SUPPORTING REPORT C

LAND USE AND URBAN PLANNING

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SUPPORTING REPORT C: LAND USE AND URBAN PLANNING

1. Purpose and Procedures

1.1 Purpose of Urban Planning Input

The chapter is intended to provide a compilation of land use, population, and development data for the study area, to a level of detail appropriate for assessing flood protection needs. It consists of an analysis of current land use and population distribution and a forecast of the probable pattern of development over the next twenty years.

It is not the intention to prepare a master plan for urban development. It is hoped, however, that some of our forecasts of future trends may coincide with the findings of the proposed metropolitan plan for Dhaka, which is due to start this year.

1.2 Procedures Adopted

The sequence of this supporting report is shown below :

1) population forecast for metropolitan area

2) analysis of existing land use and changes.

3) detailed examination of 1981 - 90 trends.

4) distribution of population and major land uses 1990.

5) assessment of 1990 - 2000 commitments and likely development areas, with assumptions on density increase.

6) distribution of population and major land uses 2000.

7) comparison of development options post 2000.

8) distribution of population and major land uses 2010 for the probable option.

9) alternative development strategies

10) summary tables of population and land use 1981, 1990, 2000, 2010.

11) more detailed assessment of future major land use needs.

2. Dhaka Population Forecasts and Definitions

2.1 Definitions

Fig. C.1 shows the Dhaka `pull' area, the study area, and its divisions. Fig. C.2 shows zones and divisions within the study area.

The study area (850 square kilometers) is that area within which investigations to determine the master plan area have largely been confined. Most data gathered has been for this study area.

The `pull area' is smaller in size than the study area, but extends outside it in two places. It is based on the Dhaka Metropolitan Area Integrated Urban Development Plan (DMAIUDP) area considered to contain those economic metropolitan functions which provide the `pull' or attraction for urban in-migration. It is assumed that migrants from outside the city will move into this `pull' area. Our population forecast is made for this area. DMAIUDP's defined area was that considered to attract migrants to 2000. The area has now been increased to that which may attract migrants and contain most urban growth until 2010. The boundary has been adjusted to coincide with census/administrative boundaries.

There are 115 zones within the study area (of which 102 are in the `pull' area). These are wards and unions as defined in the 1981 census. As some boundaries have been inconsistently recorded, some interpretation has been needed.

Districts are combinations of zones within the study area. There are five such districts referred to in this report : Greater Dhaka, Savar, Tongi, Keraniganj and Narayanganj.

The Master Plan Area is where structural measures for flood protection will be proposed. It contains most of the area expected to be urban by 2010. However, flooding outside the future urban area will also be considered and guidelines for flood plain management will be prepared for the rural areas.

2.2 National Population Forecast

During the last inter - censal period (1974 - 81), half of all national growth was in urban areas. Migration was thus a major factor in urban growth. The national population is the pool from which Dhaka draws its migrants. The size of this 'pool' is thus of importance in determining levels of urban in - migration.

As the last census was in 1981, the population has to be projected 9 years to obtain an estimate for the present day, 19 years to obtain a figure for ten years hence and 29 years for a forecast 20 years from now. Clearly, the longer term the forecast, the less confidence there will be in its accuracy. Any forecast is based on challengeable assumptions, with the 1991 census soon to provide evidence on the assumptions adopted.

While providing a range of forecasts would more accurately reflect levels of confidence, such a range could, especially long term, become so wide as to be of little use. The different extremes could require the formulation of quite different assessments of what will be needed in Dhaka. A preferred forecast in thus adopted early on.

