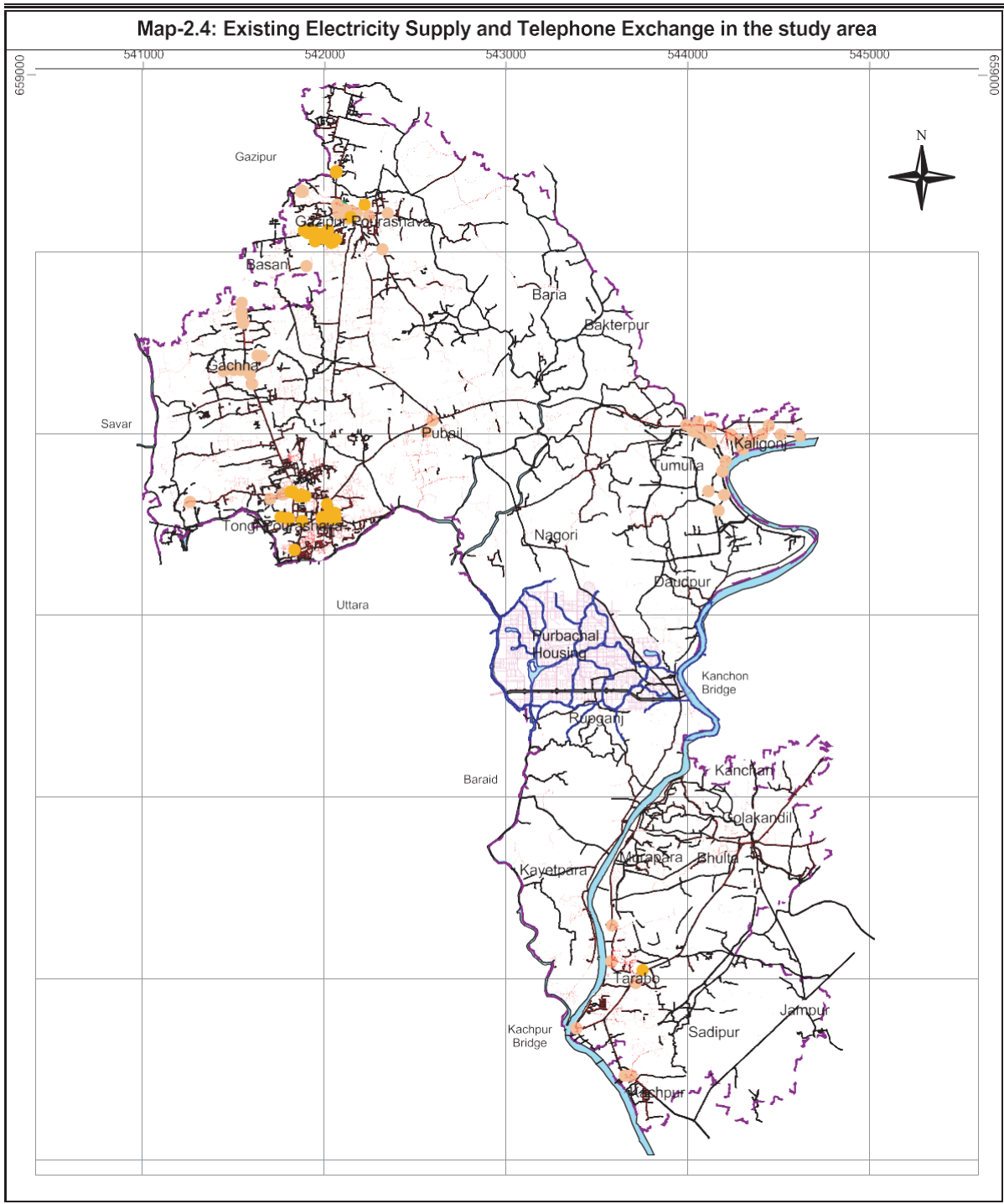
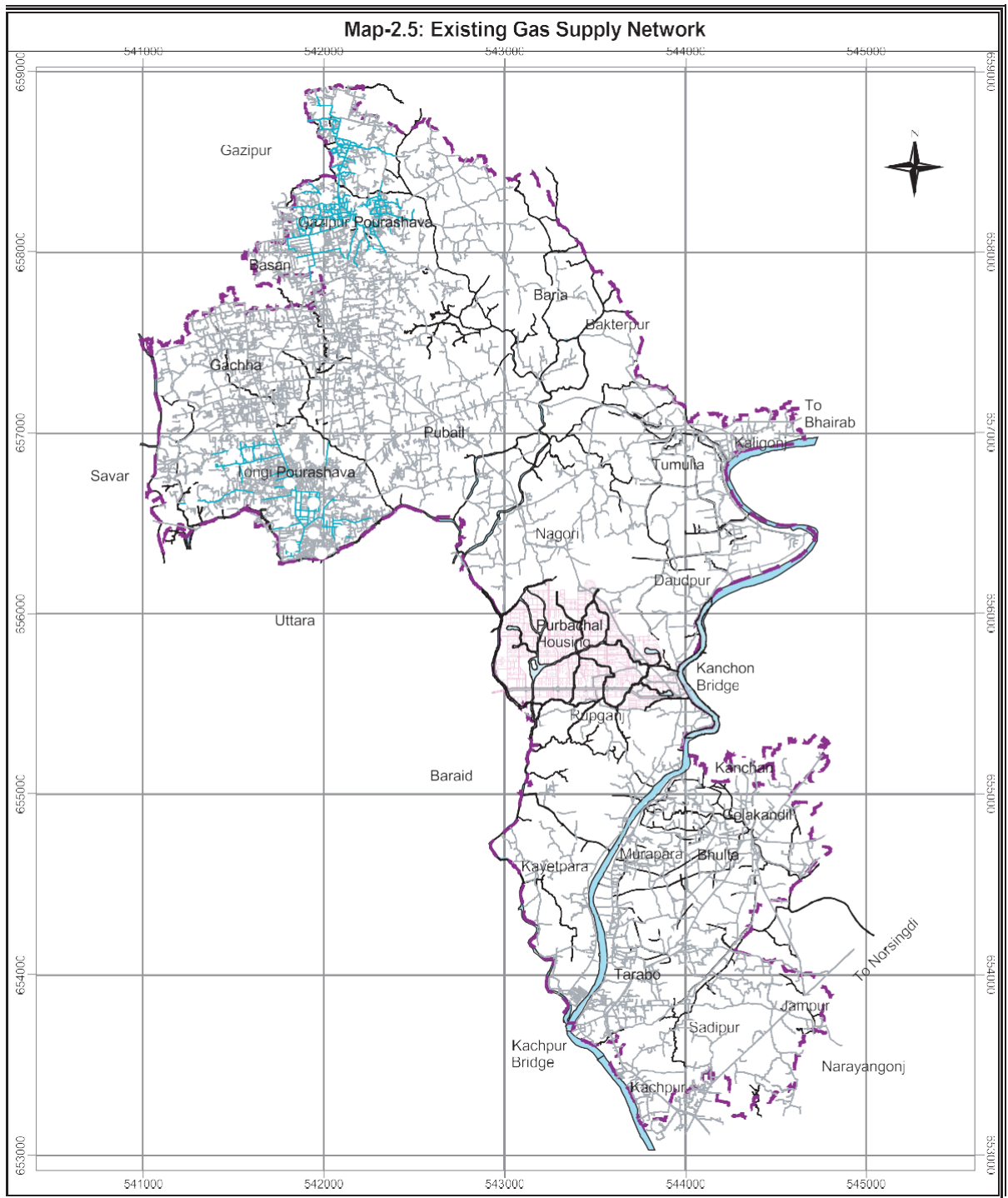


Map-2.4: Existing Electricity Supply and Telephone Exchange in the study area



<p>CONSULTANT Development Design Consultants Ltd 17 Mirshakpur, Dhaka 1212, Bangladesh Divine Associates Limited House No. 8, Road No. 11 (New), Diamond Square 1206, Comilla</p> <p>INDEX MAP DMDP AREA</p> <p>Study area</p>	<p>Detailed Area Plan for DMDP Area, Group-A</p> <p>3 0 3 6 Kilometers</p> <p>LEGEND</p> <ul style="list-style-type: none"> Project Boundary Existing Road River/Khal Purbachal Road Electric Pole Power Supply House Power Station Telephone Box Telephone Pole Mobile Tower Tower_High_Volt Tower_Tele 	<p>CLIENT Government of the People's Republic of Bangladesh Ministry of Housing and Public Works Rajdhani Unnayan Kartripakkha (RAJUK)</p> <p>NOTES Data Source GPS & Total Station based advanced topographic physical feature and landuse survey conducted by Development Design Consultants Ltd.</p> <p>Reference Bench Mark (BM) * SGB (ICAI)-3407 and SGB (ICAI)-3469 for Latitude /Northing & Longitude/Easting * SGB-542 and SGB-6039 for Reduce Level (RL) adjustment</p> <p>Projection Parameters</p> <table border="0"> <tr><td>Projection System</td><td>: Bangladesh Transverse Mercator (BTM)</td></tr> <tr><td>Spheroid</td><td>: Everest 1830</td></tr> <tr><td>Scale Factor</td><td>: 0.9996</td></tr> <tr><td>Central Meridian</td><td>: 90 degree East</td></tr> <tr><td>False Easting</td><td>: 500,000 Meter</td></tr> <tr><td>False Northing</td><td>: -2000,000 Meter</td></tr> <tr><td>Latitude of Origin</td><td>: 0 degree (Equator)</td></tr> <tr><td>Seven-parameters for User Defined Datum</td><td>: 283.729, 735.942, 261.143, 0.0, 0.0, 0.0, 1.0</td></tr> </table>	Projection System	: Bangladesh Transverse Mercator (BTM)	Spheroid	: Everest 1830	Scale Factor	: 0.9996	Central Meridian	: 90 degree East	False Easting	: 500,000 Meter	False Northing	: -2000,000 Meter	Latitude of Origin	: 0 degree (Equator)	Seven-parameters for User Defined Datum	: 283.729, 735.942, 261.143, 0.0, 0.0, 0.0, 1.0
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Seven-parameters for User Defined Datum	: 283.729, 735.942, 261.143, 0.0, 0.0, 0.0, 1.0																	

Source : Physical Feature Survey 2007



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 Development Design Consultants Ltd.
 47 Monashini C/A, Dhaka 1312, Bangladesh
 Divine Associates Limited

INDEX MAP
 DMDP AREA

Study area

Detailed Area Plan for DMDP Area, Group-A

3 0 3 6 Kilometers

LEGEND

- Project Boundary
- Existing Gas Supply Network
- Existing Road
- River/Khal
- Purbachal Road

CLIENT
 Government of the People's Republic of Bangladesh
 Ministry of Housing and Public Works
 Rajdhani Unnayan Karttripakkha (RAJUK)

NOTES
Data Source
 GPS & Total Station based advanced topographic physical feature and land use survey conducted by Development Design Consultants Ltd.

