastewater, sanitary sewage, solid waste dumping. The present trend of development in the project area, the surface water pollution level may further increase for high volume of discharge of wastewater, sanitary sewerage, over spilling of pit and septic tank, industrial effluents, surface run-off of katcha bazars, indiscriminate solid and medical waste dumping.

Mitigation:

- Stop katcha, hanging and pit latrines.
- Create underground sewerage system for Paurashava area.
- Use pucca latrine with septic tank and soak well.
- Prohibit indiscriminate dumping of medical and solid waste in drainage, khals and river.
- Improve sanitation condition of slaughter house, fish market and katcha bazars.

- Prohibit the direct discharge of Paurashava waste water to any chhoras, low lying areas and river.
- Establish waste water and sewerage treatment plant.

Responsible Organizations: Paurashava, LGED and DOE

Groundwater Depletion

Groundwater level of Paurashava has a considerable lowering over the last few decades. It has been calculated that in 2031 the lowering of ground water level might be 20m. Eventually fall of groundwater table is a common phenomenon in project area during dry period (Feb.-May). With expansion of urbanization and industrialization, the groundwater table may further fall if present tradition of using groundwater is continued.

Mitigation:

- Use khals water for pipeline supply to households and industries.
- Use of surface water treatment plant to purify the river water and use as drinking water.
- Introduce rainwater harvesting system and use in the project area.
- Stop land filling of ponds and water bodies (area more than 0.25 acre) to maintain the groundwater level through recharge and leaching process.

Responsible Organizations: Paurashava, DPHE, and NGOs

Groundwater Pollution

Groundwater pollution due to manganese, iron and hardness is a major problem in the project area. With expansion of urban area, more dependency on groundwater sources may increase the pollution level of sub-surface water.

Mitigation:

- Use surface water of khals for supply water system.
- Introduce rain water harvesting system.
- Reduce dependency on groundwater.
- Preserve surface water in ponds, khals, ditches and rivers for irrigation.

Responsible Organization: Paurashava, LGED, BWDB, DOE and NGOs

12.7.1.3.3 Other Pollution

Any pollution other than mentioned above is not yet identified at Kalai Paurashava.

12.7.2 Natural Calamities and Hazard Mitigation Proposals

12.7.2.1 Plan for Addressing Natural Calamities (Structural and non structural measures)

Earthquake

Earthquake is among the most destructive and terrifying disaster that nature can unleash. Bangladesh Sits on several seismically active faults are the focal point of tremors. Paurashava is located in the seismic zone 3 and so it is less vulnerable to earthquake. Earth quake of 4 to 5 magnitude has the probability of occurrence in the locality. Unplanned and unregulated

urbanization and disregard to BNBC rules in building construction aggravate the situation more. With the implementation of master plan the planned urbanization will strictly follow the actual zoning plan and following of BNBC rule will minimize the earthquake damage. In DMDP Urban Area Plan Volume- II, (Part-3, Interim Planning Rules) development restriction considering the geological fault line areas states "Structures above 2 storey's situated within 500 meters of a geological fault is not allowed unless built to the BNBC standards for Seismic Zone 3 (BNBC Section 6 Chapter 2.25)". Similar measures are also suggested for Kalai Paurashava.

Enhancement Activities:

- Ensure all new buildings are designed and constructed following the guideline of BNBC.
- Development of a comprehensive plan for managing post earthquake situation.
- Train community workers who would carry out the initial search and rescue efforts.
- Launch a massive public awareness campaign.

Responsible Organizations: Paurashava, Civil Surgeon, Civil Defense, Fire Service and DOE

Change in Topography

Topographically Kalai Paurashava is flat and gentle sloping. The natural topography of Paurashava area has already been changed for urbanization. The present trend of development like roads, drainage, bridge/culvert, housing and industrial estates and bazars will radically change the natural topography and land use pattern of the area. The agricultural area will be converted into urban and semi-urban area. The present green scenic beauty will disappear, water bodies will be lost and general slope will be diminished for earth cutting due to rapid urbanization. The current effort of master plan will ensure sustainable development.

Mitigation:

- Careful planning to minimize the change of topography.
- Avoid water bodies during construction of roads, housing and industrial estates.
- Practice good architectural/engineering design during planning of housing estates, buildings and the intersections of main roads.
- Enhancement of plantation and gardening to increase the scenic beauty of the city.
- Preserve the natural greenery, ponds, khals and large water bodies.

Responsible Organizations: Paurashava, DOE and Forest Department

Land Use Change

With the implementation of master plan, the Peripheral-urban and agricultural land use will be controlled and conserved using landuse control mechanism.

Mitigation:

- Careful planning to reduce change of agricultural land use and rural set up.
- Conserve water bodies and productive agricultural land free from haphazard urban development.
- Economical use of land.

Responsible Organizations: Paurashava and Ministry of Agriculture& Livestock, DOE

12.7.2.2 Plan for Addressing Hazards

Traffic Congestion

Traffic congestion is space-based problem. It occurs at particular junction and or at a particular land use area. Urbanization and growth of population will increase movement of vehicles in and around the Paurashava. Number of rickshaws will also increase to meet the people's demand. Rickshaws will be the main cause of traffic congestion in Kalai Paurashava in future.

Mitigation:

- Phase wise implementation of proposed road network.
- Strict implementation of traffic rules to improve traffic management.

Responsible Organization: Paurashava, LGED, RHD

Fire Hazard

In future the probability of fire may increase for more offices, institutions, markets, growth centers and industries. Electric short-circuit is mainly responsible for fire hazards in urban area. However, human error may also cause for fire sometimes. Slums and some industries like garments and plastic products are more susceptible to fire hazards. The present fire station facility is not enough to cope with future fire hazards.

Mitigation:

- Set up one new fire station at proposed location
- Collect modern fire prevention devices.
- Refrain people from using low quality electrical wire in buildings and industries.
- Ensure periodical checking of electric lines.
- Create awareness of people about fire hazards.
- Ensure fire-fighting devices in new industries, high-rise buildings and markets.
- Strict implementation of BC rule.
- Large and medium scale water bodies should be conserved for quick and huge supply of water at the time of emergency.

Responsible Organizations: Paurashava, PDB, DOE and Fire Service and Civil Defense

Loss of Habitat

The habitat for fauna and wildlife has been losing day by day in the Paurashava area. For urbanization and industrialization, agricultural land will be disappear, water bodies will be filled up, rivers and khals will be polluted and trees will be cut down for new settlement. Birds, fishes and other animals will permanently lose their habitat and food in the urban area.

Mitigation:

- Careful planning to avoid the sensitive ecosystem.
- Minimum use of land for urbanization.
- Preservation of water bodies and khals.
- Initiate people to avoid tree cutting and vegetation clearing.

Responsible Organizations: Paurashava, DoE and NGOs

Loss of Biodiversity

Continuous expansion of the urban area will enhance the urban development in this area. Urban elements like roads, infrastructure development, housing, commercial places, industrialization etc. will replace the existing green natural environment to manmade environment. Trees will be cut down, water bodies will be filled up and polluted; garden and bush will disappear for urban expansion in new area. Wild animals, birds and fishes will lose their habitats and as a result a big loss of biodiversity will happen for urban expansion in the Paurashava area.

Mitigation:

- Avoid critical ecological area and refugee sites from development works.
- Aware people for keeping some trees and bushes around the homesteads.
- Increase tree plantation in roadsides along the river and khals and homesteads.
- Preserve the lakes for aquatic birds and fishes and some bush areas as wildlife refuge sites.
- Ban on hunting of birds and wildlife.

Responsible Organizations: Paurashava, Forest Department, Fisheries Department and NGO's

Loss of Capture Fisheries

The project area is mainly high and medium high land. Khals and low lands are very limited. Therefore, open water fisheries resources are low in the project area. Only 15-20% fish demand is met by the capture fisheries. Ponds and khals support the capture fisheries in the project area. Lowering of water level in the river also there is no water in the khals in dry season is a major reason of the damage of aquatic environment.

With the continuing urbanization, the capture fisheries will be remarkably reduced for loss of habitat due to water pollution of sewerage and drainage discharge, industrial effluent, solid waste dumping, earth filling and less flushing. Area of khals, beels and other water bodies will be reduced for land development and urbanization.

Mitigation:

- Stop direct drainage outfall to river, khals and beels.
- Set up sewerage and wastewater treatment plant.
- At the early monsoon, keep open the gates of sluices and regulators during spawning period of fish.
- Excavation of khals and natural water bodies
- Strict regulation on land filling of water body.

Responsible Organizations: Paurashava, and DOE

Loss of Ponds and Culture Fisheries

With urbanization and industrialization through this project, many ponds will be lost for land filling by the owners for increasing land value due to human pressure, settlement and development accordingly loss of fishes. There is no strict regulation on earth filling of ponds in the area.

Mitigation:

- Designate all ponds in Master Plan Map and protect the large ones according to the ecological importance and public interest.
- Protect the ponds having area more than 0.25 acre as per regulatory framework of Master Plan.
- Create public awareness about the importance of ponds and its role in culture fisheries, bathing and water reservoir for surface run-off during monsoon.

Responsible Organizations: Paurashava, DOE and DC (Land)

Loss of Productive Agricultural Land

The Master plan Project has included a vast area of agricultural land in the project area. Both highlands and lowlands fall into this project. After implementation of MP project, agricultural environment will be converted into un-productive urban and semi-urban area.

Mitigation:

The DOE EIA Guidelines emphasized on the avoidance of productive agricultural land during any development project. Therefore, it will be wise to consider more economical use of land to avoid some fertile lands. The land acquisition should be based on the growth rate of population. The designated agricultural land in the master plan must conserve from any type development or land use change. Strict rules and regulation must be imposed to control the agricultural land.

Responsible Organizations: Paurashava and DOE

12.8 Plan Implementation Strategies

12.8.1 Regulations to Implement the Environmental Management Plan

Drainage and Environmental Management plan should be performed under the clauses in the Local Government (Paurashava) Act 2009 and other national rules existed in Bangladesh.

According to the second part of section 50-71 of Local Government (Paurashava) Act:

Removal, collection and disposal of refuse

1) A Paurashava shall make adequate arrangements for the removal of refuse from all public streets, public latrines, urinals, drains, and all buildings and land vested in the Paurashava and for the collection and proper disposal of such refuse.
2) The occupiers of all other buildings and lands within the municipality shall be responsible for the removal of refuse from such buildings and lands subject to the general control and supervision of the Paurashava.
3) The Paurashava may cause public dust-bins or other suitable receptacles to be provided at suitable places and where such dust-bins or receptacles are provided, the Paurashava may, by public notice, require that all refuse accumulating in any premises or land shall be deposited by the owner or occupier of such premises or land in such dust-bins or receptacles.

4) All refuse removed and collected by the staff of the Paurashava or under their control and supervision and all refuse deposited in the dust-bins and other receptacles provided by the Paurashava shall be the property of the Paurashava."

Latrines and urinals

1) "A Paurashava may, and if so required by the Government shall, provide and maintain, in sufficient number and in proper situation, public latrines and urinals for the separate use of each sex, and shall cause the same to be kept in proper order, and to be properly cleaned.
2) The occupier of any premises to which any latrine or urinal pertains shall keep such latrine or urinal in a proper state to the satisfaction of the Paurashava and shall employ such staff for the purpose as may be necessary, or as may be specified by the Paurashava.
3) Where any premises are without privy or urinal accommodation, or without adequate privy or urinal accommodation, or the privy or urinal is on any ground objectionable, the Paurashava notice require the owner of such premises.

The privy or urinal disposed in the Paurashava's dustbin or disposal ground is the property of Paurashava."

12.8.2 Implementation, Monitoring, Evaluation and Coordination of the Plan

Resettlement

Resettlement is a burning question for any urban development project. For Master Plan Project land will be required for roads, markets & bazars, educational organizations, housing & industrial estates, open spaces, play grounds, parks, lakes, etc. Therefore, land acquisition is required from people in the project area. People have been living in their homesteads for many years in ancestral way and reluctant to leave their croplands and homesteads. The project authority should take proper care during land acquisition. Requisition of sensitive and conflict land area should be done in consultation with the landowners, local ward commissioners/ members/ chairmen and political persons. Without appropriate rehabilitation and compensation, no one should be evacuated from his homesteads. Slum people do not have the land right, they should be rehabilitated in new places with full compensation of housing and occupation.

Compensation

Land acquisition should be discussed with individuals affected and through participation of local people. The compensation of each affected landowner should be paid in the shortest possible time. If anyone loses his/her occupation/business/income source for land acquisition, it should be incorporated in compensation package. This would necessitate amendment of compensation rules. Persons losing their homesteads for housing project may be rehabilitated with due compensation and sanction of one plot in housing estate.

Section 12 of the Environment Conservation Act (ECA) 1995 stipulates that "no industrial unit or project shall be established or undertaken without obtaining environmental clearance from the Director General, Department of Environment, in the manner prescribed by the rules."

The Environment Conservation Rules (ECR) 1997 have been prepared under the clause (2) (f) of the section 20 of Environment Conservation Act (ECA) 1995. The requirements of EIA for new

development projects came into enforcement under the ECR 1997. These are the first set of rules promulgated under the Environment Conservation Act 1995. Among other things, these rules set out the requirements for and procedures to obtain environmental clearance. This also explains the requirements for IEE/EIA according to different categories (green, orange/amber or red) of industrial and development interventions.

During the implementation of Master plan, environmental clearance procedure will be guided by the Environment Conservation Rules 1997 of the Department of Environment. Paurashava will have the authority to approve the plan as per agreed principles in the Master plan but the owner of the plot will be obliged to get clearance from the DOE before actual implementation.

For implementation of the mitigation plan emphasis has to be laid on implementing the mitigation measures. Appropriate institutional set up will be required to implement the measures. Government must allocate sufficient budget for this purpose.

Duration, Revision and Updating

The proposed Drainage and Enivronmental Management Plan along with a set of policy guidelines has been provided for a period of 20 years, 2011 through 2031. However, to suit in time and space, revision and updating of the Drainage and Enivronmental Management Plan will be necessary at a regular interval.

Drainage and Enivronmental Management Plan should be regularly reviewed and updated during the end of every fifth year of the five-year term. In this way, four revisions will be carried out during its twenty years lifetime.

Chapter 13: Plan for Urban Services

This chapter describes the urban basic services development proposals for future development of the Paurashava. The proposals have been made at the town level, that is, the area under the urban area plan. The local level development proposals will be addressed in the Ward Action Plan. The development proposals deal with the basic urban services, like, water supply, drainage, sanitation, solid waste, telecommunication, electricity and gas, community facilities, education and health.

13.1 Water Supply

The Paurashava is yet to develop its own network based water supply system. The entire water supply system of the Paurashava is based on household tube well and pond. As per the census 2011, about 84.5% household depend on tube well for their drinking water. However, many of the tube wells provide arsenic free drinking water. As a result lots of hand tube wells water is mostly used for washing purpose. Water from ponds is mainly used for washing.

Developing a network based supply system will depend on availability of fresh water aquifer. Detailed geological Investigation is required to find out fresh water aquifers. But here problem lies here to use of ground water. Safiuddin (2001) observed the serious arsenic contamination of groundwater in Bangladesh has come out recently as the biggest natural calamity in the world. The people in 59 out of 64 districts comprising 126,134 sq km of Bangladesh are suffering due to the arsenic contamination in drinking water (arsenic contamination is also found in the ground water of Paurashava). So in case of water supply for Kalai Paurashava, special emphasis will be given to use surface water rather than use of ground water. Paurashava should take a programme to preserve and maintain all major ponds at the Paurashava for the greater interest of the people at large.Total 4.62 acres land will be used for utility services.

The town dwellers use ponds, khals and river water for their daily necessities other than drinking and cooking purpose. So it will require much less amount of water supply for the Paurashava town than city consumption. According to the estimation the total population in 2011 of Kalai Paurashava is 16464and at the end of the project i.e. in 2031 this will be around 22750. Assuming that Per day per capita water consumption of 100 liters, Technical loss 20% and Industrial/Commercial demand 20%.

By considering the above assumption, requirement per day for the Paurashava will be 2275000 litters by 2031. This consideration has been taken by avoiding excess industrial and commercial demand so that there are no mentionable industrial establishments in this Paurashava.

As an alternative to drinking water supply harvesting of rain water may be explored. The idea of rainwater harvesting is unknown to the local people. NGOs working in rain water harvesting training and motivation may be engaged for this purpose. Paurashava may take initiative to prepare a programme for popularizing rain water harvesting among the Paurashava people.

13.2 Solid Waste Management

There will be 5 waste transfer stations with an area of 1.65 acres for collection of solid waste located at suitable locations. A dumping site will be developed over an area of 2.08 acres for final disposal of the solid waste. The waste dumping site is located in Ward-06 at the east corner boundary of the Paurashava.

Table 13-1: Solid Waste Management Proposal

Type of Facilities	Ward No.	Mouza Name	Plot No.	Existing (Acre)	Proposed (Acre)
Waste Transfer Station	3	Hatior 54_02	1403, 1404, 1408	0	0.57
	2	Kalai 111_01	300-309	0	0.33
	2	Kalai 111_01, Kalai 111_01	215, 217, 214, 1044, 1045	0	0.29
	8	Kalai 111_02	1683, 1694		0.36
	5	Aura 56_01	1346, 1348		0.13
Waste Dumping Ground	6	Purbo Sarail 108_00	492-497, 577, 578, 627, 628	0	2.08
Total				0	3.76

13.3 Sanitation

As the field survey shows, the present sanitation system of the Paurashava is composed of a variety of types, like, hanging latrine, pit latrines of different types, water sealed latrines and septic tank based sanitary latrine.

The record of sanitation condition is also not perfectly available. However, according to BBS 2011 about 65.2% Households covered sanitary latrine (including water sealed and nonwater sealed) and there is no open latrine in this Paurashava.

Due to prohibitive expenditure one should not expect establishing network and treatment plant based sewerage system in the town by the Paurashava. So, for long the sanitary system of the Paurashava will remain on site. To promote healthy sanitation, Paurashava should promote low cost sanitary latrines in the town together with awareness building for healthy sanitation. It is proposed to set up public toilets in public gathering areas, like, existing and proposed bus stand, bazar and the main town center.

13.4 Electricity and Gas

Power Development Board (PDB) is mainly responsible for electricity supply in the Paurashava, supported by the Rural Electrification Board (REB). PDB works for power production and distribution, while REB is responsible for distribution only. Both, PDB and REB have their own plans for power supply in the town, which is executed in phases, depending on demand for power. In its infrastructure plan has shown the future power supply network of the town. The required electricity facility within the Paurashava will be provided through existing power system master plan of both REB and PDB. But the greatest problem of power supply in the entire country remains to be handicapped by the shortage of supply due to low production.

Area for gas related facilities is not proposed in the plan, because there is no scope for installation gas facilities in this Paurashava within the planning period. If land required in future for gas related facilities will be allocated from propose urban differed area. Gas network has been shown along all major roads and to the designated industrial site. A recent policy of the government forbids supply of gas for domestic purpose.

13.5 Telecommunication

The town enjoys the networks of all mobile and PSTN telecommunication companies operating in the country. Besides, there also exist landlines of BTCL, the national telephone company. Due to easy and cheaper access to mobile, the demand for land lines has decreased substantially.

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Map 13-1: Proposed Urban Services of Kalai Paurashava

Chapter 14: Ward Action Plan

14.1 Introduction

This chapter presents Part-C of the report which contains Ward Action Plan of each individual Ward. First, the issues prevailing in different Wards have been briefly described followed by description of Development Proposals in first ward action plan (1st to 5th year of planning period) for each Ward.

14.1.1 Background

The Ward Action Plans are prepared under the framework of Structure Plan and Urban Area Plan. The Ward Action Plans contain details of development proposals at Ward level including the problems and opportunities existing therein and also include the proposals made in the upper level plan that is in the Urban Area Plan. The Ward Action Plans have been formulated for execution within a period of 5 years.

Ward Action Plan is a vital part of the current plan package as far as spatial development and development control is concerned. Absence of Ward Action Plan not only hampers undertaking of development projects by planning authority, but also leads to uncontrolled and unwanted spatial development in the private sector. Land use zoning is also provided in the Ward Action Plan to enable detailed view of proposed land use and development.

14.1.2 Content and Form of Ward Action Plan

The Ward Action Plan is detailed area plan based on the policy framework, guideline indication of Structure Plan and more detailed guideline of Urban Area Plan. The provision of Ward Action Plan is inherent in the Structure Plan with some specific purposes. The Ward Action Plan is to:

a) Provide basic micro level infrastructure and services in the study area through systematic planning, under the framework of Structure Plan and proposals of the Urban Area Plan;
b) Create congenial environment to promote economic activities;
c) Improve drainage system and protect natural water channels from encroachment; and
d) Create service centers to promote urban growth.