In forecasting national population, DMAIUDP decided "to take an optimistic view as an act of faith and not because it is clearly heralded by past achievements". Its central forecast fertility assumption was that a replacement level of fertility would be achieved for women entering the reproductive period in the year 2000. This forecast shows:

1975	79 m
1980	91.5m
1985	104.1m
1990	116.6m
2000	138.7m

The extrapolated 93.9m figure for 1981 was an overestimate compared to the census (89.9m). However, its year 2000 figure is well within the range of BBS' current forecasts :

Assuming net replacement rate unity	1990 pop.	2000 pop.
: by 2020	112.9 m	142.1 m
: by 2010	113.0 m	139.7 m
: by 2000	111.3 m	131.7 m

The National Physical Planning Project prepared a series of 20 projections based on combinations of 5 fertility and 4 mortality assumptions. The preferred projection assumed a medium decline in fertility (from an assumed 6.0 in 81 - 86 to 4.8 in 96 - 2001) and a medium improvement in mortality (from a life expectancy assumed at 50 in the first period to 56 in the last). Such a combination was selected because the improvements in fertility and mortality appeared attainable. This resulted in the following forecast :

1981	:	89.9m
1991	:	111.3m
2000	:	147.3m
(2001	:	151 m)

Whatever the assumptions or methods used, continuing forecasting for a further decade will be uncertain; in effect it would be a thirty year projection from 1981. For the NPPP[S] 'preferred' projection, a continuation of its 1996 - 2001 growth rate (2.66% pa) would show a national population of 190m by 2010. A reduction to a growth rate, post - 2000, commensurate with the NPPP[S] low fertility-medium mortality projection (2.02% for 96 - 2001) would still show a 2010 population exceeding 180 million.

DMAIUDP[S] national central projection for 2000 is more likely to be too low than too high. Lower rates of economic growth than the study hoped may continue in the nineties. The implications of a larger migration pool and lower rates of national economic development point towards continuing high levels of in - migration to the capital.

2.3 Alternative Forecasts for Dhaka

A number of population forecasts have been made for differently defined areas:

2.3.1. DMAIUDP's forecasts are for a 'projection area' considered to contain those economic metropolitan functions which provide the 'pull' for urban in-migration. It was assumed that all migrants from outside the district would move into this area. It consists of all the (then) built-up land, plus that which was reckoned would be urbanized by the year 2000.

Though DMAIUDP 's population estimate for this area was pre-'81 census, it proved remarkably accurate.

The projections themselves were based on

- natural increase
- migration
- absorption of rural population by city expansion

The high projection assumed a combination of:

- slow fertility rate decline from current levels
- migration to Dhaka continuing at the 1961-74 rate.
- slow mortality rate decline

The low projection assumed :

- fertility rates falling to replacement levels of fertility for women entering their reproductive years, achieved by 2000
- migration being at a slower rate than during 1961 to '74
- a similar slow mortality rate decline to the high projection

The averaged high and low forecasts used subsequently in the study are summarized below:

Year	Natural increase	Migration	Sub Total	Rural Absorption	Total
1975	2520	-	-	-	2520
1980	2905	470	3375	-	3375
1985	3270	1115	4385	180	4545
1990	3585	1905	5490	390	5880
2000	4275	3950	8225	815	9040

(Figs. in 000)

DMAIUDP argues that migration, a major component of growth, is most likely to be high if national economic growth is slow. Further, continuing migration at the same rate means an increase in numbers as the migrant pool is becoming larger. Slower growth in Dhaka is considered more likely if national economic growth has been higher as this would restrain higher in-migration levels.

2.3.2. WASA Projections. The 1981 "Dhaka Metropolitan Area Water Supply and Wastewater Systems Long Term Development Plan and Feasibility Study" contains forecasts up to 2010 for the metropolitan area. These forecasts were :

1980	:	4.1m
1990	:	6.4m
2000	:	9.3m
2010	:	12.7m

The 1980 population projected to 1981 gives 4.29m, somewhat higher than the corrected S.M.A. census figure of 3.7m. The adopted growth rates however are lower than the previous forecasts.

2.3.3. The JICA Storm Water and Drainage Project prepared projections to the year 2000, but for a study area smaller than the GDPP area and the Dhaka SMA.