Reference Bench Mark (BM)
 * BM: RAJUK-001 and 002 (IICA-USAID) for Latitude Northing & Longitude Easting
 * SOB-542 and SOB-6005 for Reduced Level (RL) adjustment

Projection Parameters

Projection System	Bangladesh Transverse Mercator (d/M)
Spheroid	Everest 1830
Scale Factor	0.9996
Central Meridian	90 degree East
False Easting	500,000 Meter
False Northing	-2000,000 Meter
Latitude of Origin	0 degree (Equator)
Seven parameters for User Defined Datum	283.729, 735.542, 261.143, 0.0, 0.0, 0.0, 1.0

Source: Physical Feature Survey 2007

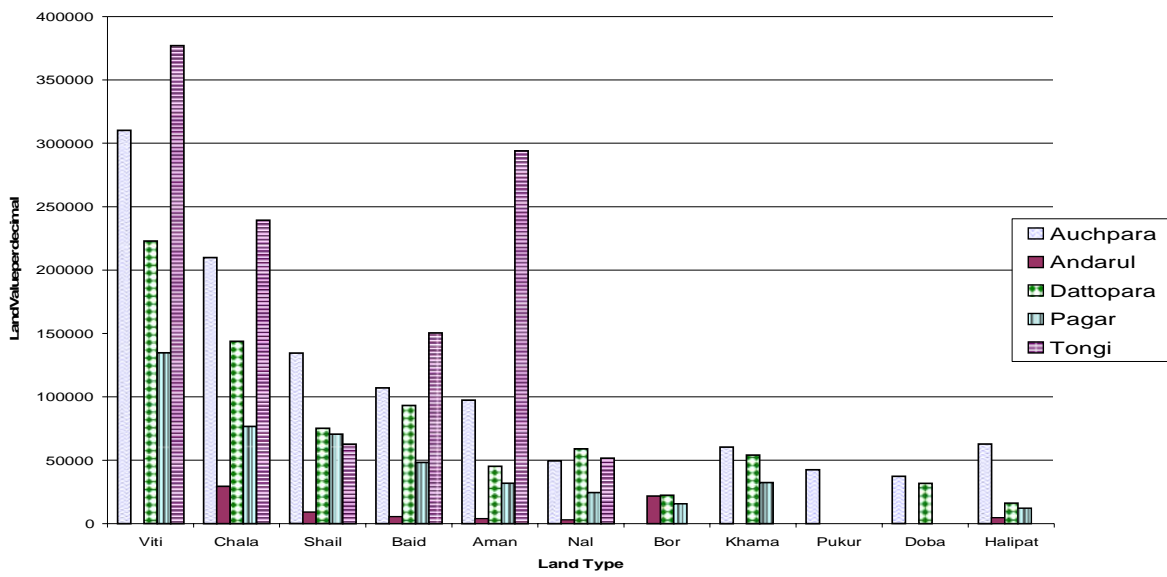


Fig 2.3: Average Land Value in Tongi, 2007

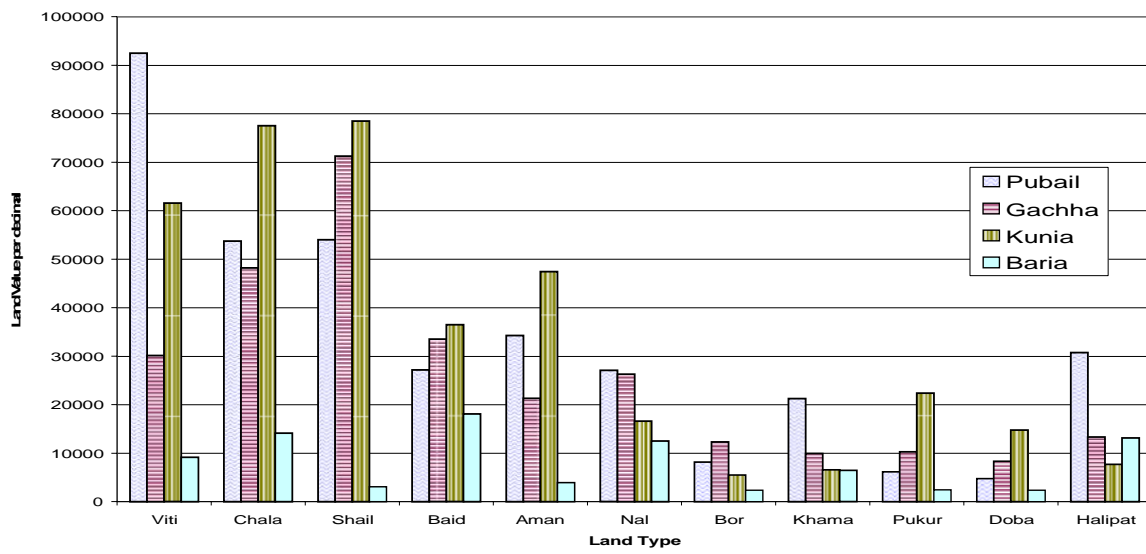


Fig 2.4: Average Land Value in Tongi-Gazipur Fringe, 2007

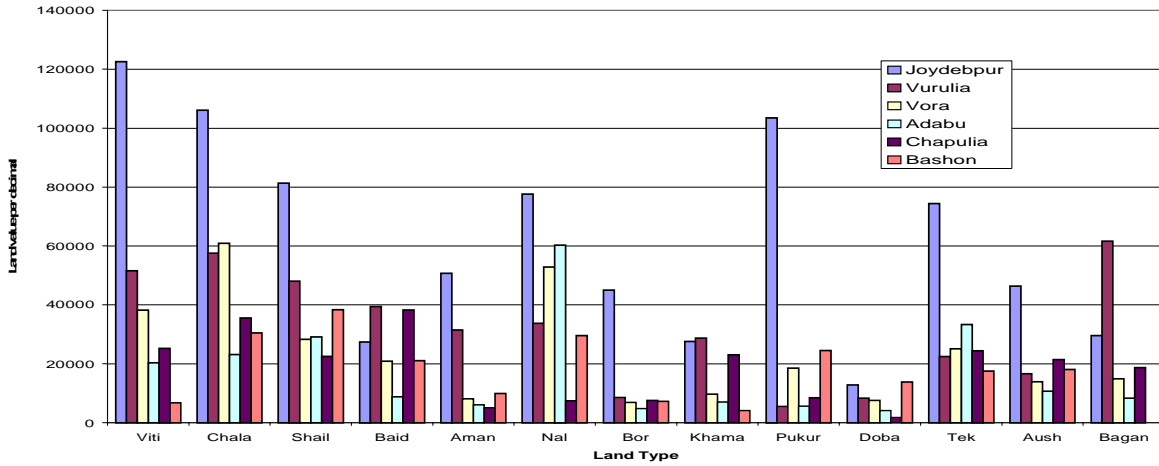


Fig 2.5: Average Land Value in Gazipur, 2007

In RAJUK east, land value of *viti* type land in Kanchpur mouza is identified as the highest. Land value of Daudpara, Murapara, Tumulia and Nagori is almost similar for *viti* type land. The value of *Viti*, *chala* and *shail* type land in Kanchpur mouza is more than BDT one lac whereas in other mouza identified in the RAJUK east it is of BDT one lac for any type of land. Like other mouzas in the Study Area land value for *doba*, *bor*, *khama* and *pukur* type lands are of lowest value in RAJUK east.