14.1.3 Linkage with Structure and Urban Area Plan

Ward Action Plan is the 3rd component of the Master Plan package. The other two upper level components are Structure Plan and Urban Area Plan. Structure Plan lay down the framework of the future plan including strategy and the sectorial policies. The Urban Area Plan and the Ward Action Plan detail out development proposals under the framework of Structure Plan.

14.1.4 Approach & Methodology

The methodology could be illustrated through tri-step process for the assessment of Ward Action Plan. The first step of the methodology of Ward Action Plan is to conceptualize the content and background of the plan. In the next step, the linkage with Structure Plan & Urban Area Plan is identified. The final phase of the study is to adopt ward action plan in details. The proposal and planning, priority tasks and cost estimation are incorporated here to get a pictorial view of the Ward Action Plan.

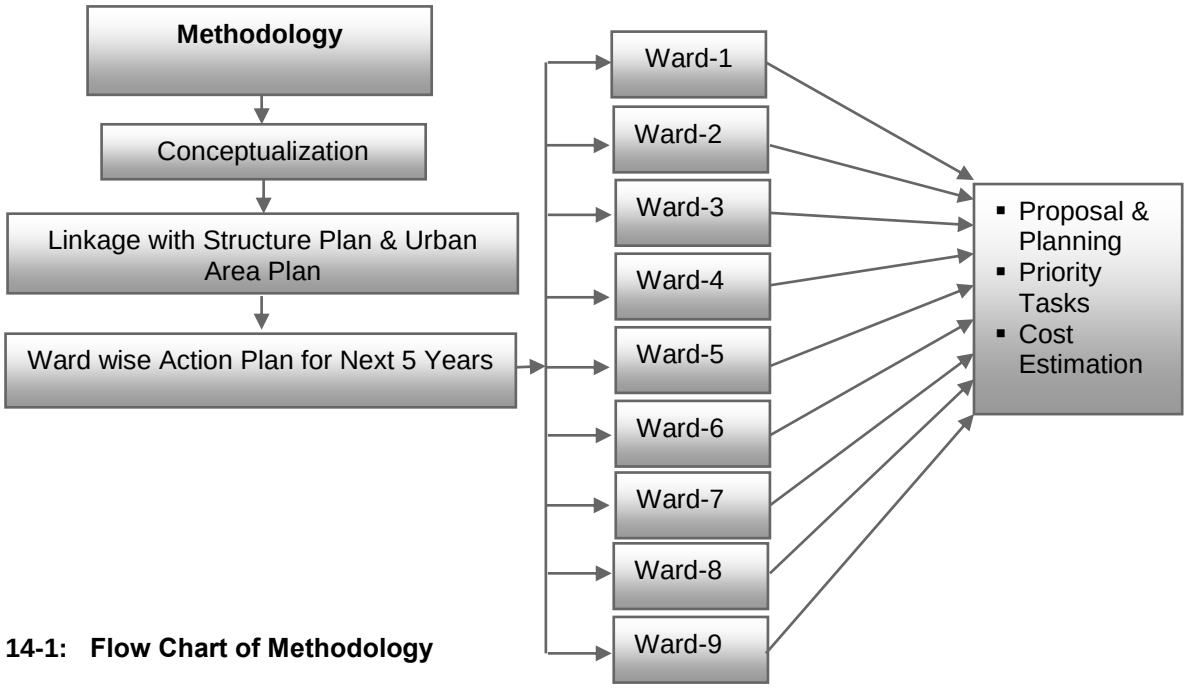

Fig 14-1: Flow Chart of Methodology

14.2 Derivation of the Ward Action Plan

The Ward Action Plan is derived from the conceptual framework, and guidelines and strategies for development under Structure Plan and detailed proposals of Urban Area Plan. Ward Action Plan is aimed to provide detailed infrastructure plan to guide the physical development of town including its all economic and social activities. This plan adheres to the policy directives spelled out in the Structure Plan.

14.2.1 Revisiting Structure Plan and Urban Area Plan

To guide long term growth of the Paurashava, potential locations of major development areas are identified and the Structure Plan Area is broadly classified into nine categories, namely Established Urban Area, Sub Urban Area, New Urban Area, Recreational Facility, Circulation Network, Restricted Area, Urban Peripheral Area, Agriculture Area and Water Retention Area. The Urban Area Plan is prepared under the framework of Structure Plan and the infrastructure identified for improvement and development are listed as proposals in the Urban Area Plan. The

broad classification of lands in the Structure Plan and detailed proposals in the Urban Area Plan form the basis for Ward Action Plan.

14.2.2 Prioritization

The prioritization of project proposals in Ward wise Action Plan are made on the basis of urgency for development depending on the needs of people and the town's requirement for infrastructure development.

14.2.3 Ward Wise Action Plan for Next Five Years

The Ward Action Plan is prepared for each of the nine Wards and is presented in order of their serial number. The Ward Action Plans are a series of detailed spatial development plans of different use and facilities. The plans comprise maps of appropriate scale supported by explanatory report. The Ward Action Plans have been formulated for execution within a period of 5 years. They do not initially cover the entire Structure Plan area. While all sub-areas will eventually require Ward Action Plan, only priority areas are to be dealt with initially. The aim of a Ward Action Plan is to prevent haphazard urban development and ensure livable environment in areas that are likely to be urbanized soon. Initially Detailed Area Plan should be covered for only those areas where action is needed immediately or where development pressure is high.

Public involvement is a key issue. To this end, the Paurashava has adopted a "Planning for Real" based approach which allows hands-on participation by all the residents of each local community. They help by identifying local issues and problems which the Plan can tackle; expressing their views on the Paurashavas policies; and suggesting how these could be improved. Ward Action Plan must be topical and relevant. The Paurashavas target is to ensure that they are reviewed on a 5 yearly cycle. A comprehensive Map of Ward Action Plan is shown in **Map 14-1**.

Map 14-1: Ward Action Plan of Kalai Paurashava

Ward Action Plan for Ward-01

14.3 Proposals and Plans for Ward-01

Ward No. 1 is located at the western fringe of Kalai Paurashava. The area of the Ward is 561.847 acres. After reviewing & commensuration the policies and proposals of Structure Plan & Urban Area Plan the following proposals are made in the Action Plan of Ward-1.

14.3.1 Road Network Development Plan

In road network development plan there is about 12.68 km road in ward no 01. All of the roads of this Pourashava will be constructed as a pucca road in different phases of plan. Road widening is considered for all the existing road

Table 14-1: Proposal of Roads for Ward-01

Existing Road Type	Proposed Road Type	ID	Length (m)	Proposed Width (ft)	Proposal Type
Primary	Widening Road	WRK433	685.2	80	Pucca
Secondary	Widening Road	WRK276	660.64	60	Pucca
Secondary	Widening Road	WRK256	235.38	40	Pucca
Secondary	Widening Road	WRK32	1558.62	30	Pucca
Secondary	Widening Road	WRK229	365.63	30	Pucca
Secondary	Widening Road	WRK230	182.95	30	Pucca
Secondary	New Construction	NRK501	153.8	30	Pucca
Secondary	New Construction	NRK445	251.76	30	Pucca
Secondary	New Construction	NRK451	263.97	60	Pucca
Secondary	New Construction	NRK504	669.96	30	Pucca
Tertiary	Widening Road	WRK214	106.97	20	Pucca
Tertiary	Widening Road	WRK372	123.63	20	Pucca
Tertiary	Widening Road	WRK396	140.03	20	Pucca
Tertiary	Widening Road	WRK366	156.83	20	Pucca
Tertiary	Widening Road	WRK222	161.74	20	Pucca
Tertiary	Widening Road	WRK381	162.95	20	Pucca
Tertiary	Widening Road	WRK375	165.85	20	Pucca
Tertiary	Widening Road	WRK169	368.75	20	Pucca
Tertiary	Widening Road	WRK383	215.43	20	Pucca
Tertiary	Widening Road	WRK232	193.1	20	Pucca
Tertiary	Widening Road	WRK263	186.4	20	Pucca
Tertiary	New Construction	NRK453	122.8	20	Pucca
Tertiary	New Construction	NRK452	163.76	20	Pucca
Tertiary	New Construction	NRK444	252.1	20	Pucca
Tertiary	New Construction	NRK499	253.14	20	Pucca
Tertiary	New Construction	NRK498	362.97	20	Pucca
Tertiary	New Construction	NRK449	370.74	20	Pucca
Tertiary	New Construction	NRK447	371.32	20	Pucca
Tertiary	New Construction	NRK450	429.97	20	Pucca

*** Road length≥ 100 meter incorporated here. Detail was given in Appendix*

14.3.2 Drainage Development Plan

Drain is necessary for discharge all its waste water and storm water. The plan proposes 9019.83 meters of drains for ward no. 01 which will be developed during the different phase. The natural sources of drainage are playing the critical roles in drainage plan.

Table 14-2: Proposal of Drain for Ward-01

Pro_ID	TYpe	Construction Type	LENGTH_MET	Pro_Width	Outfall
KD29	Primary	Pucca	652.57	3	Pond
KD82	Primary	Pucca	543.22	3	Pond
KD86	Secondary	Pucca	239.37	2	Pond
KD102	Secondary	Pucca	592.77	2	KD86
KD111	Secondary	Pucca	622.18	2	Pond
KD48	Tertiary	Pucca	442.50	1	KD29
KD61	Tertiary	Pucca	414.86	1	KD48
KD62	Tertiary	Pucca	395.15	1	KD48
KD68	Tertiary	Pucca	247.51	1	KD63
KD69	Tertiary	Pucca	206.81	1	KD68
KD77	Tertiary	Pucca	152.42	1	KD76
KD87	Tertiary	Pucca	377.14	1	KD80
KD91	Tertiary	Pucca	581.26	1	KD82
KD96	Tertiary	Pucca	345.49	1	KD96
KD97	Tertiary	Pucca	490.18	1	KD91
KD99	Tertiary	Pucca	379.34	1	KD82
KD100	Tertiary	Pucca	854.90	1	KD97
KD104	Tertiary	Pucca	156.41	1	KD100
KD107	Tertiary	Pucca	177.93	1	KD100
KD108	Tertiary	Pucca	237.53	1	KD100
KD109	Tertiary	Pucca	410.29	1	Pond
KD76	Tertiary	Pucca	351.98	1	Pond

*** Drain length≥ 100 meter incorporated here. Detail was given in Appendix*

14.3.3 Development Proposals

The urban services are the pre condition of any potential development. The proposals for service facilities of ward no 01 is shown in table 14.3 together with mouza name and plot number.

Table 14-3: Proposal for Other Facilities of Ward-01

ID	Use	Plot No.	Mouza Name	Area (Acres)
BUT_1	Bus Terminal	100, 264, 265	Kalai 111_01	0.75
STD-1	Stadium	390-392,408-416,419,427,428	Thupsara 50_01	6.22
PSE_2	Primary School	117-118	Tahirpur (153_00)	0.88
TST_1	Tempo/Rickshaw Stand	1137-1138, 1145	Thupsara 50_01	0.06
TST_7	Tempo/Rickshaw Stand	952, 953, 967	Kalai 111_02	0.03
WCM_1	Ward Center	87, 112, 115-117	Kalai 111_01	0.62
HA-1	Housing Area (Part)	702-737, 769-822,825,830,832	Kalai 111_02	38.88
CM-1	Cattle Market	1176-1179, 1206, 1213-1218	Thupsara (50_01)	2
SM-1	Super Market	100,265-267	Kalai 111_01	2.5

Map 14-2: Landuse Plan Map of Ward-01

Map 14-3: Service and Drainage Network Map of Ward-01

Ward Action Plan for Ward-02

14.4 Proposals and Plans for Ward-02

Ward No. 02 is located at the middle part of Kalai Paurashava. The area of the Ward is 191.118 acres. After reviewing and commensuration the policies and proposals of Structure Plan and Urban Area Plan the following proposals are made in the Action Plan of Ward-02 for implementation within next 20 years.

14.4.1 Road Network Development Plan

In road network development plan there is about 10.74 km road in ward no 02. All of the roads of this Pourashava will be constructed as a pucca road in different phases of plan. Road widening is considered for all the existing road

Table 14-4: Proposal of Roads for Ward-02

Existing Road Type	Proposed Road Type	ID	Length (m)	Proposed Width (ft)	Proposal Type
Primary Road	Widening Road	WRK434	408.21	80	Pucca
Primary Road	Widening Road	WRK433	439.3	80	Pucca
Secondary Road	Widening Road	WRK2	377.23	60	Pucca
Secondary Road	Widening Road	WRK103	550.98	40	Pucca
Secondary Road	Widening Road	WRK318	1218.48	60	Pucca
Secondary Road	Widening Road	WRK286	288.99	30	Pucca
Tertiary Road	Widening Road	WRK153	170.59	20	Pucca
Tertiary Road	Widening Road	WRK234	201.35	20	Pucca
Tertiary Road	Widening Road	WRK117	202.43	20	Pucca
Tertiary Road	Widening Road	WRK136	267.35	20	Pucca
Tertiary Road	Widening Road	WRK181	302.5	20	Pucca
Tertiary Road	Widening Road	WRK167	373.8	20	Pucca
Tertiary Road	New Road	NRK442	443.96	20	Pucca

*** Road length≥ 150 meter incorporated here. Detail was given in Appendix*

14.4.2 Drainage Development Plan

Drain is necessary for discharge all its waste water and storm water. The plan proposes 5555.22 meters of drains for ward no. 02 which will be developed during the different phase. The natural sources of drainage are playing the critical roles in drainage plan

Table 14-5: Proposal of Drains for Ward-02

Drain Type	ID	Construction Type	Length (m)	Average Width (m)	Outfall
KD66	Primary	Pucca	1228.66	3	Khal
KD43	Secondary	Pucca	318.27	2	KD25
KD70	Secondary	Pucca	116.28	2	KD66
KD37	Tertiary	Pucca	381.79	1	KD33
KD41	Tertiary	Pucca	178.19	1	KD44
KD44	Tertiary	Pucca	216.56	1	KD33
KD45	Tertiary	Pucca	178.06	1	Pond
KD53	Tertiary	Pucca	139.53	1	Pond
KD54	Tertiary	Pucca	469.20	1	Pond

Drain Type	ID	Construction Type	Length (m)	Average Width (m)	Outfall
KD55	Tertiary	Pucca	146.41	1	Khal
KD56	Tertiary	Pucca	149.13	1	KD45
KD57	Tertiary	Pucca	315.76	1	Khal
KD58	Tertiary	Pucca	221.41	1	Pond
KD59	Tertiary	Pucca	373.05	1	Pond
KD60	Tertiary	Pucca	554.36	1	KD33
KD65	Tertiary	Pucca	170.02	1	Pond
KD71	Tertiary	Pucca	305.47	1	KD66

*** Drain length≥ 100 meter incorporated here. Detail was given in Appendix*

14.4.3 Development Proposals

The urban services are the pre condition of any potential development. The proposal for service facilities of ward no 02 is shown in table 14-6 together with mouza name and plot number.

Table 14-6: Proposal for Other Facilities of Ward-02

ID	Use	Plot No.	Area (Acres)	Mouza Name
CC_1	Community Clinic	515, 516, 1189, 1190	0.58	Kalai 111_01, Kalai 111_02
HH_1	Hospital	528, 547, 572, 574-577	1.43	Kalai 111_01
NMC_4	Neighbourhood Market	516, 1182, 1190-1194	1.07	Kalai 111_01, Kalai 111_02
NPO_1	Neighborhood Park	1112-1115,1121,1124,1126,1128,1285-1287,1291,1293,1308,1309	2.0	Kalai 111_02
TST_2	Tempo Stand	471, 511, 512, 514, 515	0.24	Kalai 111_01
TST_3	Tempo Stand	216, 217	0.07	Kalai 111_01
WSTU_2	Waste Transfer Station	300-309	0.33	Kalai 111_01
WSTU_3	Waste Transfer Station	215, 217, 214, 1044, 1045	0.29	Kalai 111_01, Kalai 111_02
WCM_2	Ward Center	547,548,570,572,575	1.07	Kalai 111_01

Map 14-4: Landuse Plan Map of Ward-02

Map 14-5: Service and Drainage Network Map of Ward-02

Ward Action Plan for Ward-03

14.5 Proposals and Plans for Ward-03

Ward No. 03 is located at the nortern part of Kalai Paurashava. The area of the Ward is 453.827 acres. After reviewing and commensuration the policies and proposals of Structure Plan & Urban Area Plan the following proposals are made in the Action Plan of Ward-3 for implementation.

14.5.1 Road Network Development Plan

In road network development plan there is about 10.22 km road in ward no 03. All of the roads of this Pourashava will be constructed as a pucca road in different phases of plan. Road widening is considered for all the existing road

Table 14-7: Proposal of Roads for Ward-03

Existing Road Type	Proposed Road Type	ID	Length (m)	Proposed Width (ft)	Proposal Type
Secondary Road	Widening Road	WRK425	1801.18	40	Pucca
Secondary Road	New Road	NRK477	150.25	30	Pucca
Secondary Road	New Road	NRK455	160.58	30	Pucca
Secondary Road	Widening Road	WRK388	165.43	30	Pucca
Secondary Road	New Road	NRK454	198.93	30	Pucca
Secondary Road	Widening Road	WRK422	236.31	30	Pucca
Secondary Road	Widening Road	WRK423	302.82	30	Pucca
Secondary Road	Widening Road	WRK413	349.33	30	Pucca
Secondary Road	Widening Road	WRK278	353.73	30	Pucca
Secondary Road	New Road	NRK475	403.95	30	Pucca
Secondary Road	New Road	NRK504	481.13	30	Pucca
Secondary Road	New Road	NRK478	715.78	30	Pucca
Secondary Road	Widening Road	WRK424	495.98	30	Pucca
Tertiary Road	New Road	NRK476	150.41	20	Pucca
Tertiary Road	Widening Road	WRK401	157.89	20	Pucca
Tertiary Road	Widening Road	WRK410	217.94	20	Pucca
Tertiary Road	New Road	NRK447	238.56	20	Pucca
Tertiary Road	Widening Road	WRK404	441	20	Pucca
Tertiary Road	New Road	NRK479	446.13	20	Pucca

*** Road length≥ 150 meter incorporated here. Detail was given in Appendix*

14.5.2 Drainage Development Plan

Drain is necessary for discharge all its waste water and storm water. The plan proposes 7775.88 meters of drains for ward no. 03 which will be developed during the different phase. The natural sources of drainage are playing the critical roles in drainage plan.

Table 14-8: Proposal of Drains for Ward-03

Drain Type	ID	Construction Type	Length (m)	Average Width (m)	Outfall
KD70	Secondary	Pucca	2246.47	2	KD66
KD75	Secondary	Pucca	823.44	2	Khal
KD206	Secondary	Pucca	742.96	2	KD75

KD222	Secondary	Pucca	467.86	2	Pond
KD80	Tertiary	Pucca	310.93	1	KD75
KD87	Tertiary	Pucca	232.42	1	KD80
KD92	Tertiary	Pucca	672.86	1	KD75
KD110	Tertiary	Pucca	712.17	1	Pond
KD112	Tertiary	Pucca	177.05	1	KD115
KD113	Tertiary	Pucca	152.90	1	Pond
KD114	Tertiary	Pucca	508.60	1	KD70
KD115	Tertiary	Pucca	285.27	1	Pond
KD116	Tertiary	Pucca	258.86	1	KD110
KD117	Tertiary	Pucca	283.90	1	KD116
KD118	Tertiary	Pucca	181.74	1	KD114
KD119	Tertiary	Pucca	208.33	1	KD110
KD120	Tertiary	Pucca	231.71	1	Pond
KD121	Tertiary	Pucca	241.46	1	KD110

*** Drain length≥ 100 meter incorporated here. Detail was given in Appendix*

14.5.3 Development Proposals

The urban services are the pre condition of any potential development. The proposal for service facilities of ward no 03 is shown in table 14.9 together with mouza name and plot number

Table 14-9: Proposal for Other Facilities of Ward-03

ID	Use	Plot No.	Mouza Name	Area (Acres)
CH_2	Community Clinic	312, 313, 320, 330	Kalai 111_01	0.66
CH_3	Community Clinic	2, 3, 8-14, 1281, 1315	Duronjo 55_00, Hatior 54_02	1.82
NMC_2	Neighborhood Market	320, 329-333	Kalai 111_01	1.18
PGO_4	Playground	51-56, 1257, 1269	Duronjo 55_00, Hatior 54_02	1.24
PSE_3	Primary School	3, 5, 7, 8, 13, 16-18	Duronjo 55_00	0.89
TST_6	Tempo Stand	14, 21, 23	Duronjo 55_00	0.08
WCM_3	Ward Center	12-18, 23, 24	Duronjo 55_00	0.77
WSTU_1	Waste Transfer Station	1403, 1404, 1408	Hatior 54_02	0.58
CP-1	Central Park	392-394	Kalai 111_01	7.99
		1344-1348,1351-1353,1363-1366,1374-1376,1379-1382	Hatior 54_02	

Map 14-6: Landuse Plan Map of Ward-03

Map 14-7: Service and Drainage Network Map of Ward-03

Ward Action Plan for Ward-04

14.6 Proposals and Plans for Ward-04

Ward No. 04 is located at the northern part of Kalai Paurashava. The area of the Ward is 422.369 acres. After reviewing and commensuration the policies and proposals of Structure Plan and Urban Area Plan the following proposals are made in the Action Plan of Ward-4 for implementation.