The initial forecast for 1981-86 was based on past growth trends assessed at 5-6% annually, on the basis that :

1) the BBS Dhaka region forecast assumes 2.89% annual growth and as, in the past, SMA growth had been 3% higher, it assumed that study area growth would also be 3% higher. This gives 5.89% p.a.

2) National Physical Planning Project Working Paper 4 estimated Dhaka growth at 5.8% p.a.

3) the rate would be less in the study area than the 6.47% estimated for 1974-81 for the whole city, because the study area did not include the peripheral fast growing areas.

However, impressions gained from the JICA land use study suggested that the rate would be less than for 1974-81. The forecast from 1981 to 1986 was made on the basis of 5.3% annual growth.

Projecting the study area population to 2000 appears to have been on the basis of land availability per zone multiplied by density assumptions. The resultant figure for annual growth for 1986-2000 is 3.03%

2.3.4. The most recent set of projections for the city are those by Mir Shahidul Islam and A.S.M Mahbubun Nabi, of the Bangladesh University of Engineering and Technology (BUET)in their paper, 'Population of Dhaka City : Past, Present and Future'.

The annual increase in Dhaka between 1961 and 1981 was over 9%. The paper notes that this extremely high rate is a function of migration, natural increase, and extended city boundaries. When the 74-81 growth is applied to a constant area, the annual increase was 5.59%

For the period 1981-2000, the limits to the urban area in 2000 were assessed and projections made for this consistent area. The population of this area in 1981 was 3.642 million.

Projections were done for both natural increase and migration components. For natural increase, two projections were made, both with constant mortality rates and decreasing fertility. Decreasing fertility was predicted because of a rapid expansion in family planning, more educated women in the city and a high male to female ratio. The lower growth variant assumed replacement fertility levels being achieved by 2000 while the higher assumed its later achievement.

Two assumptions were also made on migration. The higher assumed that 1974 - `81 migration levels would remain but that its natural increase would be at decreasing rates. The lower assumption was that all factors reducing migration would be effective and bring about lower in - migration rates than during 1974 - `81.

The growth resulting from the combination of these causes is summarized below :

Year	Total Increase p.a.		Total Population	
	High	Low	High	low
1981			5.59% 3642	
1981 - 1986	5.3%	5.1%		
1986			4715	4671
1986 - 1991	4.9%	4.5%		
1991			5989	5821
1991 - 1996	4.4%	3.6%		
1996			7428	6946
1996 - 2001	3.8%	2.6%		
2001			8951	7898

(Figs in 000s)

2.4 Selection of Preferred Growth Rate

The preferred variant for subsequent use in this study is selected on the basis of what appears most reasonable and attainable.

The JICA projections follow a logical methodology but :

1) no corrections were made for 1974 and 1981 census undercounts. It follows therefore that its trends are inaccurate (but not necessarily wrong).

2) the study area is considerably smaller than the GDPP area.

3) a 'saturation' capacity limit is considered unlikely to have been reached given that so little new land has been developed.

The DMAIUDP accounts for all the major variables and has examined the issues in depth. The closeness of its estimates to the 81 census suggest that its continuing use would still be valid. Nevertheless, its low projection assumes that replacement level of fertility for women entering their reproductive years would be achieved by 2000. This now appears unlikely. National population in 2000 may also be higher than DMAIUDP's forecast. Thus the migration pool would be greater. As an economic upturn hoped for by DMAIUDP may also prove unlikely in the nineties, migration levels are considered likely to stay high and not decrease significantly. We therefore prefer the higher variants of both the natural increase and migration components.

The B.U.E.T. forecasts are for a slightly different area to DMAIUDP. However, no correction has been made for the 1974 and 1981 census undercounts. This would slightly modify growth trends. BUET follow the DMAIUDP procedure in differentiating between natural and migration caused growth. Their higher variant seems to be a realistic assessment of what is likely to happen given the continuation of current economic trends into the nineties.