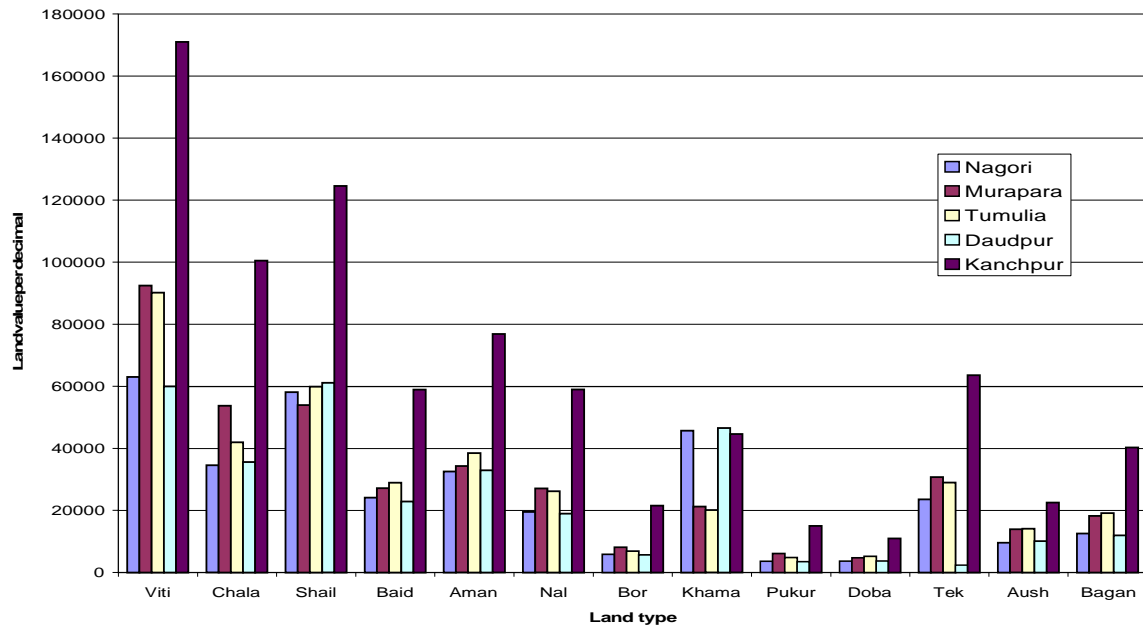


Fig 2.6: Average Land Value in Rupgonj, 2007

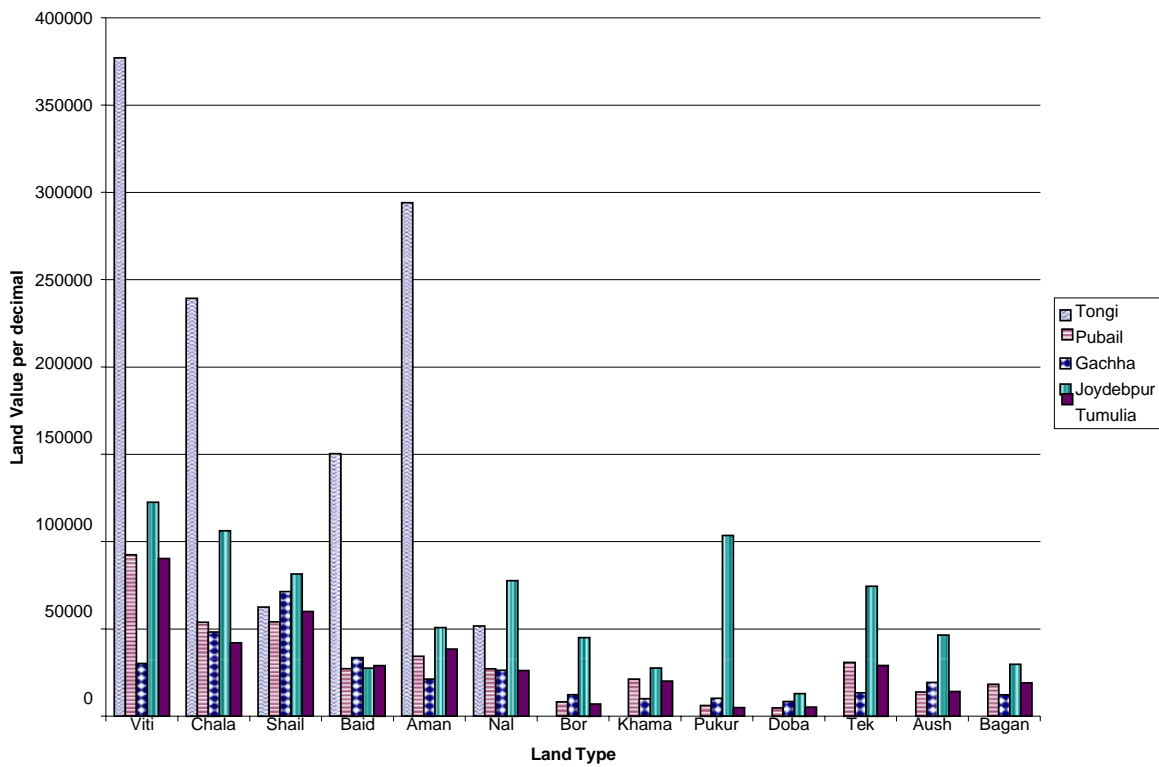


Fig 2.7: Average Land Value in the Study Area (Group-A), 2007.

2.2 Expected Development

In order to prepare Detailed Area Plan, different stakeholders, public agencies, local communities, private developers, NGOs, elite groups and pressure groups were consulted. For the preparation and implementation of the plan, their role is considered as vital. It was also necessary to collect basic information on existing situation of the study area. At the same time, positive suggestion was collected from them. Future and on-going projects of public agencies were reviewed and incorporated in the plan. The whole process of consultation was participatory, transparent and involved all the stakeholders. In each consultation, local people highlighted their problems and made some suggestions. There were some gaps found between political leaders and Government officials' about projects and their appraisals. Several groups stressed on the importance of dissemination of information as a condition for participation. People need effective access to information from the Government before any participation is sought from them.

Expected development is highlighted based on the projected population. The projected population up to the year 2015 has been considered for those purposes. The growth scenario further describes the growth of physical components. Existing government establishment considered as a permanent establishment and proposed for further expansion where necessary.

Table-2.17: Average land value of the Study Area, 2007

SP Z	Area	Mouza	Type wise Land Value (BD Taka/Decimal)													
			Viti	Chala	Shail	Baid	Am an	Nal	Bo r	Kha ma	Puk ur	Do ba	Tek	Hali pat	Au sh	Baga n
14	Tongi	Auchpara	31013	209775	134416	107059	97324	49417		60424	42424	37309		62765		
		Andar ul		29412	9160	5556	3913	3030	21667					4583		
		Dattop ara	222889	143783	75094	93180	45130	58968	22428	54056		31687		16245		
		Pagar	134659	76625	70642	48177	31727	24440	15685	32209				12182		
		Tongi	377030	239320	62556	150376	294118	51625								
14.5	Tongi-Gazipur Fringe	Pubail	92482	53763	53999	27185	34285	27083	8145	21286	6139	4765	30731		13904	18258
		Gachha	30137	48191	71264	33519	21324	26298	12336	9926	10275	8347	13322		19375	12121
		Kunia	61538	77541	78498	36496	47414	16633	5479	65713	22413	14775	7714			
		Baria	9156	14145	3061	18105	3958	12500	2344	6441	2459	2363	13157		4285	9156
15	Gazipur	Joydebpur	122555	106114	81306	27438	50757	77625	45045	27586	103472	12844	74414		46398	29637
		Vurulia	51614	57559	48080	39429	31500	33755	8584	28724	5524	8352	22500		16614	61650
		Vora	38223	60887	28306	20929	8158	52861	6886	97094	18494	7575	25105		13912	14934
		Adabu	20366	23161	29098	8796	6061	60303	4812	7031	5644	4114	33333		10714	8357
		Chapul ia	25263	35597	22537	38310	5119	7432	7575	23040	8418	1817	24419		21429	18763
		Bashon	6766	30463	38367	21069	9941	29627	7306	4072	24493	13864	17553		18049	
19	RAJUK East (Kaliganj, Rupganj, Sonargoan/Baidyer Bazar)	Nagori	62989	34589	58125	24189	32568	19589	5897	45698	3598	3698	23569		9569	12598
		Murap ara	92482	53763	53999	27185	34285	27083	8145	21286	6139	4765	30731		13904	18258
		Jampur	82982	43963	61099	30185	36275	28013	7945	18986	5998	4625	28798		12987	17895
		Tumuli a	90182	41969	59899	28957	38459	26189	6897	20098	4879	5200	29012		14120	19121
		Daudpur	59987	35596	61128	22897	33012	18987	5689	46589	3499	3709	2410		10126	11989
		Bhulta	180987	96987	125987	60259	79059	60459	19852	46259	15698	11098	65897		24589	36987
		Kanchpur	170979	100527	124569	58972	76897	58987	21589	44589	14988	10987	63598		22598	40259
		Tarabo	198659	121544	99566	52698	74589	62598	22589	47598	14277	10255	66822		22146	39892

Source: Tongi and Gazipur Sub-Registry Office 2007.

2.2.1 Population

Urban Area Plan demographic projections indicate that the areas which constitute the Group-A area will have an increase of 1279211 people in the year 2010. Table-2.19 shows the population projections of Urban Area Plan period. The projection has been made on the basis of Strategic Planning Zone division of the RAJUK area.

Table-2.18: Total population (at a glance) in the project area

SPZ No.	Pourashava / Thana	Population		
		2001	2010	2015
14	Tongi Pourashava	273281	378525	456921
14.5	Tongi-Gazipur Fringe (Pubail,Gacha)	119452	122236	122907
15	Gazipur Pourashava	118997	188566	223934
19	RAJUK East (Kaliganj, Rupganj, Baidyer Bazar)	491963	589884	593374
Total		1003693	1279211	1397136

Source: Population Census, 1991, 2001

Table-2.19: Total population in Tongi Pourashava (Urban Area)

Ward No	Area in Acre	Population			Population Density Per Acre		
		2001	2010	2015	2001	2010	2015
Ward-01	2214.459	8160	17535	21143	4	8	10
Ward-02	1294.9	13089	18722	22601	10	14	17
Ward-03	493.658	30053	30766	37140	61	62	75
Ward-04	474.861	16140	35361	42687	13	17	20
Ward-05	299.182	23235	33238	40124	34	74	90
Ward-06	138.629	29083	38225	46144	78	111	134
Ward-07	153.716	29766	39122	47227	210	276	333
Ward-08	722.825	31432	39035	47121	75	117	141
Ward-09	683.745	22131	25692	31014	194	255	307
Ward-10	175.22	10758	16870	20365	43	54	65
Ward-11	1169.743	33646	47833	57744	32	38	45
Ward-12	96.282	25788	36126	43611	53	67	80
Total	7917.22	273281	378525	456921	61	96	116

Source: Population Census, 1991, 2001

Table-2.20: Total population in Gazipur Pourashava (Urban Area)

Ward No	Area in Acre	Population			Population Density / Acre		
		2001	2010	2015	2001	2010	2015
Ward-01	819.4	7189	12969	15658	9	16	19
Ward-02	1710.9	22002	33437	40363	13	36	43
Ward-03	726.5	20509	46091	55639	14	32	38
Ward-04	615.1	21311	26233	29106	35	43	47
Ward-05	510.0	9436	11616	12888	19	23	25
Ward-06	1865.0	6650	10028	12105	4	5	7
Ward-07	1010.0	15393	21789	26303	10	14	17
Ward-08	1309.5	12257	18233	22011	7	11	13
Ward-09	1645.6	4250	8169	9861	4	7	8
Total	10212.0	118997	188566	223934	13	19	23

Source: Population Census, 1991, 2001

In order to calculate the population of 2015, projection has been made on the basis of 2001 census data. The growth rate has been taken from 2001 Census report and with little adjustment of growth rate projection for 2001, 2010 and 2015 has been made. It is found that for the project area Group-A, records increase of 1397136 persons in the year 2015.