14.6.1 Road Network Development Plan

In road network development plan there is about 6.02 km road in ward no 04. All of the roads of this Pourashava will be constructed as a pucca road in different phases of plan. Road widening is considered for all the existing road.

Table 14-10: Proposal of Roads for Ward-04

Existing Road Type	Proposed Road Type	ID	Length (m)	Proposed Width (ft)	Proposal Type
Primary	Widening Road	WRK266	177.26	80	Pucca
Secondary	Widening Road	WRK317	155.72	60	Pucca
Secondary	Widening Road	WRK303	160.65	40	Pucca
Secondary	Widening Road	WRK493	306.82	60	Pucca
Secondary	Widening Road	WRK318	479.42	60	Pucca
Secondary	New Road	NRK482	509.04	40	Pucca
Secondary	New Road	NRK478	299.85	30	Pucca
Tertiary	New Road	NRK480	223.45	20	Pucca
Tertiary	New Road	NRK481	223.76	20	Pucca
Tertiary	Widening Road	WRK331	284.61	20	Pucca
Tertiary	Widening Road	WRK368	360.76	20	Pucca
Tertiary	Widening Road	WRK328	377.85	20	Pucca
Tertiary	Widening Road	WRK308	417.45	20	Pucca
Tertiary	Widening Road	WRK376	480.06	20	Pucca

*** Road length≥ 150 meter incorporated here. Detail was given in Appendix*

14.6.2 Drainage Development Plan

Drain is necessary for discharge all its waste water and storm water. The plan proposes 5509.06 meters of drains for ward no. 04 which will be developed during the different phase. The natural sources of drainage are playing the critical roles in drainage plan

Table 14-11: Proposal of Drains for Ward-04

Drain Type	ID	Construction Type	Length (m)	Average Width (m)	Outfall
KD46	Primary	Pucca	214.95	3	Poura Boundary
KD63	Secondary	Pucca	735.86	2	KD46
KD75	Secondary	Pucca	1354.65	2	Khal
KD106	Secondary	Pucca	293.72	2	KD75
KD67	Tertiary	Pucca	101.50	1	KD63
KD83	Tertiary	Pucca	502.13	1	KD106
KD84	Tertiary	Pucca	144.93	1	Pond
KD88	Tertiary	Pucca	232.61	1	KD75

Drain Type	ID	Construction Type	Length (m)	Average Width (m)	Outfall
KD93	Tertiary	Pucca	391.70	1	Pond
KD94	Tertiary	Pucca	161.39	1	KD88
KD98	Tertiary	Pucca	208.03	1	Pond
KD101	Tertiary	Pucca	235.45	1	Pond
KD103	Tertiary	Pucca	712.74	1	KD93

*** Drain length≥ 100 meter incorporated here. Detail was given in Appendix*

14.6.3 Development Proposals

The urban services are the pre condition of any potential development. The proposal for service facilities of ward no 04 is shown in table 14-12 together with mouza name and plot number

Table 14-12: Proposal for Other Facilities of Ward-04

ID	Use	Plot No.	Mouza Name	Area (Acres)
NMC_5	Neighborhood Market	1044, 1362, 1367-1369, 1372	Aura 56_01	0.33
NPO_2	Neighborhood Park	728, 768-778, 780-785, 813	Aura 56_01	1.22
PSE_4	Primary School	864-876, 878-880, 884-887	Aura 56_01	1.08
TST_5	Tempo Stand	1044	Aura 56_01	0.11
WCM_4	Ward Center	1044, 1371-1376	Aura 56_01	0.27
TMS_1	Temple	702, 707, 710, 711, 714	Aura 56_01	0.38
CRS_1	Crematory	641, 715-717, 705, 708, 709	Aura 56_01	0.82

Map 14-8: Landuse Plan Map of Ward-04

Map 14-9: Service and Drainage Network Map of Ward-04

Ward Action Plan for Ward-05

14.7 Proposals and Plans for Ward-05

Ward No. 05 is located at the eastern part of Kalai Paurashava. The area of the Ward is 382.891 acres. After reviewing and commensuration the policies and proposals of Structure Plan and Urban Area Plan the following proposals are made in the Action Plan of Ward-5 for implementation.

14.7.1 Road Network Development Plan

In road network development plan there is about 6.83 km road in ward no 05. All of the roads of this Pourashava will be constructed as a pucca road in different phases of plan. Road widening is considered for all the existing road.

Table 14-13: Proposal of Roads for Ward-05

Existing Road Type	Proposed Road Type	ID	Length (k.m)	Proposed Width (ft)	Proposal Type
Secondary	Widening Road	WRK295	171.51	60	Pucca
Secondary	Widening Road	WRK317	305.68	60	Pucca
Secondary	New Road	NRK463	321.9	60	Pucca
Secondary	New Road	NRK494	355.75	30	Pucca
Secondary	Widening Road	WRK316	360.02	30	Pucca
Secondary	Widening Road	WRK75	471.01	30	Pucca
Tertiary	Widening Road	WRK346	153.35	20	Pucca
Tertiary	New Road	NRK461	153.45	20	Pucca
Tertiary	Widening Road	WRK254	179.68	20	Pucca
Tertiary	New Road	NRK457	217.48	20	Pucca
Tertiary	Widening Road	WRK328	282.12	20	Pucca
Tertiary	New Road	NRK460	342.915	20	Pucca
Tertiary	Widening Road	WRK296	429.8	20	Pucca

*** Road length≥ 150 meter incorporated here. Detail was given in Appendix*

14.7.2 Drainage Development Plan

Drain is necessary for discharge all its waste water and storm water. The plan proposes 5117.73 meters of drains for ward no. 05 which will be developed during the different phase. The natural sources of drainage are playing the critical roles in drainage plan.

Table 14-14: Proposal of Drain for Ward-05

Drain Type	ID	Construction Type	Length (m)	Average Width (m)	Outfall
KD46	Primary	Pucca	113.47	3	Poura Boundary
KD30	Secondary	Pucca	354.34	2	KD46
KD74	Secondary	Pucca	626.48	2	KD46
KD81	Secondary	Pucca	855.88	2	Khal
KD67	Tertiary	Pucca	207.09	1	KD63
KD72	Tertiary	Pucca	317.40	1	Pond
KD73	Tertiary	Pucca	1273.18	1	KD46
KD78	Tertiary	Pucca	251.54	1	KD73
KD85	Tertiary	Pucca	163.75	1	KD73

KD89	Tertiary	Pucca	413.22	1	KD81
KD90	Tertiary	Pucca	325.99	1	KD81
KD95	Tertiary	Pucca	203.19	1	KD90

*** Drain length≥ 100 meter incorporated here. Detail was given in Appendix*

14.7.3 Development Proposals

The urban services are the pre condition of any potential development. The proposal for service facilities of ward no 05 is shown in table 14-15 together with mouza name and plot number.

Table 14-15: Proposal for Other Facilities of Ward-05

ID	Use	Plot No.	Mouza Name	Area (Acres)
CH_1	Clinic	1073, 1088, 1091-1095	Aura 56_01	0.36
NMC_7	Neighborhood Market	1229, 1232, 1217,9999	Aura 56_01	0.06
PGO_2	Playground	1094, 1371, 1376, 1581-1586, 1593-1596	Aura 56_01	0.47
WCM_5	Ward Center	1346, 1587-1595, 1600	Aura 56_01	0.71
WSTU_5	Waste Transfer Station	1346, 1348	Aura 56_01	0.13

Map 14-10: Landuse Plan Map of Ward-05

Map 14-11: Service and Drainage Network Map of Ward-05

Ward Action Plan for Ward-06

14.8 Proposals and Plans for Ward-06

Ward-6 is located more or less at the extreme eastern part of Kalai Paurashava. The area of the ward is 359.253 acres. After reviewing & commensuration the policies & proposals of Structure Plan & Urban Area Plan the following proposals are made in the Action Plan of Ward-6 for implementation.

14.8.1 Road Network Development Plan

In road network development plan there is about 5.25 km road in ward no 06. All of the roads of this Pourashava will be constructed as a pucca road in different phases of plan. Road widening is considered for all the existing road.

Table 14-16: Proposal of Roads for Ward-06

Existing Road Type	Proposed Road Type	ID	Length (k.m)	Proposed Width (ft)	Proposal Type
Primary Road	Widening Road	WRK266	1500.78	80	Pucca
Secondary	New Road	NRK463	515.92	60	Pucca
Secondary	Widening Road	WRK115	164.58	30	Pucca
Secondary	New Road	NRK494	821.36	30	Pucca
Tertiary	Widening Road	WRK63	194.35	20	Pucca
Tertiary	Widening Road	WRK65	222.19	20	Pucca
Tertiary	Widening Road	WRK91	323.97	20	Pucca
Tertiary	Widening Road	WRK78	426.54	20	Pucca
Tertiary	Widening Road	WRK265	563.42	20	Pucca

*** Road length≥ 150 meter incorporated here. Detail was given in Appendix*

14.8.2 Drainage Development Plan

Drain is necessary for discharge all its waste water and storm water. The plan proposes 4728.43 meters of drains for ward no. 06 which will be developed during the different phase. The natural sources of drainage are playing the critical roles in drainage plan.

Table 14-17: Proposal of Drain for Ward-06

Drain Type	ID	Construction Type	Length (m)	Average Width (m)	Outfall
KD46	Primary	Pucca	1444.93	3	Poura Boundary
KD127	Primary	Pucca	113.62	3	KD25
KD30	Secondary	Pucca	822.70	2	KD46
KD74	Secondary	Pucca	528.39	2	KD46
KD31	Tertiary	Pucca	568.78	1	KD46
KD35	Tertiary	Pucca	322.14	1	KD23
KD51	Tertiary	Pucca	169.75	1	KD32
KD32	Tertiary	Pucca	292.82	1	Pond
KD32	Tertiary	Pucca	372.30	1	KD46

*** Drain length≥ 100 meter incorporated here. Detail was given in Appendix*

14.8.3 Development Proposals

The urban services are the pre condition of any potential development. The proposals for service facilities of ward no 06 is shown in table 14.18 together with mouza name and plot number.

Table 14-18: Proposal for Other Facilities of Ward-06

ID	Use	Plot No.	Mouza Name	Area (Acres)
DSW_1	Dumping Ground	492-496, 497, 577, 578, 627, 628	Purbo Sarail 108_00	2.08
HSE_2	High School	202, 242, 245, 722	Purbo Sarail 108_00	0.59
NMC_6	Neighborhood Market	472, 478-480	Purbo Sarail 108_00	0.44
NPO_5	Neighborhood Park	463, 467, 468, 472, 479, 484	Purbo Sarail 108_00	0.52
PGO_1	Playground	159, 245, 249, 456	Purbo Sarail 108_00	0.44
WCM_6	Ward Center	463, 467, 468, 472, 484	Purbo Sarail 108_00	1.18
TTT-1	Truck Terminal	62-65,528,536-540	Purbo Sarail 108_00	2.42

Map 14-12: Landuse Plan Map of Ward-06

Map 14-13: Service and Drainage Network Map of Ward-06

Ward Action Plan for Ward-07

14.9 Proposals and Plans for Ward-07

Ward No. 07 is located at the eastern southern part of Kalai Paurashava. The area of the Ward is 438.365 acres. After reviewing and commensuration the policies and proposals of Structure Plan & Urban Area Plan the following proposals are made in the Action Plan of Ward-7 for implementation.

14.9.1 Road Network Development Plan

In road network development plan there is about 8.90 km road in ward no 07. All of the roads of this Pourashava will be constructed as a pucca road in different phases of plan. Road widening is considered for all the existing road.

Table 14-19: Proposal of Roads for Ward-07

Existing Road Type	Proposed Road Type	ID	Length (m)	Proposed Width (ft)	Proposal Type
Primary	Widening Road	WRK266	446.96	80	Pucca
Primary	Widening Road	WRK434	805.66	80	Pucca
Secondary	Widening Road	WRK488	150.85	60	Pucca
Secondary	Widening Road	WRK52	299.45	60	Pucca
Secondary	New Road	NRK464	385.09	60	Pucca
Secondary	New Road	NRK486	931.57	60	Pucca
Secondary	Widening Road	WRK431	163.88	40	Pucca
Secondary	New Road	NRK465	237.25	40	Pucca
Secondary	New Road	NRK483	337.36	40	Pucca
Secondary	Widening Road	WRK55	425.92	40	Pucca
Secondary	Widening Road	WRK18	427.93	40	Pucca
Secondary	Widening Road	WRK40	462.49	40	Pucca
Secondary	New Road	WRK48	225.69	30	Pucca
Secondary	Widening Road	WRK23	247.28	30	Pucca
Tertiary	Widening Road	WRK29	152.23	20	Pucca
Tertiary	Widening Road	WRK41	204.04	20	Pucca
Tertiary	Widening Road	WRK53	222.28	20	Pucca
Tertiary	Widening Road	WRK54	272.75	20	Pucca
Tertiary	Widening Road	WRK24	340.79	20	Pucca

*** Road length≥ 150 meter incorporated here. Detail was given in Appendix*

14.9.2 Drainage Development Plan

Drain is necessary for discharge all its waste water and storm water. The plan proposes 8667.67 meters of drains for ward no. 07 which will be developed during the different phase. The natural sources of drainage are playing the critical roles in drainage plan.

Table 14-20: Proposal of Drain for Ward-07

Drain Type	ID	Construction Type	Length (m)	Average Width (m)	Outfall
KD25	Primary	Pucca	818.74	3	Pond
KD46	Primary	Pucca	1136.00	3	Poura Boundary
KD66	Primary	Pucca	186.56	3	Khal
KD127	Primary	Pucca	1159.70	3	KD25
KD43	Secondary	Pucca	289.24	2	KD25

KD1	Secondary	Pucca	296.44	2	Pond
KD11	Tertiary	Pucca	934.09	1	Pond
KD14	Tertiary	Pucca	145.38	1	Pond
KD15	Tertiary	Pucca	268.07	1	KD11
KD16	Tertiary	Pucca	350.16	1	KD23
KD17	Tertiary	Pucca	413.00	1	KD11
KD18	Tertiary	Pucca	115.69	1	KD16
KD20	Tertiary	Pucca	165.55	1	KD16
KD21	Tertiary	Pucca	282.30	1	KD20
KD22	Tertiary	Pucca	142.64	1	KD17
KD23	Tertiary	Pucca	379.51	1	KD11
KD24	Tertiary	Pucca	373.24	1	KD25
KD47	Tertiary	Pucca	141.25	1	Pond
KD50	Tertiary	Pucca	479.19	1	KD25
KD2	Tertiary	Pucca	361.43	1	Pond

*** Drain length≥ 100 meter incorporated here. Detail was given in Appendix*

14.9.3 Development Proposals

The urban services are the pre condition of any potential development. The proposal for service facilities of ward no 07 is shown in table 14.21 together with mouza name and plot number.

Table 14-21: Proposal for Other Facilities of Ward-07

ID	Use	Plot No.	Mouza Name	Area (Acres)
HSE_1	High School	505-513, 516, 519-530, 960	Mulgram 109_00	1.94
NMC_1	Neighborhood Market	654,664,772	Kalai 111_02	1.34
PGO_3	Playground	602-604, 612-620, 654, 782	Mulgram 109_00	0.64
WCM_2	Ward Center	77, 153-157, 516-520, 530, 531, 936	Dahra 110_00, Mulgram 109_00	0.91
IND_1	Industrial Zone	905-921, 866-868, 932,933	Mulgram (109_00)	17.16
		278,280,287-292	Dahra (110_00)	
SH-1	Slaughter House	122,123,124,134	Dahra 110_00	1.6

Map 14-14: Landuse Plan Map of Ward-07

Map 14-15: Service and Drainage Network Map of Ward-07

Ward Action Plan for Ward-08

14.10 Proposals and Plans for Ward-08

Ward No. 08 is located at the extreme southern part of Kalai Paurashava. The area of the Ward is 356.813 acres. After reviewing and commensuration the policies and proposals of Structure Plan & Urban Area Plan the following proposals are made in the Action Plan of Ward-08 for implementation.

14.10.1 Road Network Development Plan

In road network development plan there is about 7.38 km road in ward no 08. All of the roads of this Pourashava will be constructed as a pucca road in different phases of plan. Road widening is considered for all the existing road.

Table 14-22: Proposal of Roads for Ward-08

Existing Road Type	Proposed Road Type	ID	Length (m)	Proposed Width (ft)	Proposal Type
Secondary	New Road	NRK435	231.35	60	Pucca
Secondary	New Road	NRK484	355.72	60	Pucca
Secondary	Widening Road	WRK1	343.56	60	Pucca
Secondary	Widening Road	WRK18	542.82	40	Pucca
Secondary	Widening Road	WRK2	940.38	60	Pucca
Secondary	Widening Road	WRK28	214.53	30	Pucca
Secondary	Widening Road	WRK20	222.63	30	Pucca
Secondary	Widening Road	WRK11	816.31	30	Pucca
Tertiary	Widening Road	WRK4	181.213	20	Pucca
Tertiary	New Road	NRK469	192.75	20	Pucca
Tertiary	New Road	NRK472	262.62	20	Pucca
Tertiary	New Road	NRK473	285.23	20	Pucca
Tertiary	Widening Road	WRK13	309.05	20	Pucca

*** Road length≥ 150 m incorporated here. Detail was given in Appendix*

14.10.2 Drainage Development Plan

Drain is necessary for discharge all its waste water and storm water. The plan proposes 5751.40 meters of drains for ward no. 08 which will be developed during the different phase. The natural sources of drainage are playing the critical roles in drainage plan.

Table 14-23: Proposal of Drain for Ward-08

Drain Type	ID	Construction Type	Length (m)	Average Width (m)	Outfall
KD25	Primary	Pucca	588.18	3	Pond
KD33	Secondary	Pucca	553.13	2	KD43
KD1	Secondary	Pucca	388.63	2	Pond
KD3	Tertiary	Pucca	508.64	1	Pond
KD6	Tertiary	Pucca	920.34	1	Pond
KD7	Tertiary	Pucca	456.48	1	KD1
KD8	Tertiary	Pucca	158.06	1	Pond
KD9	Tertiary	Pucca	215.62	1	KD3
KD10	Tertiary	Pucca	122.40	1	KD9
KD12	Tertiary	Pucca	451.66	1	KD7
KD13	Tertiary	Pucca	211.69	1	KD12

Drain Type	ID	Construction Type	Length (m)	Average Width (m)	Outfall
KD26	Tertiary	Pucca	272.99	1	KD25
KD122	Tertiary	Pucca	445.50	1	Pond
KD124	Tertiary	Pucca	248.22	1	KD25

*** Drain length≥ 100 meter incorporated here. Detail was given in Appendix*

14.10.3 Development Proposals

The urban services are the pre condition of any potential development. The proposal for service facilities of ward no 08 is shown in table 14-24 together with mouza name and plot number.

Table 14-24: Proposal for Other Facilities of Ward-08

ID	Use	Plot No.	Mouza Name	Area (Acres)
EID_1	Eidgah	28-30, 47	Dahra 110_00	2.23
GVD_1	Graveyard	48,50,51	Dahra 110_00	1.32
NPO_3	Neighbourhood Park	8, 9, 14, 15, 22, 25, 26, 27	Dahra 110_00	1.96
PSE_1	Primary School	50, 51, 126-128	Mulgram 109_00	1.81
HH-2	Hospital	26,27,29-31	Dahra 110_00	2.8
TST_4	Tempo Stand	1694, 1695, 1697, 1698, 1700	Kalai 111_02	0.17
WCM_8	Ward Center	1706, 1707, 126, 138, 139, 49, 50, 126, 128, 129	Kalai 111_02, kathail 112_00, Mulgram 109_00	0.42
WSTU_4	Waste Transfer Station	1683, 1694	Kalai 111_02	0.36

Map 14-16: Landuse Plan Map of Ward-08

Map 14-17: Service and Drainage Network Map of Ward-08

Ward Action Plan for Ward-09

14.11 Proposals and Plans for Ward-09

Ward No. 09 is located at the western south part of Kalai Paurashava. The area of the Ward is 268.941 acres. After reviewing and commensuration the policies and proposals of Structure Plan & Urban Area Plan the following proposals are made in the Action Plan of Ward-9 for implementation.