A comparison of the two high variant growth rates is given below :

	DMAIUDP	BUET
1980 - '85	5.8%	
1981 - '86		5.3%
1985 - '90	5.2%	
1986 - '91		4.9%
1990 - '95	5.1%	
1991 - '96		4.4%
1995 - 2000	4.9%	
1996 - 2001		3.8%

The average of these estimates has been adopted to the year 2000. For the next decade, if we assume a continuing decline in natural increase as per BUET, this would mean natural increase of 1.6% and 1.4% per annum for the periods 2001 - 06 and 2006 - 11 respectively. This would mean higher contraceptive usage and lower family size in Dhaka than nationally, which is not an unreasonable expectation.

In the same manner as DMAIUDP assumed improved economic development a decade hence, we may similarly assume some improvement nationally post-2000 which would reduce levels of in-migration. Any estimate of this is arbitrary. Both the preferred high projections show migrants increasing between 1980 and 2000, but reducing as a total component of city growth. We have assumed a continuation. In the BUET projection, this would lead to an additional 1.15 million migrants between 2001 and 2006 and a further 1.25 million between 2006 and 2011.

The resulting total annual increase (both natural growth and migration) is the equivalent of 3.35% for 2001-06 and 3% for 2006-2011.

These annual growth rates adopted are summarized in the table below: In addition, it should be noted that:

1) data from Table PO 1 p.p. 49-59. Dhaka SMA Thana Series (BBS July `85) is used. Unlike some other tables in other publications, this table is internally consistent and adds up to the commonly quoted SMA total.

2) 7.7% has been added for 1981 census undercount (see Post Enumeration Check. BBS. October 1983).

3) a projection area (or `pull area) as defined in Fig. C.1 is used.

PERIOD	GROWTH RATE	POPULATION	POPULATION INCREASE
1981	-	3.98 million	-
1981-90	`81-85:5.55% pa `86-90:5.05% pa	-	+ 2.34 million (+59%)
1990	-	6.32 million	-
1990-2000	1990-95:4.75% pa 95-2000:4.35% pa	-	+ 3.54 million (+56%)
2000	-	9.86 million	-
2000-2010	2000-05:3.35% pa 05-2010:3 % pa	-	+ 3.62 million (+ 36%)
2010	-	13.48 million	-

Quite small changes in growth can affect the population forecast for a particular year. In turn, this could determine whether particular areas would need to be developed at particular times. But, if the forecast is too high, a population predicted for a particular year will be reached later and if too low earlier. Given the pressures causing in-migration, any forecast is only likely to be wrong in its timing.

3. Existing Land Use

The JICA Study Team conducted a land use survey of the study area at scales of 1:20,000 and 1:50,000, between November 1990 and February 1991. It is believed to be the first detailed land use survey of the city. Its major use has been to establish a sound definition of the present situation prior to determining urban development trends. It is also used to determine run-off coefficients within the study area.

The classification of uses shows seven residential types, determined so as to permit their identification in the field without need for interpretation. The other major land uses differentiated are commercial, industrial, institutional, recreational, transport use, and water bodies. Excerpts from the 1:50,000 land use sheet, covering the existing built-up parts of the study area, are shown on Figs.C.3a to C.3d.

Other sources have also been used to complete the picture of current land use and trends.

The aerial photographs of December 1983/January 1984, at 1:50,000 scale, were made available for checking at SPARSSO Headquarters. This check was used to supplement the land use survey (which concentrated on the urban area) in the city's rural surroundings. This record of Dhaka's development seven years ago has also proved invaluable for comparison with the record of present land use, to allow a determination of trends. The land use survey has been supplemented also by the plotting of slum and squatter settlements surveyed in 1988 and reproduced in a 1990 seminar paper.* This map is reproduced in Fig.C.4.

The following table, based on the 1:50,000 land use map, summarizes major land uses in 1990.