Table-2.21: Total population in Rural Area

Thana Name	Union Name	Area in Acre	Population			Population Density Per Acre		
			2001	2010	2015	2001	2010	2015
Joydevepur	Gachha (p)	6701.0	65001	59551	59824	10	9	9
	Pubail	12061.7	54451	62685	63083	5	5	5
	Baria	9938.3	34706	42040	42238	3	4	4
	Total :	28700.9	154158	164277	165145	5	6	6
Kaliganj	Bakterpur (p)	1361.6	404	938	943	0	1	1
	Nagori (p)	8859.1	30576	40611	40805	4	5	5
	Tumulia (p)	5963.4	26901	38623	38806	5	7	7
	Kaliganj (p)	1251.3	15809	23787	23897	13	20	20
	Total :	17435.3	73690	103959	104450	4	6	6
Rupganj	Daudpur (p)	6986.2	39683	46694	46912	6	7	7
	Rupgonj (p)	7595.3	43213	45047	45252	6	6	6
	Kayetpara	6934.5	64650	72453	72777	10	11	11
	Murapara	2171.8	27009	30030	30168	12	14	14
	Golakandail	4503.5	24135	27671	27795	5	6	6
	Kanchan (p).	156.0	696	816	820	4	5	5
	Tarabo (p)	4958.6	85890	105361	106632	17	21	21
	Bholta	2149.0	28647	30717	30854	13	14	14
	Total :	35454.9	313923	358788	361210	9	10	10
Sonargaon/ Baidyer Bazar	Sadipur,Jampur (p)	4862.4	35652	39872	40050	7	8	8
	Kanchpur (p)	2975.7	33992	45223	45425	11	15	15
	Total :	7838.1	69644	85095	85475	9	11	11
Gross Total		89429.2	611415	712120	716281	7	8	8

Source: Population Census, 1991, 2001

2.2.2 Economic Activities

Four growth centers (except Purbachal) partly occupied by industrial development. This development encompasses from the year 1954. Including industrial activities, almost all type of economic activities are found in Group-A. Agriculture production including irrigation project, fruits and vegetables production on highlands, pisciculture in three rivers, handloom and handicrafts, service, business and informal economic activities are found in the study area. Following discussion shows detail scenario:

Industrialization: Tongi is primarily known and developed as industrial zone according to the Master Plan of 1959. Bhulta in Rupganj and Kaliganj are also two-focal point of industrialization. According to the Structure Plan, Tongi and Narayanganj are proposed to be developed as manufacturing and Jute and cotton industries respectively. The study area adjacent with Narayanganj has already been developed with re-rolling mills and saw mills. Further expansion is not possible here. New industrial estate including expansion of present development in Tongi, Kaliganj and Bhulta in Rupganj is encouraged with road, drainage, water, electricity and telephone facilities. Such initiative will attract the investor to invest here and help in industrialization in the study area. Garments industry and IT sector may also grow in those areas benefiting from low labour cost.

Business: Wages and salary are the dominant sources of household monthly income in the study area accounting for around 37% of the total household monthly income. Income from trade and commerce accounts for around 22% of household monthly income. Agriculture including crops, livestock and poultry and fish cultivation, accounts for 19%, while remittances from members working abroad accounts for around 5% of the total monthly household income. With expansion of urbanization facility in the rural area, the business sector will develop new business centers, markets, bazars and expansion of existing growth centers of Tongi, Gazipur, Rupganj and Kaliganj will be expanded. Improved road communication in the study area will attract more outside traders to import vegetables, handicrafts and agricultural products to central Dhaka, Sylhet, Chittagong, Bogra, Mymensingh and other parts of the country. Business in the urban area will also get more momentum for setting up new markets, shopping malls, restaurants, etc.

Tourism: Tourism has not only emerged as a leading economic sector worldwide but also has boosted trade in countries that lagged behind in economic development. For many countries, it is a significant vehicle for economic progress that generates employment, foreign exchange, revenue, and contributes to poverty alleviation. Comprehensive approach of tourism planning should be imperative, making plans with other development planning activities. Like any planning, tourism planning for the development of the city needs to be goal-oriented, trying to achieve the set objectives. The process of tourism planning may be viewed as interactive and on going with modifications and refinement at any stage of the planning process. As one of many activities in the area that need to be considered as part of physical, environmental, social and economic components of the planning. Tourism should be addressed, at least partially, in land cover / use, transportation, recreation, economic development, or comprehensive plan. The degree to which tourism is to be addressed would depend upon the relative importance of tourism in the development of an area. The study area has great potential to develop as tourists spot. There are several historical places in the study area, which could be preserved and developed for tourism. Murapara Jagadish Babu Zamindar Bari (currently used as Murapara Degree College) of Rupganj Thana, Joydevpur Old Rajbari (currently used as DC Office Complex) and Puja Mandap, Shiv Temple, Gobinda Mondir, Kaliganj Kalibari, Kaliganj Christian Mission, etc. may be mentioned as some such type of historical monuments and should be preserved and developed as tourists spot.

With implementation of the DAP, the tourism sector may further expand through improvement of communication, tourist accommodation and security.

Employment: Employment opportunity is very limited in the study area due to insufficient number of industries. In 2005 around 13% of the total employed persons were engaged in agricultural activities compared to around 50% for the whole country. This included owner-farmer, tenant farmer (share-cropper), and agricultural day laborers. Average 23.15% people have employment in government and autonomous organizations and 8.35% in industrial sector in the study area.

With implementation of this plan, the employment in industrial sector will increase for setting up new industrial zone with provision of water, electricity, telephone, drainage and good road communication. However, the employment in government sector may remain same or slightly increase. Non-government employment in health, education and utility services will expand further with the setting up of new clinics, hospitals, schools, colleges, etc.

2.3 Development Problems

The Group-A area is predominantly unplanned except Tongi Industrial Area, National University, Open University, Machine Tools Factory, Bangladesh Rice Research Institute, Bangladesh Agricultural Research Institute, Rapid Action Battalion Training Centre, etc.

Several National Highways named Dhaka-Mymensingh, Dhaka-Sylhet, Dhaka-Chittagong passes through the study area in different directions. Other regional highway named Tongi-Ghorashal (via Kaliganj) and Kaliganj by-pass road passes through the heart of the study area. The above national and regional highways were fully or partially implemented as per Structure Plan guidelines. But other roads do not follow.

Housing sector has not flourished as per specified guidelines indicated in the Structure Plan except Purbachal New Town, Dattapara slum (Ershad Nagar) and Chanpara slum at Rugganj. Most of the housings are scattered and spontaneously developed by private developers.

Rivers and khals are the main hydrological aspects in the project area but industrial wastes pollute most of those rivers. Turag, Balu and Sitalakkhya Rivers are stagnant due to hindrances at different points and water is not flowing smoothly. No sewerage system exists in the study area. Maximum urban and slum dwellers use septic tank for disposal of human excreta. In rural areas, sanitary latrines are being used mostly provided by the NGOs and own initiatives.

To expedite the rate of urbanization, it is necessary to provide accelerated urban services on priority basis. Rural areas will also follow the Detailed Area Planning guidelines as prescribed according to the planning standard.

2.3.1 Hydrology (Drainage and Flooding)

Most of the land in the study area is subjected to flood flow. In the rainy season, most of the land of the flood-flow areas goes under water. Locations of those lands are in Baria, Bakterpur, Nagori, Gazipur Sadar, Daudpur, Kayetpara, Jampur and Sadipur Union. The rivers named Balu, Sitalakkhya and old Brahmaputra are responsible for such flooding.

Two irrigation canals are found in the study area named North Rugganj Irrigation Project, Narsingdi and Narayanganj Irrigation Project. Those canals including other natural canals, khals and rivers are used as outlet of drain water from high land. Any physical development activities without considering the drainage plan may create drainage problems.

Group-A consists of Narayanganj, Rugganj, Kaliganj, Gazipur and Tongi Thana areas. Average annual rainfalls in those areas are about 2200 mm; of them, about 70% of total annual rainfall occurs in wet months i.e. in April to September in a year. Because of very high rainfall, runoff rate from the developed area is very high. As a result, most of the areas are flooded due to the stagnation of storm water; more over, the river flows through the area and overflows their banks and inundates the area. The major rivers/khals which cause flooding in the area are Bangsi, Tongi khal, Turag, Balu, Sitalakkhya and old Brahmaputra. However, main rivers responsible for drainage are Turag, Balu and Sitalakkhya.

Flooding: Tongi Area

Flooding of Tongi area occurs due to over flowing of Bangsi River in the upper part of Turag River and Tongi Khal from Tekdhitpur to Chak Bhadam in the west and from Tongi Highway Bridge to Chak Bhadam by Tongi Khal. However, there is hardly any flood coming from east and north sides due to presence of Dhaka - Mymensingh and Gazipur Chowrasta - Tangail highways. Long duration and high rainfall causes inundation, accumulation and water-logging and also flooding of southwest part of Tongi area named Bhadam, Bhakral, Kakail Satais, Satais Pala Sama, etc. Flood -prone area in the concerned portion is about 14000 acres.

Flood recedes from upstream to down stream from Gazipur, Joydevpur, Baria, Pubail, Nagori, Tumulia, Daudpur Rugganj and Kayetpara, Upazila and Union Parishad, respectively. In case of flood from high rainfall in the catchment area and storm water overflow, the order of flooding is just reverse as against backwater flow, is from Gazipur Pourashava area to Kayetpara Union. The intensity, duration and depth of flooding in Gazipur, Joydevpur, Nagori unions are of less magnitude than other Union Parishads as mentioned above. The flood catchment area of those rivers and khals are approximately 64% of total study area or about 27230.00 acres. Flooding is a serious problem for development. The land needs protection from flooding and flood-free land is the first order requirement for the pursuit of development. Structural measures can be taken to develop flood-free land.