14.11.1 Road Network Development Plan

In road network development plan there is about 7.23 km road in ward no 09. All of the roads of this Pourashava will be constructed as a pucca road in different phases of plan. Road widening is considered for all the existing road.

Table 14-25: Proposal of Roads for Ward-09

Existing Road Type	Proposed Road Type	ID	Length (m)	Proposed Width (ft)	Proposal Type
Secondary	New Road	NRK435	387.32	60	Pucca
Secondary	New Road	NRK487	475.91	60	Pucca
Secondary	Widening Road	WRK276	435.5	60	Pucca
Secondary	Widening Road	WRK103	453.26	40	Pucca
Secondary	Widening Road	WRK60	152.324	30	Pucca
Secondary	New Road	NRK451	484.38	60	Pucca
Tertiary	Widening Road	WRK111	182.25	20	Pucca
Tertiary	Widening Road	WRK89	186.98	20	Pucca
Tertiary	Widening Road	WRK171	196.28	20	Pucca
Tertiary	Widening Road	WRK71	299.1	20	Pucca
Tertiary	Widening Road	WRK110	375.1	20	Pucca
Tertiary	Widening Road	WRK141	407.38	20	Pucca
Local Access	New Road	NRK436	212.77	20	Pucca

*** Road length≥ 150 m incorporated here. Detail was given in Appendix*

14.11.2 Drainage Development Plan

Drain is necessary for discharge all its waste water and storm water. The plan proposes 4217.44 meters of drains for ward no. 09 which will be developed during the different phase. The natural sources of drainage are playing the critical roles in drainage plan.

Table 14-26: Proposal of Drain for Ward-09

Drain Type	ID	Construction Type	Length (m)	Average Width (m)	Outfall
KD25	Primary	Pucca	565.79	3	Pond
KD29	Primary	Pucca	338.25	3	Pond
KD33	Secondary	Pucca	454.00	2	KD43
KD27	Tertiary	Pucca	207.49	1	KD126
KD28	Tertiary	Pucca	293.43	1	Pond
KD34	Tertiary	Pucca	185.20	1	KD36
KD36	Tertiary	Pucca	318.14	1	KD25
KD39	Tertiary	Pucca	252.01	1	KD40
KD40	Tertiary	Pucca	489.64	1	KD27
KD42	Tertiary	Pucca	290.69	1	Pond
KD52	Tertiary	Pucca	373.53	1	Pond
KD126	Tertiary	Pucca	201.21	1	KD25

*** Drain length≥ 100 meter incorporated here. Detail was given in Appendix*

14.11.3 Development Proposals

The urban services are the pre condition of any potential development. The proposal for service facilities of ward no 09 is shown in table 14.27 together with mouza name and plot number.

Table 14-27: Proposal for Other Facilities of Ward-09

ID	Use	Plot No.	Mouza Name	Area (Acres)
NMC_3	Neighbourhood Market	756, 766, 769, 825	Kalai 111_02	0.32
WCM_9	Ward Center	903, 905-909, 915	Kalai 111_02	0.47
PGO_6	Playground	902, 910, 911, 914-916	Kalai 111_02	0.72
HA-1	Housing Area (Part)	702-737, 769-822,825,830,832	Kalai 111_02	38.88

Map 14-18: Landuse Plan Map of Ward-09

Map 14-19: Service and Drainage Network Map of Ward-09

14.12 Implementation Guidelines

14.12.1 Tasks of Paurashava Authority

As a planning and development authority Paurashava shoulders the responsibilities of undertaking and implementing Ward wise Action Plans. Discussion meetings and negotiations with local leaders will have to be carried out relentlessly for successful execution of any detailed area plan through their active participation. The Paurashava must have the Planning Unit.

14.12.1 Institutional Strengthening

In Ward wise planning the most significant role will be played by Paurashava Authority. The Planning Department must have to launch in the Paurashava which will carry out the entire work of project initiation and plan formulation. These works are complicated and time consuming, and require multidisciplinary professionals.

14.12.2 Role of Municipal Authority

According to the Local Government (Paurashava) Act 2009, Paurashava may, and if so required by the prescribed authority shall, draw up a Master Plan for the municipality within five years of its establishment. The Paurashava should have to play an important role by implementing all the priority tasks without any delaying otherwise the plan proposals will be inactive for implementation in wrong periods.

14.12.3 Publicity and Circulation of the Plans and Documents

In order to enable greater access of the Paurashava inhabitants, the plan documents must have wide circulation. This is necessary to create awareness among people about city planning and development. The plan document should be sent to every public office. Copies of plans and reports should be made available for purchase by people in general. This will be a step forward in promoting good governance through enabling beneficiary participating in planning and development activities.

14.13 Concluding Remarks

This master plan is developed a comprehensive vision for Kalai in context with its location, natural resources, and visions of the community. Kalai Master Plan will describe a strategy to address the need for facility improvements and for capital investments to support current and future development of the Paurashava. The community will be involved every step of the way. It wills guild the future development of the Paurashava.

In order to make the plans sustainable through people's participation, it is now emphasized involvement of the local stakeholders in the planning development process. Such participation creates a sense of ownership of the plan among the stakeholders that brings support for the plan

and helps to create favourable conditions to implement the plan provisions. Keeping this approach in mind the present Structure Plan, Urban Area Plan and Ward Action Plans for Kalai Paurashava has been prepared. It will shape and guide the growth of city in order to meet its social, cultural, environmental, economical, and recreational and many other needs of city dwellers.

Paurashava will be not only the custodian of the plan; it will also be responsible for implementing much of the development projects. Besides, it will also be responsible for monitoring implementation of the development projects by other urban development and service giving agencies. This situation calls for strengthening the existing capacity of Paurashava to handle future volume of work.

Annexure

Annexure-A: Land Use Permission

Annexure- A: Land use Permission

a. Urban Residential Land Use

Land Use Permitted

The following uses in the tables are proposed to be applicable for this zone only.

Table A.1: Land Use Permitted

Permitted Urban Residential Uses
Artisan's Shop
Assisted Living or Elderly Home
Confectionery Shop
Barber Shop
Child Daycare \ Preschool
Cleaning \ Laundry Shop
Communication Service Facilities
Communication Tower Within Permitted Height
Condominium or Apartment
Cottage
Cyber Café
Daycare Center (Commercial or Nonprofit)
Drug Store or Pharmacy
Employee Housing (Guards \ Drivers) \ Ancillary Use
General Store
Grocery Store
High School
Household Appliance and Furniture Repair Service (No Outside Storage)
Housing For Seasonal Firm Labor
Landscape and Horticultural Services
Mosque, Place Of Worship
Newspaper Stand
Nursery School
Orphanage
Eidgah
Photocopying and Duplicating Services (No Outside Storage)
Pipelines and Utility Lines
Playing Field
Primary School
Private Garages (Ancillary Use)
Project Identification Signs
Property Management Signs
Public Transport Facility
Satellite Dish Antenna
Shelter (Passers By)
Shoe Repair or Shoeshine Shop (Small)
CBO Office
Special Dwelling
Temporary Tent
Temporary tent for Permitted Function
Newspaper Stand
Specialized School: Dance, Art, Music, Physically Challenged & Others
Transmission Lines
Urban-Nature Reserve
Utility Lines
Woodlot
Children's Park (Must Have Parking)
ATM Booth
Water Pump \ Reservoir
Monument (Neighborhood Scale)
Bill Payment Booth
Boarding and Rooming House
Dormitory
Memorial Structure (Ancillary)
Neighborhood Center* *(Where Neighborhood Center exists)*
Permitted
Community Center
Doctor \ Dentist Chamber
Cultural Exhibits and Libraries
Fast Food Establishment \ Food Kiosk
Flowers, Nursery Stock and Florist Supplies
Fitness Centre
Gaming Clubs
Departmental Stores
Retail Shops \ Facilities

Source: Compiled by the Consultants

*Permission of Neighborhood Center Facilities in absence of formal neighborhood should be subject to Landuse Permit Committee

Land Use Conditionally Permitted

The following uses may be permitted or disallowed in this zone after review and approval by the authority/committee following appropriate procedure while

the application meets the criteria mentioned in the requirement.

Table A.2: Land Use Conditionally Permitted

Conditionally Permitted Urban Residential Uses
Addiction Treatment Center
Amusement and Recreation (Indoors)
Funeral Services
Art Gallery, Art Studio \ Workshop
Automobile Driving Academy
Beauty and Body Service
Billiard Parlor \ Pool Hall
Book or Stationery Store or Newsstand
Building Maintenance \ Cleaning Services, No Outside Storage
Bus Passenger Shelter
Graveyard \ Cemetery
Coffee Shop \ Tea Stall
Correctional Institution
Courier Service
Crematorium
Plantation (Except Narcotic Plant)
Furniture & Variety Stores
Emergency Shelter
Energy Installation
Garages
Garden Center or Retail Nursery
Fire Brigade Station
Police Station
Temporary Rescue Shed
Guest House
Slaughter House
Static Transformer Stations
Tourist Home or Resort
Market (Bazar)
Optical Goods Sales
Outdoor Café
Outdoor Fruit and Vegetable Markets
Community Hall
Neighborhood Co-Operative Office
Overhead Water Storage Tanks
Row House
Paints and Varnishes Store
Parking Lot
Patio Homes
Photofinishing Laboratory
Post Office
Postal Facilities
Sports and Recreation Club
Tennis Club
Flood Management Structure
Telephone Sub Station
Electrical Sub Station

Source: Compiled by the Consultants

Restricted Uses

All uses except permitted and conditionally permitted uses are restricted in this zone.

b. General Industry
Land use Permitted

General Industry land use category approve only Green and Orange-A category industry mentioned in *The Environmental Conservation Rule, 1997*.The following uses in the tables are proposed to be applicable for this zone only.

Table A.3: Land Use Permitted

Permitted General Industrial Activities
Confectionery Shop
Bank & Financial Institution
Bicycle Assembly, Parts and Accessories
Blacksmith
Bus Passenger Shelter
Communication Tower Within Permitted Height
Freight Transport Facility
Police Box \ Barrack
Fire \ Rescue Station
Grocery Store
Household Appliance and Furniture Repair Service
Machine Sheds
Meat and Poultry (Packing & Processing)
Mosque, Place Of Worship
Newspaper Stand
Photocopying and Duplicating Services
Pipelines and Utility Lines
Printing, Publishing and Distributing
Public Transport Facility
Restaurant

Permitted General Industrial Activities
Retail Shops \ Facilities
Salvage Processing
Salvage Yards
Satellite Dish Antenna
Sawmill, Chipping and Pallet Mill
Shelter (Passers By)
Television, Radio or Electronics Repair (No Outside Storage)
Transmission Lines
Truck Stop & Washing or Freight Terminal
Utility Lines
Wood Products
Woodlot
ATM Booth
Water Pump \ Reservoir
Effluent Treatment Plant
Social Forestry

Source: Compiled by the Consultants

Land Use Conditionally Permitted

The following uses may be permitted or denied in this zone after review and approval by the authority/committee following appropriate procedure.

Table A.4: Land Use Conditionally Permitted

Conditionally Permitted General Industrial Land Uses
Amusement and Recreation (Indoors)
Appliance Store
Plantation (Except Narcotic Plant)
Cyber Café
Daycare Center (Commercial or Nonprofit)
Doctor \ Dentist Chamber
Electrical and Electronic Equipment and Instruments Sales
Employee Housing
Energy Installation
Fast Food Establishment \ Food Kiosk
Garages
Grain & Feed Mills
Incineration Facility
Super Store
Lithographic or Print Shop
Motor Vehicle Fuelling Station \ Gas Station
Motorcycle Sales Outlet
Outdoor Fruit and Vegetable Markets
Outside Bulk Storage
Overhead Water Storage Tanks
Painting and Wallpaper Sales
Paints and Varnishes
Parking Lot
Parking Lot (Commercial)
Private Garages
Retail Shops Ancillary To Studio \ Workshop
Jute Mill

Source: Compiled by the Consultants

Restricted Uses

All other uses; except the permitted and conditionally permitted uses.

c. Commercial Zone

Land Use Permitted

Commercial zone is mainly intended for supporting the office and business works. There are several functions that are permitted in this zone.

Table A.5: Land Use Permitted

Permitted Commercial Activity
Accounting, Auditing or Bookkeeping Services
Billboards, Advertisements & Advertising Structure
Agri-Business
Agricultural Sales and Services
Ambulance Service
Antique Shop
Appliance Store
Auction Market
Auditorium, Coliseum, Meeting Halls, and Conference Facilities, Convention
Auto Leasing or Rental Office
Auto Paint Shop
Auto Parts and Accessory Sales (Indoors)
Auto Repair Shop (With Garage)
Automobile Wash
Automobile Sales
Confectionery Shop
Bakery or Confectionery Retail
Bank & Financial Institution
Bar (Licensed)
Barber Shop
Beauty and Body Service
Bicycle Shop
Billiard Parlor \ Pool Hall

Permitted Commercial Activity
Book or Stationery Store or Newsstand
Building Material Sales or Storage (Indoors)
Bulk Mail and Packaging
Bus Passenger Shelter
Cinema Hall
Communication Service Facilities
Communication Tower Within Permitted Height
Computer Maintenance and Repair
Computer Sales & Services
Conference Center
Construction Company
Courier Service
Cyber Café
Daycare Center (Commercial or Nonprofit)
Department Stores, Furniture & Variety Stores
Doctor \ Dentist Chamber
Drug Store or Pharmacy
Electrical and Electronic Equipment and Instruments Sales
Fast Food Establishment \ Food Kiosk
Freight Handling, Storage & Distribution
Freight Transport Facility
Freight Yard
General Store
Grocery Store
Guest House
Hotel or Motel
Inter-City Bus Terminal
Jewelry and Silverware Sales
Junk \ Salvage Yard
Super Store
Market (Bazar)
Mosque, Place Of Worship
Motorcycle Sales Outlet
Multi-Storey Car Park
Newspaper Stand
Outdoor Fruit and Vegetable Markets
Outdoor Recreation, Commercial
Parking Lot (Commercial)
Pet Store
Photocopying and Duplicating Services
Photofinishing Laboratory & Studio
Pipelines and Utility Lines
Post Office
Preserved Fruits and Vegetables Facility \ Cold Storage
Printing, Publishing and Distributing
Project Identification Signs
Property Management Signs
Public Transport Facility
Refrigerator or Large Appliance Repair
Resort
Restaurant
Retail Shops \ Facilities
Salvage Processing
Salvage Yards
Satellite Dish Antenna
Sawmill, Chipping and Pallet Mill
Shelter (Passers By)
Shopping Mall \ Plaza
Slaughter House
Software Development
Sporting Goods and Toys Sales
Taxi Stand
Telephone Exchanges
Television, Radio or Electronics Repair (No Outside Storage)
Theater (Indoor)
Transmission Lines
Utility Lines
Vehicle Sales & Service, Leasing or Rental
Veterinarian Clinics, Animal Hospitals, Kennels and Boarding Facilities
Warehousing
Wood Products
Woodlot
ATM Booth
Water Pump \ Reservoir
Agro-Based Industry (Rice Mill, Saw Mill, Cold Storage)
Social Forestry

Source: Compiled by the Consultants

Land Use Conditionally Permitted

Some functions are permitted with some condition in this zone.

Table A.6: Land Use Conditionally Permitted

Conditionally permitted commercial activities
Amusement and Recreation (Indoors)
Bicycle Assembly, Parts and Accessories
Broadcast Studio \ Recording Studio (No

Conditionally permitted commercial activities
Audience)
Coffee Shop \ Tea Stall
Concert Hall, Stage Shows
Construction, Survey, Soil Testing Firms
Trade Shows
Craft Workshop
Plantation (Except Narcotic Plant)
Energy Installation
Firm Equipment Sales & Service
Agricultural Chemicals, Pesticides or Fertilizers Shop
Fitness Centre
Flowers, Nursery Stock and Florist Supplies
Forest Products Sales
Fuel and Ice Dealers
Garages
Garden Center or Retail Nursery
Police Box \ Barrack
Fire \ Rescue Station
Grain & Feed Mills
Household Appliance and Furniture Repair Service
Incineration Facility
Indoor Amusement Centers, Game Arcades
Indoor Theatre
Lithographic or Print Shop
Motor Vehicle Fuelling Station \ Gas Station
Musical Instrument Sales or Repair
Optical Goods Sales
Painting and Wallpaper Sales
Paints and Varnishes
Parking Lot
Patio Homes
Postal Facilities
Poultry
Private Garages
Professional Office
Retail Shops Ancillary To Studio \ Workshop
Stone \ Cut Stone Products Sales

Source: Compiled by the Consultants

Restricted Uses

All other uses except;, the permitted and conditionally permitted uses.

d. Rural Settlement

Land Use Permitted

The following uses in the tables are proposed to be applicable for this zone only.

Table A.7: Land Use Permitted

Permitted Rural Settlement
Agricultural Dwellings
Animal Husbandry
Animal Shelter
Graveyard \ Cemetery
Child Daycare \ Preschool
Primary School
Communication Tower Within Permitted Height
Cottage
Crematorium
Dairy Firming
General Store
Grocery Store
Handloom (Cottage Industry)
Housing For Seasonal Firm Labor
Mosque, Place Of Worship
Newspaper Stand
Nursery School
orphanage
Outdoor Religious Events (Eidgah)
Playing Field
Satellite Dish Antenna
NGO \ CBO Facilities
Special Dwelling (E.G. Dorm For Physically Challenged Etc.)
Temporary Shed \ Tent
Specialized School: Dance, Art, Music, Physically Challenged & Others
Static Electrical Sub Stations
Transmission Lines
Utility Lines
Woodlot
Plantation (Except Narcotic Plant)
Social Forestry
Memorial Structure

Source: Compiled by the Consultants

Land Use Conditionally Permitted

The following uses may be permitted or disallowed in this zone after review and approval by the authority/committee following appropriate procedure while the application meets the criteria mentioned in the requirement.

Table No. A.8: Land Use Conditionally Permitted

Conditionally permitted uses under Rural Settlement
Artisan's Shop (Potter, Blacksmith, and Goldsmith Etc.)
Research organization (Agriculture \ Fisheries)
Energy Installation
Fish Hatchery
Garden Center or Retail Nursery
Emergency Shelter
Sports and Recreation Club, Firing Range: Indoor

Source: Compiled by the Consultants

Restricted Uses

All uses except permitted and conditionally permitted uses are restricted in this zone.

e. Mixed use zone

Land Use Permitted

The following uses in the tables are proposed to be applicable for this zone only.

Table A.11: Land Use Permitted

Permitted uses in Mixed Use Zone
Accounting, Auditing or Bookkeeping Services
Addiction Treatment Center
Billboards, Advertisements & Advertising Structure
Agricultural Sales and Services
Antique Store
Appliance Store
Art Gallery, Art Studio \ Workshop
Artisan's Shop
Assisted Living or Elderly Home
Auditorium, Coliseum, Meeting Halls, and Conference Facilities, Convention
Auto Leasing or Rental Office
Automobile Wash
Automobile Driving Academy
Confectionery Shop
Bakery or Confectionery Retail
Bank & Financial Institution
Barber Shop
Bicycle Shop
Billiard Parlor \ Pool Hall

Permitted uses in Mixed Use Zone
Blacksmith
Boarding and Rooming House
Book or Stationery Store or Newsstand
Bus Passenger Shelter
Child Daycare \ Preschool
Cleaning \ Laundry Shop
Commercial Recreational Buildings
Communication Service Facilities
Communication Tower Within Permitted Height
Community Center
Condominium or Apartment
Correctional Institution
Courier Service
Cyber Café
Daycare Center (Commercial or Nonprofit)
Doctor \ Dentist Chamber
Employee Housing
Fabric Store
Fast Food Establishment \ Food Kiosk
Funeral Services
General Store
Grocery Store
Guest House
Hospital
Jewelry and Silverware Sales
Landscape and Horticultural Services
Mosque, Place Of Worship
Newspaper Stand
Nursery School
Photocopying and Duplicating Services
Pipelines and Utility Lines
Primary School
Project Identification Signs
Property Management Signs
Public Transport Facility
Resort
Satellite Dish Antenna
Shelter (Passers By)
Shoe Repair or Shoeshine Shop (Small)
Slaughter House
Social organization
Software Development
Special Dwelling
Toys and Hobby Goods Processing and Supplies
Training Centre

Permitted uses in Mixed Use Zone
Transmission Lines
Utility Lines
Vehicle Sales & Service, Leasing or Rental
Warehousing
Woodlot
Children's Park
ATM Booth
Water Pump \ Reservoir
Social Forestry
Dormitory
Rickshaw \ Auto Rickshaw Stand

Source: Compiled by the Consultants

Land Use Conditionally Permitted

The following uses may be permitted or disallowed in this zone after review and approval by the authority/committee.