Drainage: Tongi Area

Tongi Pourashava area is already semi-urbanized. Drainage of storm water takes place from Plot and Mahalla drains to local Khals. Two Khals are primarily responsible for drainage of Tongi area named Guchulia Khal in the western side and Khaikur and Haidrabad Khal in the eastern side. Guchulia Khal serves Kamarjuri, Kathora, Gachha, Kunia, Chandara, Satais, Bhadam Masimpur and Tongi areas. On the other hand, Khaikur and Haidrabad khal performs

drainage for Khaikur, Kuria, Haidrabad Gazipura, Dattapara, Silmon, Markua, Pager, etc. areas of Tongi Pourashava. Drainage problems are acute in western side. Many places remain inundated and waterlogged in wet months from April to September in a year, in this part of Tongi Pourashava. There are many ponds, tanks, Beels and low lands. There exists a tendency of filling these areas for making the area flood free. In the course of Haidrabad khal, there also exist low lands, where developments are slow or there is no development. These places are Khaikur, Haidrabad, Dattapara, Silmon, Markur and Pager.

As a result of drainage congestion, Tongi Pourashava is not developed to that extent, as it should be during recent years. Drains in built up areas need better and regular maintenance, and the above-mentioned khals require de-silting and re-excavation for improvement of drainage in the localities.

Flooding: Gazipur to Demra area between Balu and Sitalakkhya

Gazipur and Joydevpur areas experience flood from high rainfall and overflow of the banks of the major Khals and rivers flowing through the areas. Two Khals are responsible for flooding named Sitalakkhya River and Chilai Khal. Sitalakkhya River starts from Palli Bidduth Office of Gazipur and Chilai Khal from Fakail, and meet together at Bohora, The Khals then take the single name Chilai Khal and flows down stream and joins Nalijuri Khal at village Khoer coming from Kapasia. The joint flow meets with Sutir Khal about 0.5 km downstream and then passes under Pubail railway and Highway Bridge. The Nagda River falls to the above Khals at Pubail and flows to Ulokhola River. These khals and rivers experience tidal flow. The Ulokhola River falls to Tongi Khal at Rayerdia still retains the name of Tongi Khal. After crossing the Purbachal area, the name of river becomes the Balu River until the stream reaches Demra and joins with the Sitalakkhya River. From Isapura Bridge to Demra, the Balu River meets with Naora Khal, Harina River (joining the Balu River and the Sitalakkhya River) and Kayetpara Khal. Naora Khal starts from Binaraba paddy field and flows to west and falls in a loop of Balu River near Naora Mouza. Harina River is south of Naora Khal joins Balu and Sitalakkhya at Kamsar and Harinagram Mouzas, respectively. Kayetpara Khal starts in the paddy field of Pubgaon and falls to the Balu River. Floods in this vast catchment generally occur due to backwater flow of the Balu, Tongi Khal, Ulokhola, Nagda, Suti, Gajaria, Chilai khals, etc. from down streams to up streams in this order.

Drainage: Gazipur to Demra between Balu and Sitalakkhya

Drainage of storm water primarily generated from rainfall in Gazipur Pourashava and drained through tertiary, secondary and primary drains exists in urban and semi-urban area. Existing system provides drainage by urban area drains to natural khals like Chilai Khal and Sitalakkhya River. These two khals meet together and takes the name Chilai Khal at down stream and covers more semi-urban and villages of Gazipur and Joydevpur. In its course, it passes through low lands, Beels and wetland areas of Pubail and Kaliganj. Two Khals Suti Khal and Nalijuri Khal merge with Chilai Khal just upstream of Pubail Bailey Bridge. Gazaria is quite long, brings drainage water from upper catchment areas of Kapasia district. Suti Khal carries drainage water from its catchment and upper reach Khals to Nagda River. Drainage water from Nagda River flows into Ulokhola River. From the junction of Nagda and Ulokhola River flows down stream in a direction of south-west and meets with Tongi Khal at Mouza Boran. On the other hand, Tongi Khal starts from Tongi Railway Bridge and flows northeast and meets Ulokhola River at Boran. Another part of Tongi Khal exists under Tongi Railway Bridge to first bridge of Turag River at Dhaur Mouza. Water of Tongi Khal flows sometimes towards the Balu and sometimes towards Turag River depending on high and low water levels of the latter rivers.

Combined flow of Tongi khal and Ulokhola River continues to flow downward from Boran to Raidia, Barkow and Purbachal; from Isapura Bazar of Purbachal to the confluence of Sitalakkhya at Demra and bears its name as Balu River. However, in some reference maps, start of Balu River is shown at the confluence of Sitalakkhya River and Chilai Khal in Bordia Mouza and Harinal Mouza at eastern part of Joydevpur until it passes through Pubail Bridge and joins with Nagda Khal and Ulokhola River. Then it takes the name Ulokhola River upto Isapura Bazar, and again from Isapura Bazar to Demra it regains the name of Balu.

Drainage of Tongi, Gazipur, Joydevpur, Pubail, Tumulia, Nagori, Daudpur, Rupganj, Kayetpara, etc. areas are catered by the Tongi, Balu River system as described above. Kaliganj town area however drains to Sitalakkhya River by local drains and Khals.

Drainage is a vital issue for development. Improper drainage causes stagnation of water, water-logging and even over-flooding of roads, houses, commercial and industrial areas, government and private establishments, and sometimes agricultural land. In planning, drainage is given high priority so that any kind of obstruction to drainage due to proposed roads, railways, embankment, filling of ponds, lowlands for housing, reservoirs and wetland etc. do not occur. Maintenance of drains (Tertiary, Secondary and Primary) should be regularly done and public awareness should be created about household wastes, polythene bags etc. not to be thrown into drains. The khals and rivers lose drainage capacity due to sedimentation, growth of aquatic plant, etc. and should be re-excavated and cleaned at regular intervals.

Flooding: RAJUK East Rupganj Area

The area considered here is the south-east corner of SPZ-19 and is situated along eastern bank of the Sitalakkhya River from Kanchan Bazar to Kanchpur in the west and from Kanchpur to Baghuri in the south and from Baghuri to Kesaraba in the east and Kesaraba to Kanchan Bazar in the north. The Union Parishads which either partially or fully falls in this SPZ are Murapara, Bhulta, Golakandail, Tarabo, Kanchpur, Sadipur and Jampur Union. The area of SPZ-19 under RAJUK East Rupganj as stated above is about 23,200 acres. This area is subject to flooding due to overflow of the Sitalakkhya River from the west and north sides and from the backwater flow due to flood in the Meghna and Old Brahmaputra River.

General topography of the area is saucer shaped and the land is high along the bank of the river and away from the river, the land is low. General land level along the Sitalakkhya bank is about 5m PWD and away from the bank the land is between 4.5m to 2.00 PWD. The major khals that spill floodwater in the area are Kendua Khal, Baniadi Khal and Tatkir Khal. Most of the area would remain under floodwater from April to October in a year if there would have been no structural interventions. A number of National highways pass through this area and provide partial flood protection. These are Dhaka Sylhet highway, Dhaka-Chittagong highway and Madanpur - Narayanganj Road. Floods in the past were severe and there were loss of lives and properties around the area in 1988.

Drainage: RAJUK East Rupganj Area

The area under discussion is drained to the surrounding rivers named Sitalakkhya, Meghna and old Brahmaputra at lower reach. The vast majority of the lands are agricultural and rice, vegetable and fruits are main crops. Dhaka is the main market of those agricultural products. The drainage takes place from the area and its khals as soon as the river water level starts falling in the major surrounding rivers. September and October are months when its stage starts falling. The flood free areas are the strips along the banks of river and along the sides of highways and roads. Settlements and some growth centers are available in areas like Kanchpur, Tarabo, Golakandail, Bhulta, Murapara, etc.

Drainage in the growth centers occurs through the existing drains. There are secondary and tertiary drains found in growth centers. Drains carry household wastewater and storm water to khals and finally to low-lying areas of the surrounding growth centers.

No central sewerage system exists in the study area. Most of the households have constructed individual septic tanks for disposal of sewer. In rural areas, sanitary latrines are mostly provided by the NGOs and others are built on own initiatives. For disposal of toilet effluence nearly 17% of the households use katcha latrines, 33% semi-pucca and 28% pucca latrines. About 18% are pit latrines; while less than 3% of the households do not have any latrines.

In the rural area, over spilling of pucca, semi-pucca and pit latrines and night soil of hanging toilets, open space and bushes are polluting the surface water of ponds, khals, beels and rivers. As a result, prevalence of diseases like diarrhea is higher than other diseases in the study area.

2.3.2 Geological fault

Two fault lines cross the study area, one from Tongi to Mymensingh named **Tongi Fault** and another from Kanchpur Bridge to Moyezuddin Bridge through Sitalakkhya River named **Sitalakkhya Fault**. Tongi Fault may be hazardous for

development activities rather than Sitalakkhya Fault. Existing scenario indicates tremendous growth with heavy structure beside Tongi Fault. Construction of light structure may be permitted on those Faults.

Load bearing capacity of the soil is higher in the Tongi and Gazipur areas rather than other locations of the study area. Low load bearing capacity of the land is found in the floodplain areas. Earth filling with sandy soil may increase load-bearing capacity of those floodplain lands. Non-availability of clay soil on the floodplain lands is prominent character in the study area. It proves that formation of the land in the study area is continuation of the Madhupur tract.

2.3.3 Spontaneous Development

The study area is predominately a rural based area but moderately fast trend of urbanization is happening. With the implementation of DAP, a wide range of rural area would come under increasing pace of urbanization. This urbanization will improve the socio-economic and living condition of the rural people in communication, sanitation, electricity, health, education, industrialization, business and social services.

Conflicts of drainage and waterways arise whenever and wherever the road networks cross the drainage networks. The conflict may be minimized if the systems are made parallel as far as possible so that they do not cross each other. Practically this is not possible in all cases. In this project, roads are developed straight and in a gridiron frame to minimize the cost. In this process, it crosses the rivers and waterways; and its drainage function is thus hampered, on the other hand, roads should not be left to remain open at the drainage crossings for continuous flow of the traffic.

To reduce the vulnerability of the waterway-road conflicts, the DMDP proposed certain principles. Its recommendation was, "Roads have to be aligned in such a way (when necessary) and khals and ponds have to be somewhat remodeled that as much as possible of the land along the roads can be put to high value uses, with khals and ponds in peripheral position, roughly halfway between a pair parallel roads".

2.3.4 Transportation

Before formulating the Detailed Area Plan (DAP), it was crucial to identify the critical planning issues which are required to be addressed properly. To this end, a review and analysis of the Structure Plan, the Urban Area Plan, and the Strategic Transport Plan (STP) for Dhaka was undertaken. A thorough assessment of the current transport situation of Dhaka was also made and the following critical planning issues were identified:

a. Roads

Traffic Management: Traffic management in Dhaka city is very weak and as a result, large sections of road network have been taken over by traders and others for purposes other than traffic use. Prominent among these inappropriate uses are: stalls set up on the pedestrian ways and also on the roads themselves; setting up bus ticket sales booths; storing solid waste baskets and building materials on roads; as well as uncontrolled parking of rickshaws and other vehicle on traffic lanes. Drivers' behaviors also adversely impact the traffic management. Another most important aspect of traffic management is the lack of effective enforcement of traffic rules and regulations.

Road Hierarchy and Earmarking the Right of Way (ROW): In the absence of a proper road classification, the city road network is developing in a haphazard manner. Although Urban Area Plan (1995-2005) proposed geometric design standards for different classes of roads in the city, these were not adopted officially. Over and above, in the past, the rights of way (ROW) of many important roads were not strictly earmarked. As a result a lot of compensations are being paid for major road widened in the city. It is critical therefore, that road classification is completed soon, and a new set of road design standards be developed and adopted.

Incomplete Road Network: Dhaka City has a very inefficient road network. The primary orientation of the major roads is in the north-south direction. Lack of sufficient east-west connections require the motorists to travel longer distances, as a result, the existing roads get congested easily. The Strategic Transport Plan (STP) completed in 2006 has identified a large number of east- west links, which need to be implemented soon to address this critical issue. The study area road network consists of National, Regional and Local roads. The National and Regional Roads provide

access to the area. But local roads are narrow and there is lack of sufficient interconnections. The urbanization on the west side of Tongi and Gazipur Pourashavas are increasing without the development of a proper circulation system. The under construction Eastern Bypass road connects the Tongi and Gazipur areas with the Narayanganj and Kaliganj. With the development of Purbachal new town, this road will be the only link road between east and west and in a short time this road will reach its saturation level. All the Pourashava areas also lack in access roads of proper width as well Primary and Secondary roads.

Pedestrians Facilities: In the absence of a clearly developed pedestrian system, pedestrians are forced to walk on the road, and therefore subjected to unnecessarily high risks of injuries. There are many factors contributing to this situation including absence of continuous footpaths; encroachment on the footpath and absence of facilities suitable for movement of disabled persons, etc. This issue needs to be addressed immediately.

Parking: With increasing number of vehicles plying on city roads, more and more road space is being occupied by parked vehicles. Again haphazard parking of vehicles (both motorized and non-motorized) causes substantial misuse of road space. Lack of off-street parking and lack of restriction for on-street parking have been the root cause of parking every where on the street. As a result congestions develop here and there which has become a major cause of concern to the road users, city authorities and traffic managers. This issue needs urgent attention of planners and the Government.

Non-Motorized Transport (NMT): Non-motorized transport plays an important role in the transportation system of Dhaka city. In 2004, around 34% trips were made by non-motorized transport (NMT). In addition to rickshaws, there are at least five other types of NMTs which are operating in Dhaka, and these include bicycles; rickshaw van; thela garis; hand trolleys; and horse-drawn carriages. In the context of future urban transport, it is highly important that the role of NMTs, particularly the rickshaws be clearly defined.

Public Transport: Public transport is a major means of travel for the city dwellers. But it is in a very poor state at present. Bus stops are not provided with any bus bays and waiting areas for rickshaws and baby taxis are not properly earmarked, as a result these vehicles are often parked on traffic lanes. The interfaces between different modes are not properly planned and designed among buses, rickshaws and baby taxis which are required to stop in the same areas causing congestion and disorder. There is virtually no priority for public transport services. Another big problem is that at present there are 2000 large buses owned by big companies, which are operating in Dhaka city. In addition, there are nearly 4000 mini buses playing in Dhaka City, and these are owned by more than 1000 owners. Existences of so many owners having little cooperation and coordination among them make the bus transport operation very chaotic and inefficient.

All the above mentioned adverse conditions are required to be addressed properly to make the public transport efficient, comfortable and reliable.

b. Railway

The existing Dhaka-Mymensingh rail link is not in a very good condition. Trains from Dhaka to Sylhet, Chittagong, Khulna and North Bengal run through the study area. The existing facilities are extensively utilized. However, scheme to improve the rail link between Dhaka- Mymensingh, Chittagong and Khulna has been included in the Railway Master plan (for 20 years) being finalized by the government soon.

Construction of a new ICD near Dhirasram Railway Station

Bangladesh Government has decided to construct a new ICD with a capacity of handling about 3, 50,000 TEUs per year near Dhirasram Railway Station north of Tongi, which will be well connected by road and rail. Negotiations are underway with the World Bank to seek financial support for the construction of this ICD, as the kamlapur ICD will get saturated soon.

c. Waterway

The rivers named Sitalakkhya and Balu are the important water ways in the study area. Circular water ways proposed in the DMDP Structure Plan which was supported by STP in 2006 has been included in the DAP proposal. To reduce

the over crowding in urban transportation system of Dhaka, the circular water ways could contribute a great deal if developed efficiently. This circular water ways could help the study area in maintaining easy communications with the central urban areas of Dhaka.

d. Modal Conflict

In the study area, modal conflict issue will arise in future due to the increase of transport vehicles and frequency of railway movement. Tongi, Gazipur and Kaliganj will be more vulnerable for such movement. With the new town development in Purbachal, the Commuter Rail Line will increase the mass movement but at the same time it will generate extra conflict with the road transportation through the increase of population density and road vehicles. To overcome those conflicts, road proposal designed in the Detailed Area Plan should be constructed primarily before the increase of population density.

e. Transportation Problem versus Urban Landuse

Considerable traffic is expected to be generated in the four urban focal points in the study area, namely Tongi, Gazipur, Purbachal and Kaliganj. Due to the change of urban landuse in those centers, transportation problems will increase manifold. Those problems will include narrow road due to the commercial use of the roadside land, water logging due to the construction of poorly designed box culverts, undulating road surface due to lack of adequate compaction of base and sub-base road accidents due to lack of properly designed and irresponsible behavior of drivers intersections.

2.3.5 Utility Services

a. Electricity Supply

PDB and REB are responsible for distribution while PDB is responsible for production and transmission of electricity. Though the area is not substantially covered, electricity supply is subject to protracted load shedding. The situation is unlikely to improve in the near future unless substantial increase of generation is possible.

b. Water Supply

Tongi and Gazipur Pourashava and a small part of Kaliganj and Rupganj area are covered by water supply network operated by respective Pourashavas. Rest of the area is covered by DPHE or individual private tubewell. Some people in the rural area especially people of Pubail, Kaliganj, Rupganj and Baidder Bazar union depend on river and pond water for washing and bathing purposes.

c. Gas Supply

Only Tongi and Gazipur Pourashava areas are linked with the Titas Gas supply line. Other areas of the Study Area are maintaining their daily needs through the use of other fuel sources.

d. Sanitation

The Group-A area is not covered by any central sewerage network. In the absence of sewerage system, there is no equipment or machinery with the local authorities to clean septic tanks of individual houses. As a result, most of the households link up their septic tanks with the road side drains which is illegal. This results in unhygienic condition and pollution of water bodies, mostly canals and rivers which act as outfall.

Recently in rural areas, improved sanitary pit latrines are being extensively used, but a substantial number of houses are still using unhygienic hanging latrines. This results in environmental degradation and unhealthy living environment.

e. Drainage

In Tongi and Gazipur Pourashavas, water logging causes serious problem in the case of moderate to heavy rainfall. The problem has emerged due to lack of sufficient road side drain and their connection with outfall through secondary

drains. Encroachment on khals and canals and indiscriminate filling of low lying areas without securing drainage channels has also contributed to the problem.

f. Solid Waste Disposal

In the Gazipur area, there is a sanitary land fill area at Bhrulia. Solid waste collection and disposal is carried out only in Gazipur and Tongi Pourashavas. Other urban areas and rural areas are dumping their solid wastes in the adjacent low lying lands and rivers and canals. Such practices are causing serious environmental problems of pollution of river waters.

2.3.6 Amenities and Urban Facilities

a. Active and Passive Recreation

Cinema hall is the only recreational item of the people of the study area. Absence of city level open space is a common scenario. Two central auditoriums with modern facilities are existing in the Tongi and Gazipur Pourashavas. There are some play fields which are adjacent to the existing high school and college compound.

b. Educational Facilities

The BIT of Dhaka at Gazipur has been upgraded as Engineering University. Campus of the National University is also located in Gazipur. Other areas are not sufficiently developed with the educational institutions. No medical college and national level school / college are found in the other parts of the study area except Tongi and Gazipur.

c. Market Facilities

Most of the lands covered by the market facilities in the study area are govt. Khas land. Local government authority like Pourashava and Union Parishad are responsible to collect toll from those markets. Improvement of those markets with the provision of better environment facilities and further physical expansion will be needed. Detailed Area Plan has considered those development options in consideration with the outlined problems.

d. Community Facilities

At present, four development hub is concentrating in Tongi, Gazipur, Kaliganj and Rugganj. Another concentration will be found in near future when Purbachal New Town will be formed. Community facilities are mostly existing in three agglomerations named Tongi, Gazipur and Narayanganj but not in other parts of the study area. The Detailed Area Plan proposes community facilities with the consideration of the existing situation prescribed according to the DPZ.

e. Urban Facilities

People of the study area are generally dependent on Dhaka City for urban facilities due to the non-availability of the urban services in the locality. Such absence increases density of population around the urban services. The Detailed Area Plan proposes urban services with the consideration of those views and prescribed according to the DPZ.

2.3.7 Environmental Concern

Objective of the environmental impact assessment is to identify the environmental issues and parameters that may be affected by the implementation of the proposed project components, as well as an assessment of the current status of these issues and parameters. The detailed positive and negative impacts on physical, biological, social and economic environments and their potential mitigation measures are described below.