Table A.12: Land Use Conditionally Permitted

▪ Conditionally permitted uses in Mixed Use Zone
Agricultural Chemicals, Pesticides or Fertilizers Shop
Amusement and Recreation (Indoors)
Beauty and Body Service
Broadcast Studio \ Recording Studio (No Audience)
Building Maintenance \ Cleaning Services, No Outside Storage
Building Material Sales or Storage (Indoors)
Graveyard \ Cemetery
Coffee Shop \ Tea Stall
Computer Maintenance and Repair
Computer Sales & Services
Concert Hall, Stage Shows
Conference Center
Construction Company
Construction, Survey, Soil Testing Firms
Cottage
Counseling Services
Craft Workshop
Crematorium
Plantation (Except Narcotic Plant)
Cultural Exhibits and Libraries
Department Stores, Furniture & Variety Stores
Drug Store or Pharmacy
Energy Installation
Fitness Centre
Flowers, Nursery Stock and Florist Supplies
Freight Handling, Storage & Distribution

▪ Conditionally permitted uses in Mixed Use Zone
Freight Transport Facility
Gaming Clubs
Garages
Garden Center or Retail Nursery
Commercial Office
Project Office
Government Office
Hotel or Motel
Household Appliance and Furniture Repair Service
Indoor Amusement Centers, Game Arcades
Indoor Theatre
Lithographic or Print Shop
Market (Bazar)
Health Office, Dental Laboratory, Clinic or Lab
Musical Instrument Sales or Repair
Optical Goods Sales
Outdoor Café
Outdoor Fruit and Vegetable Markets
Painting and Wallpaper Sales
Paints and Varnishes
Patio Homes
Photofinishing Laboratory & Studio
Poultry
Printing, Publishing and Distributing
Psychiatric Hospital
Retail Shops Ancillary To Studio \ Workshop
Radio \ Television or T&T Station With Transmitter Tower
Refrigerator or Large Appliance Repair
Restaurant
Retail Shops \ Facilities
Sporting Goods and Toys Sales
Sports and Recreation Club, Firing Range: Indoor
Telephone Exchanges
Television, Radio or Electronics Repair (No Outside Storage)

Source: Compiled by the Consultants

Restricted Uses

All uses except permitted and conditionally permitted uses are restricted in this zone.

f. Education and Research Area

Land Use Permitted

The following uses in the tables are proposed to be applicable for this zone only.

Table A.13: Land Use Permitted

▪ Permitted uses under Education & Research Zone
Addiction Treatment Center
Billboards, Advertisements & Advertising Structure
Art Gallery, Art Studio \ Workshop
Automobile Driving Academy
Confectionery Shop
Bus Passenger Shelter
Child Daycare \ Preschool
College, University, Technical Institute
Communication Service Facilities
Communication Tower Within Permitted Height
Conference Center
Correctional Institution
Cultural Exhibits and Libraries
Cyber Café
Freight Transport Facility
General Store
Grocery Store
High School
Hospital
Lithographic or Print Shop
Mosque, Place Of Worship
Multi-Storey Car Park
Newspaper Stand
Nursery School
Outdoor Religious Events
Photocopying and Duplicating Services
Post Office
Primary School
Professional Office
Project Identification Signs
Property Management Signs
Public Transport Facility
Satellite Dish Antenna
School (Retarded)
Scientific Research Establishment
Shelter (Passers By)
Specialized School: Dance, Art, Music & Others
Training Centre
Transmission Lines
Utility Lines
Vocational, Business, Secretarial School
Woodlot
ATM Booth
Water Pump \ Reservoir
Social Forestry
Dormitory
Veterinary School \ College and Hospital

Source: Compiled by the Consultants

Land Use Conditionally Permitted

The following uses may be permitted or denied in this zone after review and approval by the authority/committee.

Table A.14: Land Use Conditionally Permitted

Conditionally permitted uses under Education and Research Zone
Auditorium, Coliseum, Meeting Halls, and Conference Facilities, Convention
Bank & Financial Institution
Barber Shop
Boarding and Rooming House
Book or Stationery Store or Newsstand
Coffee Shop \ Tea Stall
Counseling Services
Courier Service
Plantation (Except Narcotic Plant)
Daycare Center (Commercial or Nonprofit)
Doctor \ Dentist Chamber
Drug Store or Pharmacy
Fast Food Establishment \ Food Kiosk
Flowers, Nursery Stock and Florist Supplies
Gallery \ Museum
Garages
Indoor Theatre
orphanage
Outdoor Café
Parking Lot
Pipelines and Utility Lines
Postal Facilities
Psychiatric Hospital

Source: Compiled by the Consultants

Restricted Uses

All uses except permitted and conditionally permitted uses are restricted in this zone.

g. Government Office

Land Use Permitted

The following uses in the tables are proposed to be applicable for this zone only.

Table A.15: Land Use Permitted

Permitted uses under Government Office Zone
Accounting, Auditing or Bookkeeping Services
Billboards, Advertisements & Advertising Structure
Confectionery Shop

Permitted uses under Government Office Zone
Bus Passenger Shelter
Civic Administration
Communication Service Facilities
Communication Tower Within Permitted Height
Construction, Survey, Soil Testing Firms
Cultural Exhibits and Libraries
Cyber Café
Emergency Shelter
Freight Transport Facility
General Store
Project Office
Government Office
Grocery Store
Guest House
Multi-Storey Car Park
Newspaper Stand
Outdoor Religious Events
Photocopying and Duplicating Services
Post Office
Professional Office
Public Transport Facility
Satellite Dish Antenna
Scientific Research Establishment
Shelter (Passers By)
Training Centre
Transmission Lines
Utility Lines
Woodlot
ATM Booth
Water Pump \ Reservoir
Social Forestry

Source: Compiled by the Consultants

Land Use Conditionally Permitted

The following uses may be permitted or denied in this zone after review and approval by the authority/committee.

Table A.16: Land Use Conditionally Permitted

Conditionally permitted uses under Government office
Amusement and Recreation (Indoors)
Auditorium, Coliseum, Meeting Halls, and Conference Facilities, Convention
Bank & Financial Institution
Boarding and Rooming House
Book or Stationery Store or Newsstand
Coffee Shop \ Tea Stall
Conference Center
Courier Service
Plantation (Except Narcotic Plant)
Daycare Center (Commercial or Nonprofit)
Detention Facilities
Doctor \ Dentist Chamber
Energy Installation
Fast Food Establishment \ Food Kiosk
Flowers, Nursery Stock and Florist Supplies
Freight Handling, Storage & Distribution
Freight Yard
Gallery \ Museum
Garages
Police Box \ Barrack
Fire \ Rescue Station
Lithographic or Print Shop
Mosque, Place Of Worship
Outdoor Café
Parking Lot
Parking Lot (Commercial)
Pipelines and Utility Lines
Postal Facilities

Source: Compiled by the Consultants

Restricted Uses

All uses except permitted and conditionally permitted uses are restricted in this zone.

h. Agricultural Zone

Land Use Permitted

The following uses in the tables are proposed to be applicable for this zone only.

Table A17: Land Use Permitted

Permitted uses under Agricultural Zone
Food Grain Cultivation
Vegetable Cultivation
Cash Crop Cultivation
Horticulture
Arboriculture
Dairy Firming
Deep Tube Well
Shallow Tube Well
Irrigation Facilities (Irrigation Canal, Culvert, Flood Wall etc)
Temporary Structure (Agricultural)

Permitted uses under Agricultural Zone
Animal Shelter
Duckery
Aquatic Recreation Facility (Without Structure)
Tree Plantation (Except Narcotic Plant)
Aquaculture
Static Transformer Stations
Transmission Lines
Utility Lines
Woodlot
Social Forestry

Source: Compiled by the Consultants

Land Use Conditionally Permitted

Table A18: Land Use Conditionally Permitted

Conditionally permitted uses under Agricultural Zone
Graveyard \ Cemetery
Communication Tower Within Permitted Height
Crematorium
Fish Hatchery
Garden Center or Retail Nursery
Poultry

Source: Compiled by the Consultants

Restricted Uses

All uses except permitted and conditionally permitted uses are restricted in this zone.

j. Open Space

Land Use Permitted

The following uses in the tables are proposed to be applicable for this zone only.

Table A.19: Land Use Permitted

Permitted uses under Open Space
Botanical Garden & Arboretum
Bus Passenger Shelter
Caravan Park \ Camping Ground
Carnivals and Fairs
Circus
Plantation (Except Narcotic Plant)
Landscape and Horticultural Services
Open Theater
Park and Recreation Facilities (General)
Pipelines and Utility Lines
Playing Field
Special Function Tent

Permitted uses under Open Space
Tennis Club
Transmission Lines
Urban-Nature Reserve
Utility Lines
Woodlot
Zoo
Roadside Parking
Social Forestry
Memorial Structure

Source: Compiled by the Consultants

Landuse Conditionally Permitted

Table A 20: Land Use Conditionally Permitted

Conditionally permitted uses under open space
Communication Tower Within Permitted Height
Trade Shows
Fitness Centre
Flowers, Nursery Stock and Florist Supplies
Golf Course
Motorized Recreation
Outdoor Recreation Facilities
Outdoor Recreation, Commercial
Outdoor Sports and Recreation
Park Maintenance Facility
Retreat Center
Sports and Recreation Club, Firing Range: Indoor

Source: Compiled by the Consultants

Restricted Uses

All uses except permitted and conditionally permitted uses are restricted.

k. Water Body

Retaining water is the main purpose of this type of Landuse.

Land Use Permitted

The following uses in the tables are proposed to be applicable for this zone only.

Table A.21: Land Use Permitted

Permitted uses under Water Body

Aquatic Recreation Facility (Without Structure)
Fishing Club
Utility Lines
Water Parks
Memorial Structure

Source: Compiled by the Consultants

Land Use Conditionally Permitted

The following uses may be permitted or denied in this zone after review and approval by the authority/committee.

Table A.22: Land Use Conditionally Permitted

Conditionally permitted uses under water body
Plantation (Except Narcotic Plant)
Marina \ Boating Facility
Motorized Recreation

Source: Compiled by the Consultants

Restricted Uses

All uses except permitted and conditionally permitted uses are restricted.

Annexure-B: Details of road network proposal

Pro_ID	Proposed width (ft)	LENGTH (m)	Ex Width (m)	Road Type	Status	Phase
WRK433	80.00	5497.351	1.67	Primary	Widdening	Second
WRK318	60.00	1255.758	1.67	Secondary	Widdening	Second
NRK451	60.00	1120.940	0.00	Secondary	New Road	Second
WRK2	60.00	940.380	1.67	Secondary	Widdening	First
NRK486	60.00	931.574	0.00	Secondary	New Road	First
WRK276	60.00	835.549	1.67	Secondary	Widdening	First
WRK276	60.00	660.643	1.67	Secondary	Widdening	First
WRK319	60.00	555.778	1.23	Secondary	Widdening	Second
NRK463	60.00	515.910	0.00	Secondary	New Road	Second
WRK318	60.00	479.721	1.67	Secondary	Widdening	Second
NRK487	60.00	475.910	0.00	Secondary	New Road	First
NRK435	60.00	387.312	0.00	Secondary	New Road	First
NRK464	60.00	385.090	0.00	Secondary	New Road	First
WRK2	60.00	377.231	1.67	Secondary	Widdening	First
NRK484	60.00	355.715	0.00	Secondary	New Road	First
WRK1	60.00	343.555	1.23	Secondary	Widdening	First
NRK463	60.00	321.894	0.00	Secondary	New Road	Second
WRK493	60.00	306.821	2.96	Secondary	Widdening	Second
WRK317	60.00	305.677	2.96	Secondary	Widdening	Second
WRK52	60.00	299.450	1.67	Secondary	Widdening	First
NRK435	60.00	231.335	0.00	Secondary	New Road	First
WRK295	60.00	171.501	1.23	Secondary	Widdening	Second
WRK317	60.00	155.721	2.96	Secondary	Widdening	Second
WRK488	60.00	150.847	1.23	Secondary	Widdening	First
NRK486	60.00	140.250	0.00	Secondary	New Road	First
NRK462	60.00	130.255	0.00	Secondary	New Road	Second
WRK491	60.00	83.292	2.50	Secondary	Widdening	First
NRK485	60.00	65.172	0.00	Secondary	New Road	First
WRK62	60.00	59.305	1.23	Secondary	Widdening	First
WRK276	60.00	44.984	1.67	Secondary	Widdening	First
WRK58	60.00	39.260	1.23	Secondary	Widdening	First
WRK490	60.00	18.158	1.94	Secondary	Widdening	First
NRK492	60.00	17.050	0.00	Secondary	New Road	First
WRK52	60.00	1.011	1.67	Secondary	Widdening	First
WRK425	40.00	1801.372	1.67	Secondary	Widdening	Second
WRK103	40.00	550.977	1.67	Secondary	Widdening	Second
WRK18	40.00	542.828	1.67	Secondary	Widdening	First
NRK482	40.00	509.041	0.00	Secondary	New Road	Second
WRK40	40.00	462.488	1.23	Secondary	Widdening	Second
WRK103	40.00	453.206	1.67	Secondary	Widdening	Second
WRK18	40.00	427.938	1.67	Secondary	Widdening	First
WRK55	40.00	425.914	1.67	Secondary	Widdening	Second
NRK483	40.00	337.336	0.00	Secondary	New Road	Second
NRK465	40.00	237.253	0.00	Secondary	New Road	Second
WRK256	40.00	235.375	1.67	Secondary	Widdening	Second
WRK431	40.00	163.877	1.94	Secondary	Widdening	Second
WRK303	40.00	160.649	1.23	Secondary	Widdening	Second

WRK127	40.00	121.618	1.23	Secondary	Widdening	Second
WRK502	40.00	117.035	1.67	Secondary	Widdening	Second
WRK25	40.00	90.573	2.00	Secondary	Widdening	First
WRK505	40.00	74.717	2.49	Secondary	Widdening	Second
WRK302	40.00	72.012	1.67	Secondary	Widdening	Second
WRK489	40.00	54.061	1.94	Secondary	Widdening	Second
WRK64	40.00	35.843	1.23	Secondary	Widdening	Second
WRK425	40.00	21.524	1.67	Secondary	Widdening	Second
WRK425	40.00	0.512	1.67	Secondary	Widdening	Second
WRK321	30.00	1558.662	1.67	Secondary	Widdening	Second
WRK424	30.00	895.973	2.71	Secondary	Widdening	Second
NRK494	30.00	821.359	0.00	Secondary	New Road	Second
WRK11	30.00	816.309	1.67	Secondary	Widdening	Second
NRK478	30.00	715.776	0.00	Secondary	New Road	Second
WRK75	30.00	671.082	1.67	Secondary	Widdening	Second
NRK504	30.00	669.963	0.00	Secondary	New Road	Second
NRK504	30.00	481.116	0.00	Secondary	New Road	Second
NRK475	30.00	403.950	0.00	Secondary	New Road	Second
WRK316	30.00	360.018	2.59	Secondary	Widdening	Second
NRK494	30.00	355.746	0.00	Secondary	New Road	Second
WRK278	30.00	353.717	1.67	Secondary	Widdening	Second
WRK413	30.00	349.332	1.67	Secondary	Widdening	Second
WRK229	30.00	335.629	1.67	Secondary	Widdening	Second
WRK423	30.00	302.816	2.63	Secondary	Widdening	Second
NRK478	30.00	299.847	0.00	Secondary	New Road	Second
WRK286	30.00	288.987	1.67	Secondary	Widdening	Second
NRK445	30.00	251.761	0.00	Secondary	New Road	Second
WRK23	30.00	247.282	2.10	Secondary	Widdening	Second
WRK422	30.00	236.309	1.23	Secondary	Widdening	Second
NRK451	30.00	233.249	0.00	Secondary	New Road	Second
WRK48	30.00	225.688	1.97	Secondary	Widdening	Second
WRK20	30.00	222.629	2.00	Secondary	Widdening	Second
NRK451	30.00	220.993	0.00	Secondary	New Road	Second
NRK477	30.00	218.276	0.00	Secondary	New Road	Second
WRK28	30.00	214.532	2.24	Secondary	Widdening	Second
NRK454	30.00	198.928	0.00	Secondary	New Road	Second
WRK230	30.00	182.947	1.23	Secondary	Widdening	Second
WRK388	30.00	165.432	1.23	Secondary	Widdening	Second
WRK115	30.00	164.575	1.67	Secondary	Widdening	Second
NRK455	30.00	160.583	0.00	Secondary	New Road	Second
NRK501	30.00	153.782	0.00	Secondary	New Road	Second
WRK60	30.00	152.324	1.67	Secondary	Widdening	Second
NRK477	30.00	150.251	0.00	Secondary	New Road	Second
WRK258	30.00	132.537	1.67	Secondary	Widdening	Second
NRK470	30.00	129.324	0.00	Secondary	New Road	Second
WRK389	30.00	126.486	1.23	Secondary	Widdening	Second
WRK47	30.00	115.277	1.23	Secondary	Widdening	Second
WRK275	30.00	97.964	1.67	Secondary	Widdening	Second
WRK420	30.00	97.528	1.67	Secondary	Widdening	Second
NRK474	30.00	96.544	0.00	Secondary	New Road	Second

WRK80	30.00	82.688	1.67	Secondary	Widdening	Second
WRK288	30.00	80.302	1.50	Secondary	Widdening	Second
NRK506	30.00	79.232	0.00	Secondary	New Road	Second
WRK37	30.00	76.891	2.00	Secondary	Widdening	Second
WRK408	30.00	70.912	2.01	Secondary	Widdening	Second
NRK474	30.00	68.573	0.00	Secondary	New Road	Second
WRK497	30.00	59.108	1.23	Secondary	Widdening	Second
WRK61	30.00	57.200	1.23	Secondary	Widdening	Second
WRK277	30.00	56.881	1.23	Secondary	Widdening	Second
WRK75	30.00	42.915	1.67	Secondary	Widdening	Second
WRK402	30.00	37.981	2.00	Secondary	Widdening	Second
WRK414	30.00	35.384	1.23	Secondary	Widdening	Second
NRK446	30.00	35.151	0.00	Secondary	New Road	Second
NRK504	30.00	33.543	0.00	Secondary	New Road	Second
WRK409	30.00	29.092	1.23	Secondary	Widdening	Second
WRK398	30.00	26.631	1.23	Secondary	Widdening	Second
WRK61	30.00	22.235	1.23	Secondary	Widdening	Second
WRK21	30.00	21.482	1.23	Secondary	Widdening	Second
WRK115	30.00	15.604	1.67	Secondary	Widdening	Second
WRK49	30.00	12.502	1.23	Secondary	Widdening	Second
WRK23	30.00	1.470	2.10	Secondary	Widdening	Second
WRK80	30.00	0.886	1.67	Secondary	Widdening	Second
WRK278	30.00	0.716	1.67	Secondary	Widdening	Second
WRK265	20.00	563.418	1.67	Tertiary	Widdening	Third
WRK376	20.00	480.061	1.23	Tertiary	Widdening	Third
NRK479	20.00	446.128	0.00	Tertiary	New Road	Third
NRK442	20.00	443.962	0.00	Tertiary	New Road	Third
WRK404	20.00	440.996	2.05	Tertiary	Widdening	Third
NRK450	20.00	429.974	0.00	Tertiary	New Road	Third
WRK296	20.00	429.792	1.81	Tertiary	Widdening	Third
WRK78	20.00	426.536	1.67	Tertiary	Widdening	Third
WRK308	20.00	417.456	2.25	Tertiary	Widdening	Third
WRK141	20.00	407.386	1.67	Tertiary	Widdening	Third
WRK328	20.00	377.852	2.00	Tertiary	Widdening	Third
WRK110	20.00	375.049	1.23	Tertiary	Widdening	Third
WRK167	20.00	373.801	1.67	Tertiary	Widdening	Third
NRK447	20.00	371.306	0.00	Tertiary	New Road	Third
NRK449	20.00	370.746	0.00	Tertiary	New Road	Third
NRK498	20.00	362.274	0.00	Tertiary	New Road	Third
WRK368	20.00	360.761	2.02	Tertiary	Widdening	Third
NRK460	20.00	342.915	0.00	Tertiary	New Road	Third
WRK24	20.00	340.792	2.00	Tertiary	Widdening	Third
WRK169	20.00	338.745	1.67	Tertiary	Widdening	Third
WRK91	20.00	323.968	1.67	Tertiary	Widdening	Third
WRK13	20.00	309.051	1.67	Tertiary	Widdening	Third
WRK181	20.00	302.499	2.31	Tertiary	Widdening	Third
WRK71	20.00	299.120	1.23	Tertiary	Widdening	Third
NRK473	20.00	285.269	0.00	Tertiary	New Road	Third
WRK331	20.00	284.607	1.23	Tertiary	Widdening	Third
WRK328	20.00	282.119	2.00	Tertiary	Widdening	Third