Physical Environment

Flood Protection

Group-A planning area is just adjacent and outside the proposed flood embankment of FAP-8A. Implementation of FAP-8A embankment will promote adverse hydraulic effects in Balu and Sitalakkhya Rivers. Flood flow, water levels

and flood flow zone will increase and erosion, sedimentation and flood frequency will also increase. These issues are carefully examined and addressed with necessary structural measures. The unprotected side of the Balu River, Tongi khal and both sides of the Sitalakkhya River within the study area may require embankments to keep the proposed planning area flood free. Otherwise this area can not be brought under development and has to be left as it is now as flood flow, sub flood flow zone or as wetland zone.

Biological Environment

Social Forestry

Social forestry is common by the side of embankment, road, railway, homestead and highland. Main social forest plants are *shishu*, rain tree and mahogany. With implementation of this project the plantation of social forest plant will increase near the rural roads, pucca roads, embankment, open space and in the premises of government, autonomous and educational organizations.

Social Environment

Literacy

Literacy rate in the urban area is very high (82.5%) and in rural area it is 45.5%, which is more than national average (62%) (Ref.: *The Daily Ittefaq, October 10, 2002*). With implementation of the Detailed Area Plan, the literacy rate in the rural area is expected to increase further for establishment of new educational institutions. Female education rate will also increase in the rural area for promotion of female education and modernization of society. However, the literacy rate in urban area may increase slightly.

Status of women

Enlightened women in the urban area are aware about their rights and roles in the society. They are mainly housewives although some women are working in educational institutions, govt. and non-government offices and in garment industries.

However, the women in rural area are mainly housewives and engaged in household work and agricultural crop processing. With implementation of the Detailed Area Plan, the women status of the rural area will improve due to their participation in education, employment, small business, handicrafts and social awareness.

Health Services

Health services both in the urban and rural areas are not well facilitative due to absences of modern health facilities like Medical College, private hospitals, clinics and diagnostic centers. Most of the people in the rural areas rely on government hospitals. Union Parishad clinic and doctors are not available for complicated diseases. People of some Union Parishads like Gacha, Pubail, Baria, Baketpur, Nagori, Tumulia and Kayetpur demanded modern health facilities. It is expected that after implementation of the Detailed Area plan, the health facility in the Union Parishad areas will improve for setting up new clinics, hospitals, diagnostic centers in government and private sectors. For improvement of rural transportation, the government doctors of rural clinic will visit the clinics regularly, who are presently visiting 2-3 times per week.

Human Diseases

Diseases like diarrhea, worm infection, dysentery, peptic ulcer, acute respiratory infection, common or mild fever, skin diseases, female diseases like reproductive health and anemia incidences are very high in the study area. With the scenario, diarrhea, worm infection, skin diseases and anemia condition will be improved for pure drinking water supply, good sanitation, hygienic housing condition and improved dietary food intake for increasing income level. On the other hand, respiratory diseases, cardiac arrest and blood pressure may increase from air pollution by motorized vehicles, industries and brickfields.

Sanitation

No sewerage system exists in the study area. Maximum households constructed individual septic tanks for disposal of human excreta. In rural areas, sanitary latrines mostly provided by the NGOs and others are built on own initiatives. For disposal of toilet effluence nearly 17% of the households use katcha latrines, 33% semi pucca and 28 % pucca latrines. About 18% are pit latrines; while less than 3% of the households do not have any latrines.

In the rural area, over spilling of pucca, semi-pucca and pit latrines and night soil of hanging toilets, open space and bushes are polluting the surface water of ponds, khals, beels and rivers. As a result, diarrhea prevalence is higher than other diseases in the study area.

Parks and Recreational Places

Private open space and Children's park and some playground are the main recreational places in the study area. However, with implementation of the Detailed Area Plan, new open space, playground, parks / botanical gardens, Shishu Park, lake, etc. will provide more leisure places for the people of the study area.

Women Empowerment

Women empowerment is a key issue nowadays discussed everywhere. Importance of women empowerment in the overall development of the society can hardly be over emphasized. After the implementation of the DMDP, most of the rural areas will be converted to urban areas. Women in the rural areas are mainly housewives and engaged in household activities and processing of agricultural crops, which do not ensure any additional cash income for the women. As a result of urbanization, more women will be engaged in formal employment in different sectors like education, garments and other industries, transport, sales, handicrafts, etc. Women will be able to earn for themselves and this will be a positive step towards women empowerment.

Negative Impacts

Climate

Present climatic condition of the study area is sub-tropical monsoon. With implementation of DAP this climatic condition is expected to continue if further global climatic change does not occur. However, rainfall may slightly decrease in the study area due to indiscriminate felling of trees and diminishing of green vegetation. Trees and green vegetation keep environment cool and enhance precipitation and rainfall. Temperature may remain same as present. Urban development keeping vegetation, plants, water bodies and new social forestation in homesteads, educational organizations, roads, embankment, open space and parks will help maintain the climatic condition same as present.

Change in Topography

The main ground slope of the study area is in southwest to northeast direction. Natural topography of the RAJUK area has already been changed due mainly to urbanization. Implementation of DAP activities like building roads, drainage, bridge/ culvert, housing and industrial estates, bazars and growth centers will radically change the natural topography and landuse pattern of the study area. Agricultural area will be converted into urban and semi-urban area. Present green scenic beauty will disappear, water bodies will be lost and general slope will be diminished for earth filling due to urbanization.

Landuse Change

Major portion of the study area is of rural set up, with predominance of agricultural landuse. However, urban and semi-urban landuses are observed in the DMDP and its surrounding areas. With implementation of the DAP, rural setup and agricultural landuse pattern will be changed radically into urban landuse type.

Drainage Congestion

Drainage congestion may increase further with urban sprawl development. Faulty design, solid waste and rubbish dumping, encroachment and un-authorized structures, siltation, lack of renovation and re-excavation are the main causes of drainage congestion. Drainage system that exists in the study area is not enough to carry the surface run-

off properly. The outlets of these drainage networks are mostly connected with the natural channels or khals. But the conditions of these natural khals like Chelai Khal, Tongi Khal, Hydrabad Khal and Vadam Khal are dilapidated due to unauthorized encroachment. These khals will be silted due to siltation; as a result, drainage congestion generates. And thus many areas are subjected to water logging during the heavy rainfall causing inconvenience to the people of the area.

Surface Water Pollution

Surface water quality of Sitalakkhya, Balu, Turag, Tongi Khal, Chilai River, ponds and beels are very poor in respect of pH, turbidity and coliform bacteria as per national standard. Main causes of surface water pollutions are city wastewater, sanitary sewage, solid waste dumping and discharge of untreated industrial wastes. With implementation of the DAP, 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.

Groundwater Table Depletion

Fall of groundwater table is a common phenomenon in the study area during dry period (February-May). With expansion of urbanization and industrialization through the Detailed Area plan, the groundwater table may further fall if present tradition of using groundwater is continued.

Groundwater Pollution

Groundwater pollution due to manganese, iron and hardness is a major problem of the study area. With expansion of urban area, more dependency on groundwater sources may increase the pollution level of sub-surface water.

Loss of Wetlands

Wetlands are mainly affected by the urbanization process. Earth filling fills up the beels, ponds and khals. Wastewater affects the aquatic ecosystem and makes the beels, ponds and khals unproductive and as a result the aquatic plants, fishes and animals die or migrate to other places. For high value of highlands, the developers tend to acquire the low cost wetlands. There is no strict regulation on earth filling of ponds. The RAJUK or Municipality can impose penalty if someone fills the ponds. However, Wetlands Conversation Act of Bangladesh, is applicable only for natural beels and khals and is not applied strictly. Number of ponds in the study area is reduced every year to accommodate housing and commercial structures. Wetlands play an important role as a reservoir of rain and floodwater. They are also important to maintain the balance of ecosystems and for replenishing the ground water level through seepage.

Noise Pollution

Although there is no data available on noise pollution of the study area, however, it seems that present noise level does not exceed the Bangladesh Standard. More noisy area may be the Bus Terminal area and the second area the Industrial and Market area. Hydraulic horn of buses and rickshaw bells are the main noise sources in the study area. However, some noises also generate during piling and construction works. Besides, welding workshops saw mills, musical instruments and blacksmiths are also common sources of noise pollution in urban areas. With expansion of urban area, the noise pollution will be increased due to increase in number of motor vehicles, market places, industries, etc.

Air Pollution

Air-pollution is not a serious problem in the study area. Vehicular emission is also insignificant in the area. Industries and brickfields are the main sources of air pollution. However, the air pollution will be increased in near future with increase of motor vehicles, brickfields and industries. Tongi is primarily known for its planned industrial estate. A huge number of industries have already come up in Rupganj beside Sitalakkhya River. With the implementation of DAP more industrial zones will be developed which will also induce air pollution in the study area.

Loss of Biodiversity

Urbanization like roads, infrastructure development, housing, commercial places, industrialization, etc. will replace the existing natural green environment to man-made environment. Trees will be felled, water bodies will be filled up and polluted; sugarcane, paddy, banana, papaya and vegetable production will be reduced and gardens and bush will disappear with urban expansion in new area. Wild animals, birds and fishes will lose their habitats and as a result a loss of balance in biodiversity will result.

Loss of Capture Fisheries

The study area is mainly medium high and low land. There are many Beels and low lands in the study area. Therefore, open water fish resources are high mainly in Rupganj, Kaliganj, and Pubail area. Sitalakkhya River, Turag River, Balu River, Chetai River, and several Beels of Rupganj, Pubail and Kaliganj and other natural channels support the capture fisheries in the study area.

With implementation of the DAP, the captured fishes 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. New flood control embankment in Tongi and Gazipur, sluices and structures will further restrict the in and out fish migration. Area of khals, Beels and other water bodies will be reduced with more land development and urbanization.

Loss of Ponds and Fisheries Culture

The Study area is very rich in culture fisheries. There are about 4413 ponds (101.5467 ha) in the study area, out of which 569 numbers of ponds are of varying sizes from one acre or more. With urbanization and industrialization, many ponds will not exist due to land filling by the owners due to appreciation of land value.

Loss of Productive Agriculture Land

Excepting Tongi municipal and industrial areas, Gazipur municipal area, Kaliganj, Rupganj, Rupganj industrial areas, the remaining areas are rural in character with flood plain of Sitalakkhya, Balu and Brahmaputra Rivers. About 10% of the area is urban and semi-urban and remaining 90% area is rural. Agriculture (low land rice and upland vegetable, high value cash crops, fisheries, dairy, etc.) is practiced in the area. In this planning area there are lowland, Beels, flood flow and sub-flood flow zones of the Sitalakkhya, Balu and lower Brahmaputra rivers and their tributaries, where any development other than agriculture, fisheries, cause-ways, landing stations and brick fields are restricted.

Solid Waste Production

Waste disposal facilities run by the Pourashava under solid waste management programs exist in two Pourashava areas, which cover the central and core areas only. There are well-established solid waste dumping sites in each of these Pourashavas. The main dumping site (area 10.0 acres) of Gazipur Pourashava is located beside the highway in Bhurulia, which is in the north of the Pourashava area. The present dumping site is not sufficient as per information received from the conservancy department. So the department is trying to find additional space to use it as dumping place. The department will buy land for this purpose as soon as it is available. As per information received, about 24 metric tons of solid waste is generated and collected daily but the quantity transported to the dumping place is only about 18 metric tons per day. This difference results from various reasons. Some of the useful portion of the solid waste is sorted by the street children, who collect it for selling to potential buyers for recycling purpose. The other reason is that the weight of the material also decreases as it dries up with passage of time.

In Tongi, there are two solid waste dumping sites. The Meghna dumping site is located about one kilometer away from the municipal area and has a site of 1.5 acre only. In this dumping site, the solid waste is recycled for producing compost. The compost plant, having capacity of producing 3 tons in each compartment, can produce about 60 tons of fertilizer every month.

The other dumping site at Shilmon (area 1.0 acre) is located about 6 kilometer away from the center of the town and is a temporary arrangement only, which does not have any provision for producing compost

The waste dumping place is a good ground for mosquitoes, flies and insects breeding, which can spread the parasitic diseases like dengue, malaria, filaria, etc. The leaching from this landfill can pollute both the ground and surface water and ultimately may cause health risk among the local inhabitants. Many people collect compost from this landfill. The use of this mixed compost in agricultural field is very dangerous for human health and environment. Because this type of compost contains a high amount of toxic metal like lead, cadmium, mercury, nickel, chromium, etc., which are harmful to human health. These metals may enter into the food chain through vegetables and food grain.

With implementation of DAP, the environmental problems from solid waste will increase further for increased generation of waste in new urban and semi-urban area unless appropriate waste management measures are taken.

Water Supply

In Gazipur Pourashava core area, 1,87,500 nos. of people are enjoying the supply water from 7 nos. of DTWs with pump houses. Daily water production (considering 10 hour pumping on average) is 1.6 MLD per tubewell. Hence total production for the area is 11.2 MLD. At present 5 tube wells are in operation in the area and the water production is 8 MLD. But populationwise demand is 28 MLD (considering average consumption 150 LP/day.). So 20 MLD (28-8) more water production will be required per day, which may be fulfilled by further installing 13 nos. DTWs for the area. Beside this, industrial/ commercial/ educational and others private organization have their own arrangement for water supply through DTWs installed at their own premises. Deep-set hand tube well is the main source of water for drinking and cooking purpose in rural areas like Gazipur Sadar, Kaliganj, Rupganj and Sonargaon. There is no deep tube well pump house for water supply in the rural areas. People of this area are using natural surface water from ponds khals and rivers for bathing, washing and agricultural irrigation use. In this area no arsenic polluted water is detected. Natural water collected from ponds, khals, and rivers are polluted water, which are not drinkable.

Economic Environment

Traffic Congestion

The Rajbari road on which the railway level crossing is located, is the main thoroughfare of Gazipur town, and provides connection to National Highway N3 between Dhaka and Mymensingh as well as to N4 between Dhaka and Tangail. At times, the congestion at the railway level crossing extends up to 10 – 12 minutes, when large number of vehicles gets stuck at the rail gate. In view of the problem indicated above, this crossing has become a major source of inconvenience to the residents of Gazipur and in future, when this town will grow further, it may cause severe problems. In the whole area of Group-A, this was considered to be the most critical problem of traffic congestion. Traffic congestion in front of the bus terminal occurs due to poor traffic management and enforcement of law. Tongi rail crossing and Shibbari mor of Gazipur Pourashava are also traffic congested area. Due to rapid urbanization and growth of population, movement of vehicles in and around the study area will increase. Number of rickshaws will also increase to meet the people's demand. Rickshaws will be the main cause of traffic congestion in the study area in future.

Fire Hazard

With expansion of city boundary and population, the probability of fire may increase for 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 three fire stations at Tongi and Gazipur Pourashava are not enough to cope with future fire hazards.

2.3.8 Shelter and Settlement

Problems regarding shelter and settlement of the study area are similar to other areas of the country. Such problems are discussed here in two dimensions i.e. urban settlement and rural settlement:

- In urban areas, most of the settlements are in natural developed areas (excepting 11 housing areas in the Gazipur Pourashava) constructed without maintaining setback provision. As a result, those areas are

congested with bulk density. To provide service facilities in those areas, social hazards will have to be embraced.

- Amalgamation of pucca, semi-pucca and katcha settlements creates environmental pollution and social conflict.
- Most of the settlements in the urban areas have been constructed without provision of any open spaces. Building materials and construction activities are performed on the nearby roads for further expansion of those buildings. As a result, traffic congestion prevails on those roads.
- Settlements along the roads gradually change their use from residential to mixed-use. Such type of change creates accessibility problems including environmental hazards.
- Semi-pucca and katcha settlement in rural areas considered as temporary settlement are mostly constructed due to the availability of traditional building materials. To provide service facilities in those areas, low return of revenue/tax could hamper the development.

Purbachal New Town is the planned neighbourhood of the study area. This neighbourhood will ensure the hygienic condition of housing with drainage facilities, electricity and telephone, playground, open space and recreational places. Chayabithi housing in Gazipur Pourashava is also another planned residential area established without improved drainage facilities. With implementation of the DAP, new housing estates and residential areas will be developed and private housing construction will also be under the jurisdiction of RAJUK. This will regulate unauthorized housing construction to improve the scenic beauty and environmental condition of the city. Some new areas adjacent to the north of Purbachal are under the private housing companies. Unplanned and unauthorised earth filling of those areas may hamper the natural drainage system in the area and cause ecological imbalance.

2.3.9 Lack of Co-ordination among Agencies

A number of Departments / Agencies are operating in the study area. One estimate indicates that 46 government agencies are involved in the metro Dhaka's development works. But unfortunately it is found that these organizations are working according to their own agenda completely disregarding the projects of other agencies.

a. Duplication of Efforts

It is found that more than one organization is engaged in the same work at different time ignoring the fact other agencies are doing the same work resulting in duplication, chaos and wastage of valuable national resources.

b. Disregard of Abiding Plans by Line Agencies/Authorities

Line agencies often disregard the binding plan in implementation of their projects. They do not care whether Landuse plan allows them to undertake those projects in the areas they are implementing. There are thousands of examples of this violation, even, RAJUK itself violates its own plan.

c. Weak Plan Implementation Mechanism

There are various laws and regulation for development control. But there is no effort to enforce them. As a consequence violation of plan is common scenario.

2.4 Current Public Sector Investment program

Any public sector investment program is not found in the Annual Development Program 2007. Projects on Knitting Industries and Garments Industries are going to be established in Tongi and Bhulta areas as registered according to the Board of Investment Manual 2006. Private sector involvement, is present in Kanchpur and Bhulta area and those are Plastic Industry, Knitting Industry, Dying Industry and Cottage Industry. Private sector industries are small-scale industries with the involvement of 80 to 100 labour force and Tk. 100 to Tk. 150 million per industry.

Bangladesh Rural Development Board

Greater Dhaka District (Dhaka, Gazipur, Narsingdi, Narayanganj, Munshiganj and Manikganj) Infrastructure Development project.

Department of Public Health Engineering

Arsenic Mitigation Project at Tongi, Kaliganj and Gazipur.

Bangladesh Railway

Feasibility Study for conversion/construction of Dhaka-Chittagong Railway Line into Double Track with Electric Traction.

BIWTA

Introduction of Circular Waterways around Dhaka city (connecting Turag, Balu, Sitalakkhya and Buriganga Rivers).

Local Government Engineering Department (LGED)

- Rural Infrastructure Development Project (Important Roads & Hat Bazar Development) : Part-III (Revised)
- Upazila Complex Bhaban construction (Revised-II)
- Construction and Reconstruction of Roads, Bridges and Culverts in Rural areas on Priority basis.
- Construction of Large Bridges/Culverts on Important Feeder and Rural Roads.
- Construction of Union Parishad Complex Bhaban and development of connecting roads.
- Construction of Low Cost Bridges/Culverts on Rural Roads-Phase-II
- Greater Dhaka District (Dhaka, Gazipur, Narsingdi, Narayanganj, Munshiganj and Manikganj) Infrastructure Development project.
- Urban Governance and Infrastructure Development Project
- Municipal Services Project
- Rehabilitation of Flood Damaged urban physical infrastructures in 2004
- Construction of Bridge over old Brahmaputra River. (It is the bridge on old Brahmaputra river at Kaikertek)

2.5 Stake Holders' Wish-List of Projects

Stakeholders wish list include following projects:

- Container Port at Bhrulia.
- Sitalakkhya Bridge No. 3 at Nabiganj.
- Develop the banks of Sitalakkhya as recreation spot by removing all illegal occupants.
- Refurbishment of Bhawal Rajbari for tourism.
- Replacement of katcha toilets by sanitary latrines in the whole study area.
- Improvement of Solid Waste management system to prevent environmental degradation, especially in and around the industrial areas of Tongi and Kaliganj.
- Construction of a new road to connect Pubail through Uttara of Dhaka.
- Improvement of important roads to facilitate movement of industrial goods and providing hazard-free walkways for the people.
- Introduction of commuter train between Tongi–Kaliganj and Savar-Gazipur-Kaliganj.

- Conversion of Old Muslin Cotton Mill in Kaliganj into a Manufacturing Industrial Complex.
- Establishment of University Complex in Rupganj for private Universities.
- Extension of piped water in new settlement areas especially in the Pubail, Sonargaon, Kaliganj and Rupganj areas.