WRK54	20.00	272.757	1.23	Tertiary	Widdening	Third
WRK136	20.00	267.345	2.03	Tertiary	Widdening	Third
NRK472	20.00	262.619	0.00	Tertiary	New Road	Third
NRK499	20.00	253.147	0.00	Tertiary	New Road	Third
NRK444	20.00	252.065	0.00	Tertiary	New Road	Third
NRK90	20.00	252.054	1.23	Local Access	Widdening	Third
NRK447	20.00	238.565	0.00	Tertiary	New Road	Third
NRK481	20.00	233.757	0.00	Tertiary	New Road	Third
NRK480	20.00	223.453	0.00	Tertiary	New Road	Third
WRK53	20.00	222.279	2.50	Tertiary	Widdening	Third
WRK65	20.00	222.190	2.59	Tertiary	Widdening	Third
WRK410	20.00	217.936	1.67	Tertiary	Widdening	Third
NRK457	20.00	217.474	0.00	Tertiary	New Road	Third
WRK383	20.00	215.433	2.45	Tertiary	Widdening	Third
NRK436	20.00	212.767	0.00	Tertiary	New Road	Third
WRK41	20.00	204.043	2.49	Tertiary	Widdening	Third
WRK117	20.00	202.430	2.14	Tertiary	Widdening	Third
WRK234	20.00	201.353	1.23	Tertiary	Widdening	Third
WRK171	20.00	196.377	1.67	Tertiary	Widdening	Third
WRK63	20.00	194.347	2.02	Tertiary	Widdening	Third
WRK232	20.00	193.117	1.23	Tertiary	Widdening	Third
NRK469	20.00	192.746	0.00	Tertiary	New Road	Third
WRK89	20.00	186.978	2.02	Tertiary	Widdening	Third
WRK263	20.00	186.399	1.23	Tertiary	Widdening	Third
WRK111	20.00	182.245	2.06	Tertiary	Widdening	Third
WRK4	20.00	181.213	2.00	Tertiary	Widdening	Third
WRK254	20.00	179.677	2.50	Tertiary	Widdening	Third
WRK153	20.00	170.588	2.00	Tertiary	Widdening	Third
WRK375	20.00	165.844	1.53	Tertiary	Widdening	Third
NRK452	20.00	163.761	0.00	Tertiary	New Road	Third
WRK381	20.00	162.945	1.50	Tertiary	Widdening	Third
WRK222	20.00	161.741	1.67	Tertiary	Widdening	Third
WRK401	20.00	157.880	1.67	Tertiary	Widdening	Third
WRK366	20.00	156.827	1.23	Tertiary	Widdening	Third
NRK461	20.00	153.454	0.00	Tertiary	New Road	Third
WRK346	20.00	153.355	2.03	Tertiary	Widdening	Third
WRK29	20.00	152.239	1.23	Tertiary	Widdening	Third
NRK476	20.00	150.409	0.00	Tertiary	New Road	Third
WRK191	20.00	141.161	1.23	Tertiary	Widdening	Third
WRK158	20.00	140.923	1.67	Tertiary	Widdening	Third
WRK192	20.00	140.758	1.80	Tertiary	Widdening	Third
WRK236	20.00	140.150	1.67	Tertiary	Widdening	Third
WRK169	20.00	140.124	1.67	Tertiary	Widdening	Third
WRK396	20.00	140.030	1.23	Tertiary	Widdening	Third
WRK15	20.00	139.936	1.23	Tertiary	Widdening	Third
NRK456	20.00	138.234	0.00	Tertiary	New Road	Third
WRK327	20.00	137.965	1.67	Tertiary	Widdening	Third
WRK407	20.00	136.731	1.67	Tertiary	Widdening	Third
WRK324	20.00	132.094	2.00	Tertiary	Widdening	Third
NRK448	20.00	128.080	0.00	Tertiary	New Road	Third

WRK372	20.00	123.633	2.36	Tertiary	Widdening	Third
NRK453	20.00	122.776	0.00	Tertiary	New Road	Third
WRK96	20.00	119.460	2.00	Tertiary	Widdening	Third
WRK190	20.00	119.254	1.23	Tertiary	Widdening	Third
NRK441	20.00	118.925	0.00	Tertiary	New Road	Third
WRK88	20.00	118.660	1.23	Tertiary	Widdening	Third
NRK458	20.00	115.796	0.00	Tertiary	New Road	Third
WRK121	20.00	111.630	1.23	Tertiary	Widdening	Third
WRK300	20.00	108.685	1.50	Tertiary	Widdening	Third
WRK12	20.00	108.435	1.23	Tertiary	Widdening	Third
WRK244	20.00	108.106	2.91	Tertiary	Widdening	Third
WRK214	20.00	106.974	1.67	Tertiary	Widdening	Third
NRK468	20.00	106.052	0.00	Tertiary	New Road	Third
WRK355	20.00	105.885	1.67	Tertiary	Widdening	Third
NRK459	20.00	102.756	0.00	Tertiary	New Road	Third
WRK223	20.00	101.209	2.00	Tertiary	Widdening	Third
NRK443	20.00	98.657	0.00	Tertiary	New Road	Third
WRK217	20.00	97.628	1.67	Tertiary	Widdening	Third
WRK267	20.00	95.548	2.00	Tertiary	Widdening	Third
WRK6	20.00	95.212	1.23	Tertiary	Widdening	Third
WRK354	20.00	92.915	1.23	Tertiary	Widdening	Third
WRK333	20.00	92.198	2.02	Tertiary	Widdening	Third
WRK307	20.00	91.449	1.67	Tertiary	Widdening	Third
WRK168	20.00	89.570	1.67	Tertiary	Widdening	Third
WRK99	20.00	84.310	2.00	Tertiary	Widdening	Third
WRK26	20.00	83.874	1.23	Tertiary	Widdening	Third
WRK370	20.00	80.773	2.02	Tertiary	Widdening	Third
WRK154	20.00	80.551	2.00	Tertiary	Widdening	Third
WRK301	20.00	78.537	2.00	Tertiary	Widdening	Third
WRK335	20.00	78.535	1.50	Tertiary	Widdening	Third
NRK439	20.00	77.293	0.00	Tertiary	New Road	Third
WRK405	20.00	76.417	2.09	Tertiary	Widdening	Third
WRK262	20.00	76.222	1.23	Tertiary	Widdening	Third
WRK359	20.00	74.735	1.49	Tertiary	Widdening	Third
WRK106	20.00	74.348	1.67	Tertiary	Widdening	Third
WRK125	20.00	73.882	1.61	Tertiary	Widdening	Third
WRK336	20.00	73.860	1.23	Tertiary	Widdening	Third
WRK297	20.00	69.489	1.67	Tertiary	Widdening	Third
NRK466	20.00	68.742	0.00	Tertiary	New Road	Third
NRK437	20.00	67.018	0.00	Tertiary	New Road	Third
WRK218	20.00	66.160	1.60	Tertiary	Widdening	Third
WRK261	20.00	65.471	2.00	Tertiary	Widdening	Third
NRK467	20.00	59.994	0.00	Tertiary	New Road	Third
WRK159	20.00	59.780	2.15	Tertiary	Widdening	Third
NRK440	20.00	58.610	0.00	Tertiary	New Road	Third
WRK353	20.00	58.232	1.23	Tertiary	Widdening	Third
WRK16	20.00	57.361	1.23	Tertiary	Widdening	Third
NRK438	20.00	57.003	0.00	Tertiary	New Road	Third
WRK142	20.00	55.256	2.34	Tertiary	Widdening	Third
WRK203	20.00	53.473	1.23	Tertiary	Widdening	Third

WRK335	20.00	53.234	1.50	Tertiary	Widdening	Third
WRK347	20.00	53.151	1.23	Tertiary	Widdening	Third
WRK379	20.00	52.634	1.54	Tertiary	Widdening	Third
WRK177	20.00	52.632	1.50	Tertiary	Widdening	Third
WRK332	20.00	48.651	1.23	Tertiary	Widdening	Third
WRK105	20.00	48.205	1.67	Tertiary	Widdening	Third
WRK495	20.00	43.804	1.23	Tertiary	Widdening	Third
WRK395	20.00	40.281	2.08	Tertiary	Widdening	Third
WRK57	20.00	39.205	1.67	Tertiary	Widdening	Third
NRK481	20.00	39.167	0.00	Tertiary	New Road	Third
WRK380	20.00	38.476	1.23	Tertiary	Widdening	Third
WRK500	20.00	38.132	1.23	Tertiary	Widdening	Third
NRK476	20.00	36.630	0.00	Tertiary	New Road	Third
WRK118	20.00	36.097	1.23	Tertiary	Widdening	Third
WRK415	20.00	32.792	1.23	Tertiary	Widdening	Third
WRK320	20.00	31.647	2.01	Tertiary	Widdening	Third
WRK7	20.00	30.811	1.23	Tertiary	Widdening	Third
WRK305	20.00	29.816	1.23	Tertiary	Widdening	Third
WRK366	20.00	29.267	1.23	Tertiary	Widdening	Third
WRK14	20.00	27.547	1.23	Tertiary	Widdening	Third
WRK382	20.00	26.831	1.23	Tertiary	Widdening	Third
WRK385	20.00	26.441	2.01	Tertiary	Widdening	Third
WRK359	20.00	23.559	1.49	Tertiary	Widdening	Third
NRK471	20.00	23.094	0.00	Tertiary	New Road	Third
WRK410	20.00	19.676	1.67	Tertiary	Widdening	Third
WRK9	20.00	18.901	1.23	Tertiary	Widdening	Third
NRK456	20.00	10.464	0.00	Tertiary	New Road	Third
WRK169	20.00	5.816	1.67	Tertiary	Widdening	Third
WRK136	20.00	2.297	2.03	Tertiary	Widdening	Third
WRK168	20.00	1.442	1.67	Tertiary	Widdening	Third
WRK154	20.00	1.320	2.00	Tertiary	Widdening	Third
WRK118	20.00	1.113	1.23	Tertiary	Widdening	Third
WRK26	20.00	0.985	1.23	Tertiary	Widdening	Third
WRK234	20.00	0.791	1.23	Tertiary	Widdening	Third
NRK90	20.00	0.618	1.23	Local Access	Widdening	Third
WRK117	20.00	0.533	2.14	Tertiary	Widdening	Third
WRK125	20.00	0.497	1.61	Tertiary	Widdening	Third
WRK324	20.00	0.383	2.00	Tertiary	Widdening	Third
NRK473	20.00	0.160	0.00	Tertiary	New Road	Third
NRK100	0.00	434.104	1.67	Local Access	Widdening	Third
ERK201	0.00	239.017	1.67	Local Access	Widdening	Third
ERK134	0.00	208.090	1.67	Local Access	Widdening	Third
ERK374	0.00	177.882	1.80	Local Access	Widdening	Third
ERK174	0.00	169.282	1.67	Local Access	Widdening	Third
ERK280	0.00	155.539	1.50	Local Access	Widdening	Third
ERK123	0.00	154.356	1.23	Local Access	Widdening	Third
ERK67	0.00	140.847	1.67	Local Access	Widdening	Third
ERK208	0.00	137.016	1.67	Local Access	Widdening	Third
ERK163	0.00	135.069	2.02	Local Access	Widdening	Third
ERK200	0.00	133.773	1.50	Local Access	Widdening	Third

ERK377	0.00	133.305	2.49	Local Access	Widdening	Third
ERK84	0.00	126.491	1.23	Local Access	Widdening	Third
ERK390	0.00	119.824	2.06	Local Access	Widdening	Third
ERK73	0.00	116.699	1.23	Local Access	Widdening	Third
ERK32	0.00	113.993	1.67	Local Access	Widdening	Third
ERK102	0.00	109.184	2.00	Local Access	Widdening	Third
ERK19	0.00	108.274	1.99	Local Access	Widdening	Third
ERK126	0.00	104.672	1.67	Local Access	Widdening	Third
ERK310	0.00	103.636	2.00	Local Access	Widdening	Third
ERK240	0.00	102.828	1.67	Local Access	Widdening	Third
ERK157	0.00	100.480	2.01	Local Access	Widdening	Third
ERK387	0.00	99.917	2.15	Local Access	Widdening	Third
ERK227	0.00	98.872	1.67	Local Access	Widdening	Third
ERK271	0.00	94.354	2.00	Local Access	Widdening	Third
ERK358	0.00	91.673	1.23	Local Access	Widdening	Third
ERK66	0.00	86.789	1.23	Local Access	Widdening	Third
ERK330	0.00	86.651	1.23	Local Access	Widdening	Third
ERK133	0.00	85.273	1.67	Local Access	Widdening	Third
ERK361	0.00	84.781	1.67	Local Access	Widdening	Third
ERK108	0.00	84.380	1.23	Local Access	Widdening	Third
ERK496	0.00	84.180	1.23	Local Access	Widdening	Third
ERK233	0.00	84.083	1.23	Local Access	Widdening	Third
ERK341	0.00	79.834	1.67	Local Access	Widdening	Third
ERK113	0.00	79.327	1.50	Local Access	Widdening	Third
ERK10	0.00	79.161	1.23	Local Access	Widdening	Third
ERK188	0.00	79.139	1.67	Local Access	Widdening	Third
ERK189	0.00	79.063	1.23	Local Access	Widdening	Third
ERK148	0.00	78.233	8.07	Tertiary	Widdening	Third
ERK197	0.00	77.810	1.67	Local Access	Widdening	Third
ERK138	0.00	76.415	2.00	Local Access	Widdening	Third
ERK235	0.00	73.999	1.67	Local Access	Widdening	Third
ERK199	0.00	73.858	1.67	Local Access	Widdening	Third
ERK69	0.00	71.942	1.23	Local Access	Widdening	Third
ERK283	0.00	71.749	1.52	Local Access	Widdening	Third
ERK245	0.00	70.171	1.67	Local Access	Widdening	Third
ERK216	0.00	69.353	1.23	Local Access	Widdening	Third
ERK243	0.00	68.237	2.51	Local Access	Widdening	Third
ERK306	0.00	68.062	1.60	Local Access	Widdening	Third
ERK259	0.00	67.916	1.80	Local Access	Widdening	Third
ERK164	0.00	67.862	1.67	Local Access	Widdening	Third
ERK351	0.00	67.846	1.23	Local Access	Widdening	Third
ERK231	0.00	67.384	1.23	Local Access	Widdening	Third
ERK237	0.00	67.122	1.60	Local Access	Widdening	Third
ERK35	0.00	66.896	1.23	Local Access	Widdening	Third
ERK198	0.00	66.071	1.67	Local Access	Widdening	Third
ERK86	0.00	65.765	2.00	Local Access	Widdening	Third
ERK338	0.00	65.317	1.99	Local Access	Widdening	Third
ERK268	0.00	64.525	1.67	Local Access	Widdening	Third
ERK114	0.00	64.471	1.50	Local Access	Widdening	Third
ERK68	0.00	63.388	1.67	Local Access	Widdening	Third

ERK3	0.00	62.703	1.23	Local Access	Widdening	Third
ERK257	0.00	62.567	1.81	Local Access	Widdening	Third
ERK228	0.00	61.472	1.23	Local Access	Widdening	Third
ERK344	0.00	61.399	1.67	Local Access	Widdening	Third
ERK207	0.00	61.393	1.23	Local Access	Widdening	Third
ERK326	0.00	60.982	1.23	Local Access	Widdening	Third
ERK161	0.00	60.835	1.23	Local Access	Widdening	Third
ERK39	0.00	59.105	2.01	Local Access	Widdening	Third
ERK239	0.00	58.791	2.52	Local Access	Widdening	Third
ERK247	0.00	58.437	2.01	Local Access	Widdening	Third
ERK394	0.00	57.514	1.67	Local Access	Widdening	Third
ERK165	0.00	57.205	1.67	Local Access	Widdening	Third
ERK27	0.00	54.440	1.23	Local Access	Widdening	Third
ERK22	0.00	54.205	1.23	Local Access	Widdening	Third
ERK175	0.00	54.146	1.67	Local Access	Widdening	Third
ERK419	0.00	54.101	2.00	Local Access	Widdening	Third
ERK279	0.00	53.767	1.67	Local Access	Widdening	Third
ERK269	0.00	53.732	2.03	Local Access	Widdening	Third
ERK131	0.00	52.796	1.23	Local Access	Widdening	Third
ERK17	0.00	52.781	1.99	Local Access	Widdening	Third
ERK397	0.00	52.750	1.23	Local Access	Widdening	Third
ERK150	0.00	52.497	1.23	Local Access	Widdening	Third
ERK290	0.00	51.763	2.00	Local Access	Widdening	Third
ERK253	0.00	51.249	1.67	Local Access	Widdening	Third
ERK284	0.00	50.918	2.00	Local Access	Widdening	Third
ERK225	0.00	50.710	1.52	Local Access	Widdening	Third
ERK343	0.00	50.499	1.23	Local Access	Widdening	Third
ERK238	0.00	50.464	1.67	Local Access	Widdening	Third
ERK129	0.00	50.223	1.23	Local Access	Widdening	Third
ERK81	0.00	50.111	1.67	Local Access	Widdening	Third
ERK362	0.00	49.900	1.23	Local Access	Widdening	Third
ERK43	0.00	49.721	1.67	Local Access	Widdening	Third
ERK337	0.00	49.619	1.50	Local Access	Widdening	Third
ERK219	0.00	49.364	1.52	Local Access	Widdening	Third
ERK5	0.00	49.112	2.06	Local Access	Widdening	Third
ERK94	0.00	48.940	1.23	Local Access	Widdening	Third
ERK92	0.00	48.764	1.23	Local Access	Widdening	Third
ERK42	0.00	48.745	1.23	Local Access	Widdening	Third
ERK285	0.00	48.338	1.23	Local Access	Widdening	Third
ERK162	0.00	48.128	1.23	Local Access	Widdening	Third
ERK313	0.00	47.793	2.35	Local Access	Widdening	Third
ERK194	0.00	47.610	2.00	Local Access	Widdening	Third
ERK298	0.00	47.536	2.02	Local Access	Widdening	Third
ERK363	0.00	47.173	1.23	Local Access	Widdening	Third
ERK128	0.00	46.949	2.46	Local Access	Widdening	Third
ERK224	0.00	46.824	1.67	Local Access	Widdening	Third
ERK178	0.00	46.611	1.23	Local Access	Widdening	Third
ERK209	0.00	46.247	1.67	Local Access	Widdening	Third
ERK322	0.00	46.237	1.67	Local Access	Widdening	Third
ERK226	0.00	45.705	2.27	Local Access	Widdening	Third

ERK77	0.00	45.537	2.02	Local Access	Widdening	Third
ERK293	0.00	45.342	1.23	Local Access	Widdening	Third
ERK416	0.00	45.102	2.00	Local Access	Widdening	Third
ERK391	0.00	44.899	1.67	Local Access	Widdening	Third
ERK399	0.00	44.834	2.01	Local Access	Widdening	Third
ERK8	0.00	44.571	1.60	Local Access	Widdening	Third
ERK149	0.00	44.517	1.23	Local Access	Widdening	Third
ERK309	0.00	44.504	1.23	Local Access	Widdening	Third
ERK139	0.00	44.496	1.23	Local Access	Widdening	Third
ERK104	0.00	44.476	2.31	Local Access	Widdening	Third
ERK206	0.00	44.235	1.67	Local Access	Widdening	Third
ERK349	0.00	44.106	1.23	Local Access	Widdening	Third
ERK287	0.00	43.602	3.89	Local Access	Widdening	Third
ERK357	0.00	42.781	1.80	Local Access	Widdening	Third
ERK400	0.00	41.860	1.23	Local Access	Widdening	Third
ERK406	0.00	41.474	2.11	Local Access	Widdening	Third
ERK304	0.00	40.972	1.51	Local Access	Widdening	Third
ERK384	0.00	40.813	2.08	Local Access	Widdening	Third
ERK44	0.00	40.749	1.23	Local Access	Widdening	Third
ERK369	0.00	40.352	1.23	Local Access	Widdening	Third
ERK183	0.00	40.185	2.67	Local Access	Widdening	Third
ERK378	0.00	40.053	1.23	Local Access	Widdening	Third
ERK46	0.00	39.723	1.23	Local Access	Widdening	Third
ERK151	0.00	39.616	1.23	Local Access	Widdening	Third
ERK50	0.00	39.549	1.23	Local Access	Widdening	Third
ERK31	0.00	39.410	1.23	Local Access	Widdening	Third
ERK186	0.00	38.869	1.67	Local Access	Widdening	Third
ERK314	0.00	37.359	1.51	Local Access	Widdening	Third
ERK246	0.00	36.908	1.67	Local Access	Widdening	Third
ERK93	0.00	36.662	1.23	Local Access	Widdening	Third
ERK367	0.00	36.387	1.23	Local Access	Widdening	Third
ERK272	0.00	36.287	1.23	Local Access	Widdening	Third
ERK196	0.00	36.027	1.67	Local Access	Widdening	Third
ERK392	0.00	35.810	2.01	Local Access	Widdening	Third
ERK241	0.00	35.681	4.20	Local Access	Widdening	Third
ERK386	0.00	35.656	1.67	Local Access	Widdening	Third
ERK281	0.00	35.211	1.23	Local Access	Widdening	Third
ERK342	0.00	35.012	1.23	Local Access	Widdening	Third
ERK173	0.00	34.688	1.67	Local Access	Widdening	Third
ERK329	0.00	33.746	1.23	Local Access	Widdening	Third
ERK323	0.00	33.623	1.23	Local Access	Widdening	Third
ERK45	0.00	33.275	2.04	Local Access	Widdening	Third
ERK85	0.00	33.092	1.67	Local Access	Widdening	Third
ERK340	0.00	32.822	1.67	Local Access	Widdening	Third
ERK176	0.00	32.722	1.23	Local Access	Widdening	Third
ERK299	0.00	32.615	1.23	Local Access	Widdening	Third
ERK147	0.00	32.577	2.00	Local Access	Widdening	Third
ERK34	0.00	32.568	1.86	Local Access	Widdening	Third
ERK373	0.00	31.162	1.23	Local Access	Widdening	Third
ERK411	0.00	31.159	2.14	Local Access	Widdening	Third

ERK403	0.00	30.794	1.23	Local Access	Widdening	Third
ERK418	0.00	30.717	1.88	Local Access	Widdening	Third
ERK356	0.00	30.463	1.23	Local Access	Widdening	Third
ERK360	0.00	30.425	1.23	Local Access	Widdening	Third
ERK248	0.00	30.221	1.67	Local Access	Widdening	Third
ERK417	0.00	30.097	1.23	Local Access	Widdening	Third
ERK204	0.00	29.321	1.67	Local Access	Widdening	Third
ERK432	0.00	29.002	1.23	Local Access	Widdening	Third
ERK393	0.00	28.553	2.00	Local Access	Widdening	Third
ERK185	0.00	28.437	1.67	Local Access	Widdening	Third
ERK421	0.00	27.202	2.03	Local Access	Widdening	Third
ERK292	0.00	27.174	9.37	Secondary	Widdening	Second
ERK195	0.00	27.130	1.97	Local Access	Widdening	Third
ERK294	0.00	27.103	1.23	Local Access	Widdening	Third
ERK97	0.00	27.096	1.67	Local Access	Widdening	Third
ERK147	0.00	26.883	2.00	Local Access	Widdening	Third
ERK291	0.00	26.567	1.86	Local Access	Widdening	Third
ERK315	0.00	26.411	1.50	Local Access	Widdening	Third
ERK72	0.00	26.217	1.23	Local Access	Widdening	Third
ERK187	0.00	26.113	1.82	Local Access	Widdening	Third
ERK348	0.00	26.113	1.23	Local Access	Widdening	Third
ERK255	0.00	25.934	1.67	Local Access	Widdening	Third
ERK83	0.00	25.876	1.23	Local Access	Widdening	Third
ERK205	0.00	25.538	1.23	Local Access	Widdening	Third
ERK107	0.00	25.388	1.23	Local Access	Widdening	Third
ERK289	0.00	25.167	5.71	Local Access	Widdening	Third
ERK350	0.00	25.135	1.23	Local Access	Widdening	Third
ERK345	0.00	24.914	1.23	Local Access	Widdening	Third
ERK365	0.00	24.905	1.67	Local Access	Widdening	Third
ERK412	0.00	24.598	2.15	Local Access	Widdening	Third
ERK503	0.00	24.512	2.31	Local Access	Widdening	Third
ERK74	0.00	24.467	1.67	Local Access	Widdening	Third
ERK210	0.00	24.354	1.67	Local Access	Widdening	Third
ERK101	0.00	24.326	1.23	Local Access	Widdening	Third
ERK109	0.00	23.391	1.23	Local Access	Widdening	Third
ERK51	0.00	23.373	1.23	Local Access	Widdening	Third
ERK180	0.00	23.193	1.67	Local Access	Widdening	Third
ERK122	0.00	23.150	1.23	Local Access	Widdening	Third
ERK82	0.00	23.143	1.67	Local Access	Widdening	Third
ERK95	0.00	22.671	1.67	Local Access	Widdening	Third
ERK119	0.00	21.875	1.67	Local Access	Widdening	Third
ERK215	0.00	21.824	1.67	Local Access	Widdening	Third
ERK166	0.00	21.705	2.01	Local Access	Widdening	Third
ERK282	0.00	21.696	1.23	Local Access	Widdening	Third
ERK146	0.00	21.438	2.79	Local Access	Widdening	Third
ERK170	0.00	21.350	2.00	Local Access	Widdening	Third
ERK325	0.00	21.333	1.60	Local Access	Widdening	Third
ERK116	0.00	21.280	1.67	Local Access	Widdening	Third
ERK211	0.00	21.222	1.67	Local Access	Widdening	Third
ERK76	0.00	21.148	2.45	Local Access	Widdening	Third

ERK260	0.00	20.599	1.32	Local Access	Widdening	Third
ERK79	0.00	20.448	1.23	Local Access	Widdening	Third
ERK264	0.00	20.430	1.67	Local Access	Widdening	Third
ERK251	0.00	20.401	1.23	Local Access	Widdening	Third
ERK38	0.00	20.340	1.23	Local Access	Widdening	Third
ERK352	0.00	20.125	1.23	Local Access	Widdening	Third
ERK184	0.00	19.800	1.67	Local Access	Widdening	Third
ERK212	0.00	19.775	1.67	Local Access	Widdening	Third
ERK334	0.00	19.215	1.63	Local Access	Widdening	Third
ERK124	0.00	19.198	1.60	Local Access	Widdening	Third
ERK270	0.00	19.165	1.53	Local Access	Widdening	Third
ERK273	0.00	19.120	1.20	Local Access	Widdening	Third
ERK36	0.00	18.924	1.23	Local Access	Widdening	Third
ERK155	0.00	18.571	1.23	Local Access	Widdening	Third
ERK140	0.00	18.491	1.67	Local Access	Widdening	Third
ERK145	0.00	18.406	1.23	Local Access	Widdening	Third
ERK137	0.00	18.340	1.23	Local Access	Widdening	Third
ERK182	0.00	18.167	1.67	Local Access	Widdening	Third
ERK202	0.00	17.647	1.81	Local Access	Widdening	Third
ERK56	0.00	17.200	1.23	Local Access	Widdening	Third
ERK312	0.00	17.126	1.67	Local Access	Widdening	Third
ERK143	0.00	16.941	1.67	Local Access	Widdening	Third
ERK112	0.00	16.334	1.50	Local Access	Widdening	Third
ERK220	0.00	16.128	2.02	Local Access	Widdening	Third
ERK250	0.00	15.196	1.67	Local Access	Widdening	Third
ERK364	0.00	14.896	1.23	Local Access	Widdening	Third
ERK120	0.00	14.194	1.23	Local Access	Widdening	Third
ERK98	0.00	14.156	1.43	Local Access	Widdening	Third
ERK252	0.00	13.920	1.23	Local Access	Widdening	Third
ERK179	0.00	13.526	1.23	Local Access	Widdening	Third
ERK144	0.00	13.507	1.90	Local Access	Widdening	Third
ERK339	0.00	13.398	1.20	Local Access	Widdening	Third
ERK213	0.00	13.350	1.67	Local Access	Widdening	Third
ERK70	0.00	13.336	1.23	Local Access	Widdening	Third
ERK311	0.00	13.168	1.23	Local Access	Widdening	Third
ERK152	0.00	13.093	1.23	Local Access	Widdening	Third
ERK156	0.00	12.871	1.23	Local Access	Widdening	Third
ERK426	0.00	12.507	1.23	Local Access	Widdening	Third
ERK135	0.00	12.234	1.78	Local Access	Widdening	Third
ERK30	0.00	11.529	1.23	Local Access	Widdening	Third
ERK87	0.00	11.504	1.03	Local Access	Widdening	Third
ERK221	0.00	11.149	1.23	Local Access	Widdening	Third
ERK130	0.00	10.773	2.00	Local Access	Widdening	Third
ERK59	0.00	10.118	1.48	Local Access	Widdening	Third
ERK172	0.00	10.103	1.67	Local Access	Widdening	Third
ERK249	0.00	9.727	1.67	Local Access	Widdening	Third
ERK160	0.00	9.456	1.50	Local Access	Widdening	Third
ERK193	0.00	9.353	1.67	Local Access	Widdening	Third
ERK132	0.00	9.232	1.86	Local Access	Widdening	Third
ERK371	0.00	8.402	1.23	Local Access	Widdening	Third

ERK33	0.00	8.223	1.23	Local Access	Widdening	Third
ERK427	0.00	7.794	1.67	Local Access	Widdening	Third
ERK242	0.00	7.179	1.23	Local Access	Widdening	Third
ERK428	0.00	5.730	1.67	Local Access	Widdening	Third
ERK430	0.00	5.512	1.71	Local Access	Widdening	Third
ERK289	0.00	4.253	5.71	Local Access	Widdening	Third
ERK429	0.00	4.247	1.67	Local Access	Widdening	Third
ERK79	0.00	4.208	1.23	Local Access	Widdening	Third
NRK100	0.00	1.200	1.67	Local Access	Widdening	Third
ERK102	0.00	1.064	2.00	Local Access	Widdening	Third
ERK427	0.00	0.985	1.67	Local Access	Widdening	Third
ERK253	0.00	0.746	1.67	Local Access	Widdening	Third
ERK293	0.00	0.697	1.23	Local Access	Widdening	Third
ERK124	0.00	0.589	1.60	Local Access	Widdening	Third
ERK162	0.00	0.550	1.23	Local Access	Widdening	Third
ERK220	0.00	0.523	2.02	Local Access	Widdening	Third
ERK165	0.00	0.515	1.67	Local Access	Widdening	Third
ERK284	0.00	0.483	2.00	Local Access	Widdening	Third
ERK133	0.00	0.430	1.67	Local Access	Widdening	Third
ERK17	0.00	0.420	1.99	Local Access	Widdening	Third
ERK175	0.00	0.291	1.67	Local Access	Widdening	Third
ERK138	0.00	0.276	2.00	Local Access	Widdening	Third
ERK164	0.00	0.255	1.67	Local Access	Widdening	Third
ERK155	0.00	0.186	1.23	Local Access	Widdening	Third
ERK280	0.00	0.180	1.50	Local Access	Widdening	Third
ERK148	0.00	0.142	8.07	Tertiary	Widdening	Third

Annexure-C: Proposed Drain Inventory

TYpe	Pro_ID	Length (m)	(Pro)Width (m)	Outfall	Ward_No	Phase	Remarks
Primary	KD25	588.18	3	Pond	Ward No. 8	Third Phase	Covered Drain
Primary	KD25	565.79	3	Pond	Ward No. 9	Third Phase	Covered Drain
Primary	KD25	818.74	3	Pond	Ward No. 7	Third Phase	Covered Drain
Primary	KD29	338.25	3	Pond	Ward No. 9	Third Phase	Covered Drain
Primary	KD29	652.57	3	Pond	Ward No. 1	Third Phase	Covered Drain
Primary	KD46	1136.00	3	Poura Boundary	Ward No. 7	Third Phase	Covered Drain
Primary	KD46	1444.93	3	Poura Boundary	Ward No. 6	Third Phase	Covered Drain
Primary	KD46	214.95	3	Poura Boundary	Ward No. 4	Third Phase	Covered Drain
Primary	KD46	113.47	3	Poura Boundary	Ward No. 5	Third Phase	Covered Drain
Primary	KD66	186.56	3	Khal	Ward No. 7	Third Phase	Covered Drain
Primary	KD66	1228.66	3	Khal	Ward No. 2	Third Phase	Covered Drain
Primary	KD66	53.63	3	Khal	Ward No. 1	Third Phase	Covered Drain
Primary	KD82	543.22	3	Pond	Ward No. 1	Third Phase	Covered Drain
Primary	KD127	1159.70	3	KD25	Ward No. 7	Third Phase	Covered Drain
Primary	KD127	113.62	3	KD25	Ward No. 6	Third Phase	Covered Drain
Secondary	KD30	822.70	2	KD46	Ward No. 6	First Phase	Covered Drain
Secondary	KD30	354.34	2	KD46	Ward No. 5	First Phase	Covered Drain
Secondary	KD33	553.13	2	KD43	Ward No. 8	First Phase	Covered Drain
Secondary	KD33	454.00	2	KD43	Ward No. 9	First Phase	Covered Drain
Secondary	KD33	2.69	2	KD43	Ward No. 7	First Phase	Covered Drain
Secondary	KD33	1.13	2	KD43	Ward No. 2	First Phase	Covered Drain
Secondary	KD43	289.24	2	KD25	Ward No. 7	First Phase	Covered Drain
Secondary	KD43	318.27	2	KD25	Ward No. 2	First Phase	Covered Drain
Secondary	KD63	735.86	2	KD46	Ward No. 4	First Phase	Covered Drain
Secondary	KD70	116.28	2	KD66	Ward No. 2	First Phase	Covered Drain
Secondary	KD70	1246.47	2	KD66	Ward No. 3	First Phase	Covered Drain
Secondary	KD74	528.39	2	KD46	Ward No. 6	First Phase	Covered Drain
Secondary	KD74	626.48	2	KD46	Ward No. 5	First Phase	Covered Drain
Secondary	KD75	1354.65	2	Khal	Ward No. 4	First Phase	Covered Drain
Secondary	KD75	0.24	2	Khal	Ward No. 5	First Phase	Covered Drain
Secondary	KD75	813.44	2	Khal	Ward No. 3	First Phase	Covered Drain
Secondary	KD81	855.88	2	Khal	Ward No. 5	First	Covered

TYpe	Pro_ID	Length (m)	(Pro)Width (m)	Outfall	Ward_No	Phase	Remarks
						Phase	Drain
Secondary	KD86	27.40	2	Pond	Ward No. 9	First Phase	Covered Drain
Secondary	KD86	239.37	2	Pond	Ward No. 1	First Phase	Covered Drain
Secondary	KD102	592.77	2	KD86	Ward No. 1	First Phase	Covered Drain
Secondary	KD106	293.72	2	KD75	Ward No. 4	First Phase	Covered Drain
Secondary	KD106	741.96	2	KD75	Ward No. 3	First Phase	Covered Drain
Secondary	KD111	622.18	2	Pond	Ward No. 1	First Phase	Covered Drain
Secondary	KD111	467.86	2	Pond	Ward No. 3	First Phase	Covered Drain
Secondary	KD1	388.63	2	Pond	Ward No. 8	First Phase	Covered Drain
Secondary	KD1	296.44	2	Pond	Ward No. 7	First Phase	Covered Drain
Tertiary	KD3	508.64	1	Pond	Ward No. 8	Second Phase	Covered Drain
Tertiary	KD4	88.87	1	Pond	Ward No. 8	Second Phase	Covered Drain
Tertiary	KD5	45.22	1	KD6	Ward No. 8	Second Phase	Covered Drain
Tertiary	KD6	920.34	1	Pond	Ward No. 8	Second Phase	Covered Drain
Tertiary	KD7	456.48	1	KD1	Ward No. 8	Second Phase	Covered Drain
Tertiary	KD8	158.06	1	Pond	Ward No. 8	Second Phase	Covered Drain
Tertiary	KD9	215.62	1	KD3	Ward No. 8	Second Phase	Covered Drain
Tertiary	KD10	122.40	1	KD9	Ward No. 8	Second Phase	Covered Drain
Tertiary	KD10	3.97	1	KD9	Ward No. 7	Second Phase	Covered Drain
Tertiary	KD11	934.09	1	Pond	Ward No. 7	Second Phase	Covered Drain
Tertiary	KD12	451.66	1	KD7	Ward No. 8	Second Phase	Covered Drain
Tertiary	KD13	211.69	1	KD12	Ward No. 8	Second Phase	Covered Drain
Tertiary	KD14	145.38	1	Pond	Ward No. 7	Second Phase	Covered Drain
Tertiary	KD15	268.07	1	KD11	Ward No. 7	Second Phase	Covered Drain
Tertiary	KD16	350.16	1	KD23	Ward No. 7	Second Phase	Covered Drain
Tertiary	KD17	413.00	1	KD11	Ward No. 7	Second Phase	Covered Drain
Tertiary	KD18	115.69	1	KD16	Ward No. 7	Second Phase	Covered Drain
Tertiary	KD19	69.21	1	KD23	Ward No. 7	Second Phase	Covered Drain
Tertiary	KD20	165.55	1	KD16	Ward No. 7	Second Phase	Covered Drain
Tertiary	KD21	282.30	1	KD20	Ward No. 7	Second Phase	Covered Drain
Tertiary	KD22	142.64	1	KD17	Ward No. 7	Second Phase	Covered Drain
Tertiary	KD23	379.51	1	KD11	Ward No. 7	Second Phase	Covered Drain

TYpe	Pro_ID	Length (m)	(Pro)Width (m)	Outfall	Ward_No	Phase	Remarks
Tertiary	KD24	373.24	1	KD25	Ward No. 7	Second Phase	Covered Drain
Tertiary	KD26	272.99	1	KD25	Ward No. 8	Second Phase	Covered Drain
Tertiary	KD27	207.49	1	KD126	Ward No. 9	Second Phase	Covered Drain
Tertiary	KD28	293.43	1	Pond	Ward No. 9	Second Phase	Covered Drain
Tertiary	KD31	568.78	1	KD46	Ward No. 6	Second Phase	Covered Drain
Tertiary	KD34	185.20	1	KD36	Ward No. 9	Second Phase	Covered Drain
Tertiary	KD35	322.14	1	KD23	Ward No. 6	Second Phase	Covered Drain
Tertiary	KD36	318.14	1	KD25	Ward No. 9	Second Phase	Covered Drain
Tertiary	KD37	8.87	1	KD33	Ward No. 9	Second Phase	Covered Drain
Tertiary	KD37	381.79	1	KD33	Ward No. 2	Second Phase	Covered Drain
Tertiary	KD38	87.66	1	KD24	Ward No. 7	Second Phase	Covered Drain
Tertiary	KD39	252.01	1	KD40	Ward No. 9	Second Phase	Covered Drain
Tertiary	KD39	13.29	1	KD40	Ward No. 1	Second Phase	Covered Drain
Tertiary	KD40	489.64	1	KD27	Ward No. 9	Second Phase	Covered Drain
Tertiary	KD40	13.00	1	KD27	Ward No. 1	Second Phase	Covered Drain
Tertiary	KD41	178.19	1	KD44	Ward No. 2	Second Phase	Covered Drain
Tertiary	KD42	290.69	1	Pond	Ward No. 9	Second Phase	Covered Drain
Tertiary	KD44	8.39	1	KD33	Ward No. 9	Second Phase	Covered Drain
Tertiary	KD44	216.56	1	KD33	Ward No. 2	Second Phase	Covered Drain
Tertiary	KD45	178.06	1	Pond	Ward No. 2	Second Phase	Covered Drain
Tertiary	KD47	141.25	1	Pond	Ward No. 7	Second Phase	Covered Drain
Tertiary	KD48	97.87	1	KD29	Ward No. 9	Second Phase	Covered Drain
Tertiary	KD48	442.50	1	KD29	Ward No. 1	Second Phase	Covered Drain
Tertiary	KD49	84.25	1	KD29	Ward No. 9	Second Phase	Covered Drain
Tertiary	KD50	479.19	1	KD25	Ward No. 7	Second Phase	Covered Drain
Tertiary	KD51	169.75	1	KD32	Ward No. 6	Second Phase	Covered Drain
Tertiary	KD51	11.97	1	KD32	Ward No. 5	Second Phase	Covered Drain
Tertiary	KD52	373.53	1	Pond	Ward No. 9	Second Phase	Covered Drain
Tertiary	KD52	21.30	1	Pond	Ward No. 9	Second Phase	Covered Drain
Tertiary	KD52	21.30	1	Pond	Ward No. 1	Second Phase	Covered Drain
Tertiary	KD52	46.54	1	Pond	Ward No. 1	Second Phase	Covered Drain
Tertiary	KD53	139.53	1	Pond	Ward No. 2	Second	Covered

TYpe	Pro_ID	Length (m)	(Pro)Width (m)	Outfall	Ward_No	Phase	Remarks
						Phase	Drain
Tertiary	KD54	469.20	1	Pond	Ward No. 2	Second Phase	Covered Drain
Tertiary	KD55	146.41	1	Khal	Ward No. 2	Second Phase	Covered Drain
Tertiary	KD56	149.13	1	KD45	Ward No. 2	Second Phase	Covered Drain
Tertiary	KD57	315.76	1	Khal	Ward No. 2	Second Phase	Covered Drain
Tertiary	KD58	221.41	1	Pond	Ward No. 2	Second Phase	Covered Drain
Tertiary	KD59	373.05	1	Pond	Ward No. 2	Second Phase	Covered Drain
Tertiary	KD60	3.09	1	KD33	Ward No. 8	Second Phase	Covered Drain
Tertiary	KD60	554.36	1	KD33	Ward No. 2	Second Phase	Covered Drain
Tertiary	KD61	414.86	1	KD48	Ward No. 1	Second Phase	Covered Drain
Tertiary	KD62	395.15	1	KD48	Ward No. 1	Second Phase	Covered Drain
Tertiary	KD64	91.96	1	KD58	Ward No. 2	Second Phase	Covered Drain
Tertiary	KD65	170.02	1	Pond	Ward No. 2	Second Phase	Covered Drain
Tertiary	KD67	101.50	1	KD63	Ward No. 4	Second Phase	Covered Drain
Tertiary	KD67	207.09	1	KD63	Ward No. 5	Second Phase	Covered Drain
Tertiary	KD68	247.51	1	KD63	Ward No. 1	Second Phase	Covered Drain
Tertiary	KD69	206.81	1	KD68	Ward No. 1	Second Phase	Covered Drain
Tertiary	KD71	305.47	1	KD66	Ward No. 2	Second Phase	Covered Drain
Tertiary	KD71	3.97	1	KD66	Ward No. 3	Second Phase	Covered Drain
Tertiary	KD72	317.40	1	Pond	Ward No. 5	Second Phase	Covered Drain
Tertiary	KD73	60.27	1	KD46	Ward No. 7	Second Phase	Covered Drain
Tertiary	KD73	1273.18	1	KD46	Ward No. 5	Second Phase	Covered Drain
Tertiary	KD77	152.42	1	KD76	Ward No. 1	Second Phase	Covered Drain
Tertiary	KD78	251.54	1	KD73	Ward No. 5	Second Phase	Covered Drain
Tertiary	KD79	76.28	1	KD75	Ward No. 4	Second Phase	Covered Drain
Tertiary	KD80	310.93	1	KD75	Ward No. 3	Second Phase	Covered Drain
Tertiary	KD83	502.13	1	KD106	Ward No. 4	Second Phase	Covered Drain
Tertiary	KD84	144.93	1	Pond	Ward No. 4	Second Phase	Covered Drain
Tertiary	KD85	163.75	1	KD73	Ward No. 5	Second Phase	Covered Drain
Tertiary	KD87	377.14	1	KD80	Ward No. 1	Second Phase	Covered Drain
Tertiary	KD87	232.42	1	KD80	Ward No. 3	Second Phase	Covered Drain
Tertiary	KD88	232.61	1	KD75	Ward No. 4	Second Phase	Covered Drain

TYpe	Pro_ID	Length (m)	(Pro)Width (m)	Outfall	Ward_No	Phase	Remarks
Tertiary	KD89	73.09	1	KD81	Ward No. 4	Second Phase	Covered Drain
Tertiary	KD89	413.22	1	KD81	Ward No. 5	Second Phase	Covered Drain
Tertiary	KD90	70.04	1	KD81	Ward No. 4	Second Phase	Covered Drain
Tertiary	KD90	325.99	1	KD81	Ward No. 5	Second Phase	Covered Drain
Tertiary	KD91	581.26	1	KD82	Ward No. 1	Second Phase	Covered Drain
Tertiary	KD92	672.86	1	KD75	Ward No. 3	Second Phase	Covered Drain
Tertiary	KD93	391.70	1	Pond	Ward No. 4	Second Phase	Covered Drain
Tertiary	KD94	161.39	1	KD88	Ward No. 4	Second Phase	Covered Drain
Tertiary	KD95	203.19	1	KD90	Ward No. 5	Second Phase	Covered Drain
Tertiary	KD96	345.49	1	KD96	Ward No. 1	Second Phase	Covered Drain
Tertiary	KD97	490.18	1	KD91	Ward No. 1	Second Phase	Covered Drain
Tertiary	KD98	208.03	1	Pond	Ward No. 4	Second Phase	Covered Drain
Tertiary	KD99	379.34	1	KD82	Ward No. 1	Second Phase	Covered Drain
Tertiary	KD100	854.90	1	KD97	Ward No. 1	Second Phase	Covered Drain
Tertiary	KD101	235.45	1	Pond	Ward No. 4	Second Phase	Covered Drain
Tertiary	KD103	712.74	1	KD93	Ward No. 4	Second Phase	Covered Drain
Tertiary	KD103	44.02	1	KD93	Ward No. 3	Second Phase	Covered Drain
Tertiary	KD104	156.41	1	KD100	Ward No. 1	Second Phase	Covered Drain
Tertiary	KD107	177.93	1	KD100	Ward No. 1	Second Phase	Covered Drain
Tertiary	KD108	237.53	1	KD100	Ward No. 1	Second Phase	Covered Drain
Tertiary	KD109	410.29	1	Pond	Ward No. 1	Second Phase	Covered Drain
Tertiary	KD110	712.17	1	Pond	Ward No. 3	Second Phase	Covered Drain
Tertiary	KD112	177.05	1	KD115	Ward No. 3	Second Phase	Covered Drain
Tertiary	KD113	152.90	1	Pond	Ward No. 3	Second Phase	Covered Drain
Tertiary	KD114	508.60	1	KD70	Ward No. 3	Second Phase	Covered Drain
Tertiary	KD115	285.27	1	Pond	Ward No. 3	Second Phase	Covered Drain
Tertiary	KD116	258.86	1	KD110	Ward No. 3	Second Phase	Covered Drain
Tertiary	KD117	283.90	1	KD116	Ward No. 3	Second Phase	Covered Drain
Tertiary	KD118	181.74	1	KD114	Ward No. 3	Second Phase	Covered Drain
Tertiary	KD119	208.33	1	KD110	Ward No. 3	Second Phase	Covered Drain
Tertiary	KD120	231.71	1	Pond	Ward No. 3	Second Phase	Covered Drain
Tertiary	KD121	241.46	1	KD110	Ward No. 3	Second	Covered

TYpe	Pro_ID	Length (m)	(Pro)Width (m)	Outfall	Ward_No	Phase	Remarks
						Phase	Drain
Tertiary	KD122	445.50	1	Pond	Ward No. 8	Second Phase	Covered Drain
Tertiary	KD122	3.12	1	Pond	Ward No. 7	Second Phase	Covered Drain
Tertiary	KD123	93.02	1	KD32	Ward No. 6	Second Phase	Covered Drain
Tertiary	KD124	248.22	1	KD25	Ward No. 8	Second Phase	Covered Drain
Tertiary	KD125	2.58	1	KD127	Ward No. 7	Second Phase	Covered Drain
Tertiary	KD126	201.21	1	KD25	Ward No. 9	Second Phase	Covered Drain
Tertiary	KD2	72.70	1	Pond	Ward No. 8	Second Phase	Covered Drain
Tertiary	KD2	361.43	1	Pond	Ward No. 7	Second Phase	Covered Drain
Tertiary	KD32	292.82	1	Pond	Ward No. 6	Second Phase	Covered Drain
Tertiary	KD32	372.30	1	KD46	Ward No. 6	Second Phase	Covered Drain
Tertiary	KD76	0.30	1	Pond	Ward No. 1	Second Phase	Covered Drain
Tertiary	KD76	351.98	1	Pond	Ward No. 1	Second Phase	Covered Drain

Annexure-D: Schedule of Land Use Planning Proposal

Planning Schedule of Water Body of Kalai Paurashava

Landuse Type	Mouza	Plot No.	Area
Waterbody	Aura 56_01	8,9,11,30,31,32,33,34,35,36,200,208,250,251,252,253,254,255,256,257,258,259,260,261,262,265,266,267,269,270,271,272,284,285,286,287,293,294,381,384,390,391,394,395,396,397,398,400,401,402,487,511,512,698,699,700,726,727,728,762,763,764,766,830,831,832,837,839,840,851,852,853,854,855,856,873,874,876,877,878,894,897,898,899,900,904,910,923,924,925,926,927,937,938,940,941,950,951,952,953,955,961,962,963,964,965,966,967,973,976,977,1003,1036,1037,1038,1039,1043,1045,1046,1047,1048,1052,1054,1055,1059,1071,1072,1073,1074,1076,1082,1083,1084,1085,1094,1095,1096,1122,1123,1124,1125,1126,1127,1128,1129,1130,1131,1132,1133,1134,1135,1141,1142,1143,1159,1235,1354,1355,1356,1357,1358,1360,1362,1363,1368,1369,1370,1371,1372,1513,1525,1529,1530,1531,1532,1533,1535,1586,1632,1633,1634,1635,1636,1639,1640,1676,1677,1678,1679,1680,1681,1695,1698,1699,1704,1705,1706,1707,1708,1709,1710,1711,1712,1713,1720,1731,1741,1753,1754,1765,1772,9999,	17.43
	Aura 56_02	2292,2293,2294,2295,2298,2303,2304,2306,2307,2312,2322,2367,2368,2374,2375,2376,2377,2378,2379,2384,2497,2498,2499	1.34
	Dahra 110_00	1,3,4,5,6,7,8,11,12,13,15,16,43,49,61,62,63,65,79,80,89,130,132,133,134,135,138,142,143,145,146,168,181,215,216,217,244,245,246,254,255,256,295	4.88
	Duronjo 55_00	29,30,31,32,43,49,53,54,90,97,98,99,100,101,102,109,126,150,156,157,158,177,178,266,	2.26
	Hatior 54_02	1118,1129,1130,1131,1133,1139,1153,1154,1155,1156,1157,1158,1159,1174,1177,1178,1192,1193,1194,1195,1197,1205,1207,1209,1217,1218,1219,1220,1221,1222,1223,1239,1240,1242,1255,1257,1258,1264,1265,1266,1267,1268,1269,1288,1289,1290,1291,1292,1293,1294,1296,1298,1314,1315,1316,1332,1333,1335,1336,1365,1368,1369,1374,1375,1404,1416,1417,1425,1426,1427,	17.59
	Kalai 111_01	0,49,50,53,54,55,87,88,89,90,91,92,94,97,100,111,112,113,114,115,116,146,163,170,171,172,173,185,186,192,193,194,195,206,217,219,221,223,225,254,255,256,260,261,262,263,267,283,285,286,287,318,319,344,346,363,364,365,366,466,467,471,486,514,559,562,577,578,580,581,582,616,1158,9999,	13.154
	Kalai 111_02	711,721,722,727,728,731,732,733,735,741,743,744,745,750,756,758,759,760,761,762,763,764,765,766,770,773,774,825,886,887,888,889,890,891,898,900,901,902,915,916,917,921,926,952,953,967,968,970,971,972,973,974,975,976,977,979,996,998,1017,1019,1020,1021,1022,1028,1030,1034,1037,1038,1039,1041,1042,1044,1047,1048,1059,1074,1079,1080,1081,1093,1094,1095,1101,1102,1113,1114,1127,1128,1129,1130,1134,1136,1137,1138,1139,1146,1150,1153,1154,1155,1157,1159,1161,1162,1163,1164,1165,1166,1167,1169,1170,1171,1172,1173,1174,1175,1179,1180,1242,1243,1244,1253,1254,1257,1260,1261,1263,1265,1270,1271,1272,1284,1286,1287,1295,1296,1299,1300,1304,1307,1310,1317,1318,1319,1320,1321,1322,1323,1324,1325,1329,1330,1331,1341,1345,1354,1355,1374,1377,1385,1386,1387,1388,1389,1394,1395,1396,1398,1399,1401,1402,1403,1404,1405,1414,1416,1485,1546,1548,1549,1569,1570,1571,1587,1592,1605,1607,1611,1614,1615,1618,1619,1620,1622,1629,1630,1632,1633,1634,1637,1638,1640,1654,1669,167	27.307

Landuse Type	Mouza	Plot No.	Area
		4,1675,1679,1690,1700,1704,1705,1706,1707,1725,2203,2204,2208,9999,	
	kathail 112_00	33,53,58,59,60,61,62,63,64,73,74,77,78,79,80,81,82,83,110,111,112,113,114,115,116,117,118,119,136,149,150,151,152,153,154,155,156,157,158,159,160,161,162,163,166,201,207,208,219,230,231,232,235,236,357,360,365,	4.881
	Mulgram 109_00	11,19,20,41,51,52,53,60,61,62,63,64,66,67,68,69,70,109,110,111,112,113,115,116,117,118,119,120,121,122,126,132,135,136,137,138,139,140,141,164,316,317,318,319,321,342,343,344,345,346,347,348,359,360,361,362,363,364,365,366,377,504,513,514,515,516,521,522,523,524,534,535,536,537,547,548,549,550,551,552,553,554,555,556,605,606,607,608,610,611,646,647,649,650,651,654,659,660,663,665,772,773,782,811,815,816,817,955,	10.04
	Purbo Sarail 108_00	28,80,82,83,84,100,112,113,114,115,158,160,161,162,163,168,170,174,175,177,180,181,187,188,194,235,241,243,244,245,246,265,266,267,285,286,394,395,396,404,405,406,417,418,419,420,421,422,423,424,426,442,470,484,485,486,487,502,503,504,505,510,723,	5.185
	Thupsara 50_01	350,351,352,391,405,408,409,410,411,413,414,415,428,429,431,437,438,443,480,481,486,500,501,502,503,504,505,506,528,529,546,547,550,551,552,553,574,575,577,578,579,580,581,582,583,587,588,589,590,596,597,598,600,601,602,603,609,616,617,618,619,624,625,626,629,630,648,871,872,884,885,886,887,888,895,897,898,899,906,908,1013,1014,1032,1033,1034,1035,1055,1056,1057,1058,1059,1066,1069,1076,1077,1078,1086,1090,1116,1117,1119,1120,1121,1126,1130,1131,1132,1133,1135,1148,1149,1156,1157,1158,1159,1160,1161,1162,1163,1164,1165,1166,1167,1168,1169,1170,1175,1176,1177,1221,1222,	12.897

Planning Schedule of Development Proposals of Kalai Paurashava

Type of Facilities	Ward No.	Mouza Name	Plot No.	Area in Acre
Housing Area	1,9	Kalai 111_02	702-737, 769-822,825,830,832	38.88

Type of Facilities	Ward No.	Mouza Name	Plot No.	Area in Acre
General Industrial Area	7	Mulgram (109_00)	905-921, 866-868, 932,933	19.58
		Dahra (110_00)	278,280,287-292	

Type of Facilities	Ward No.	Mouza Name	Plot No.	Area in Acre
Neighborhood market	7	Kalai 111_02	654,664,772	1.34
	3	Kalai 111_01	320, 329-333	1.18
	9	Kalai 111_02	756, 766, 769, 825	0.31
	2	Kalai 111_01, Kalai 111_01	516, 1182, 1190-1192, 1194	1.08
	4, 5	Aura 56_01	1044, 1362, 1167-1369, 1372	0.33
	6	Purbo Sarail 108_00	472, 478-480	0.44
	5	Aura_56_01	1229, 1232, 1217,9999	0.06
Cattle Market	1	Thupsara (50_01)	1176-1179, 1206, 1213-1218	2
Slaughter House	7	Dahra 110_00	122,123,124,134	1.6

Type of Facilities	Ward No.	Mouza Name	Plot No.	Area in Acre
Super Market	1	Kalai 111_01	100,265-267	2.5

Type of Facilities	Ward No.	Plot No.	Mouza Name	Area in Acre
Ward Center	1	87, 112, 115-117	Kalai 111_01	0.62
	2	547,548,570,572,575	Kalai 111_01	1.07
	3	12-18, 23, 24	Duronjo 55_00	0.77
	4	1044, 1371-1376	Aura 56_01	0.27
	5	1346, 1587-1595, 1600	Aura 56_01	0.71
	6	463, 467, 468, 472, 484	Purbo Sarail 108_00	0.18
	7	77, 153-157, 516-520, 530, 531, 936	Dahra 110_00, Mulgram 109_00	0.91
	8	1706, 1707, 126, 138, 139, 49, 50, 126, 128, 129	Kalai 111_02, kathail 112_00, Mulgram 109_00	0.42
	9	903, 905-909, 915	Kalai 111_02	0.47

Type of Facilities	Ward No.	Mouza Name	Plot No.	Area in Acre
Primary School	8	Mulgram 109_00	50, 51, 126-128	1.81
	1	Kalai 111_01	117, 118	0.88
	3	Duronjo 55_00	3, 5, 7, 8, 13, 16-18	0.89
	4	Aura 56_01	864-867, 869-876, 878-880, 884-887	1.08
Secondary School	7	Mulgram 109_00	505-513, 516, 519-530, 960	1.94
	6	Purbo Sarail 108_00	202, 242, 245	0.6

Type of Facilities	Ward No.	Mouza Name	Plot No.	Area in Acre
Playground	6	Purbo Sarail 108_00	159, 245, 249, 456	0.44
	5	Aura 56_01	1094, 1371, 1376, 1581-1586, 1593-1596	0.47
	7	Mulgram 109_00	602-604, 612-620, 654, 782	0.64
	3	Duronjo 55_00, Hatior 54_02	51-56, 1257, 1269	1.24
	9	Kalai 111_02	902, 910, 911, 914-916	0.72
Stadium	1	Thupsara 50_01	390-392,408-416,419,427,428	6.22
Central Park	3	Kalai 111_01	392-394	7.99
		Hatior 54_02	1344-1348,1351-1353,1363-1366,1374-1376,1379-1382	
Neighborhood Park	2	Kalai 111_02	1112-1115,1121,1124,1126,1128,1285-1287,1291,1293,1308,1309	2.0
	4	Aura 56_01	728, 768-769, 771-778, 780, 782-785, 813	1.22
	8	Dahra 110_00	8, 9, 14, 15, 22, 25-27	1.96
	6	Purbo Sarail 108_00	463, 467, 468, 472, 479, 484	0.52

Type of Facilities	Ward No.	Mouza Name	Plot No.	Area in Acre
Bus Terminal	1	Kalai 111_01	100, 264, 265	0.75
Tempu Stand	1	Thupsara 50_01	1337, 1338, 1345	0.06
	2	Kalai 111_01	471, 511, 512, 514, 515	0.24
	2	Kalai 111_01	216, 217	0.07
	8	Kalai 111_02	1694, 1695, 1697, 1698, 1700	0.17
	4	Aura 56_01	1044	0.11
	3	Duronjo 55_00	14, 22, 23	0.08
	1	Kalai 111_02	952, 953, 967	0.03
Truck Terminal	6	Purbo Sarail 108_00	62-65,528,536-540	2.42

Type of Facilities	Ward No.	Mouza Name	Plot No.	Area in Acre
Waste Transfer Station	3	Hatior 54_02	1403, 1404, 1408	0.57
	2	Kalai 111_01	300-309	0.33
	2	Kalai 111_01, Kalai 111_01	215, 217, 214, 1044, 1045	0.29
	8	Kalai 111_02	1683, 1694	0.36
	5	Aura 56_01	1346, 1348	0.13
Waste Dumping Ground	6	Purbo Sarail 108_00	492-497, 577, 578, 627, 628	2.08

Type of Facilities	Ward No.	Mouza Name	Plot No.	Area in Acre
Community Clinic	3	Kalai 111_01	312, 313, 320, 330	0.66
	5	Aura 56_01	1073, 1088, 1091-1095	0.36
	3	Duronjo 55_00, Hatior 54_02	2, 3, 8-14, 1281, 1315	1.81
Hospital	2	Kalai 111_01	528, 547, 572, 574-577	1.43
	8	Dahra 110_00	26,27,29-31	2.8

Type of Facilities	Ward No.	Mouza Name	Plot No.	Area in Acre
Community Center	2	Kalai 111_01, Kalai 111_02	515, 516, 1189, 1190	0.58
Eidgah	8	Dahra 110_00	28-30, 47	2.23
Graveyard	8	Dahra 110_00	48,50,51	1.32
Temple	4	Aura 56_01	702, 707, 710, 711, 714	0.38
Crematory	4	Aura 56_01	641, 715-717, 705, 708, 709	0.82

Annexure-E: Resolution of Final Consultantion Meeting and Attendence list

Annexure-F: Paurashava Gazette

Appendix

Appendix-1: Structure Plan of Kalai Paurashava

Appendix-2: Land Use Plan of Kalai Paurashava

Appendix-3: Transportation and Traffic Management Plan

Appendix-4: Drainageand and Environment Management Plan