	GREATER DHAKA		TONGI		DND/NARA-YANGANJ		KERANIGANJ		SAVAR		TOTAL	
RESIDENTIAL	5,939	22%	273	7%	1,508	15%	243	1%	498	2%	8,462	10%
COMMERCIAL	466	2%	55	1%	149	1%	13	0%	53	0%	737	1%
INDUSTRIAL	352	1%	304	8%	460	5%	21	0%	81	0%	1,217	1%
INSTITUTIONAL	1,125	4%	22	1%	111	1%	12	0%	814	3%	2,083	3%
ROADS	1,745	6%	83	2%	438	4%	261	2%	305	1%	2,832	3%
OTHER URBAN *1)	1,767	6%	27	1%	279	3%	131	1%	648	3%	2,852	3%
VILLAGE	812	3%	292	8%	1,662	16%	1,546	9%	1,778	7%	6,089	7%
AGRICULTURE	11,860	44%	2,654	70%	4,826	48%	13,093	77%	18,926	78%	51,358	62%
WATER	3,462	13%	57	2%	662	7%	1,715	10%	1,217	5%	7,112	9%
BUILT-UP AREA	12,205	45%	1,057	28%	4,607	46%	2,228	13%	4,176	17%	24,273	29%
OTHERS	15,052	55%	2,711	72%	5,488	54%	14,807	87%	20,142	83%	58,470	71%
GRAND TOTAL *2)	27,257	100%	3,768	100%	10,095	100%	17,035	100%	24,318	100%	82,742	100%

*1) includes graveyards, urban open space, cantonment.

*2) major rivers (total area 85,000 ha) excluded

The major features of land use are :

1) the preponderance of mixed uses. This is particularly evident at 1:20,000 scale, even though only predominant land use has been recorded. A more detailed land use survey would show an even greater mix of uses.

2) the low proportion of non-residential uses - parks, roads, commercial and industrial areas - compared to the major residential use and particularly compared to the population these uses serve.

* Extent and Causes of Migration into Dhaka Metropolis, and the Impact on Urban Environment. A.Q.M. Mahbub & Nazrul Islam. Proceedings of the Seminar on People and Environment in Bangladesh. UNDP/UNFPA February 1990.

3) the wide scatter of very poor slum and squatter settlements, which house a third of the city's population, but within very small areas. In contrast, disproportionately large areas of the city are used for housing the upper income groups.

4) (when compared with population data) the high densities, especially in the inner city and slum/squatter settlements. Even in higher class suburban development, relatively high densities prevail.

These features reflect an intensity of land use brought about by increasing population pressure, limited alternative development areas for most people, and the lack of a transportation system which would allow a more extensive development pattern. These features are referred to later when more detailed consideration is given to past trends and likely future patterns of growth.

4. 1981 Population Distribution

The 1981 census is the basis not only of population forecasts but of distribution of existing population and its increase. This is done on a zonal (ward/union) basis, which is sufficiently detailed for the purposes of this study. These zones range in size and are much larger in peripheral areas which have low populations than in the inner city, where population densities are high. The wards/unions are shown in the Small Scale Atlas of the Bangladesh Bureau of Statistics. But there are a number of inconsistencies. It is sometimes difficult to determine accurate boundaries, particularly at the DMC periphery. Some interpretation of conflicting maps has therefore been necessary. There are also inaccuracies in zone areas. To allow a more confident interpretation of population densities and land use on a zonal basis, these zones have all been remeasured. As with the overall `pull' area population, 7.7% has been added to each zone population to account for census under - enumeration. The summary of 1981 census (corrected) population distribution per zone is contained in section 10.

5. Basis for Distributing the Forecast Population Increase

The main factors which currently determine population distribution, plus those factors which we think will continue to do so, are summarized below.

1) Research on allocation of urban land between different groups shows a remarkable unfairness. Nazrul Islam, in his paper on "The Poor's Access to Residential Space in an Unfairly Structured City" * shows that in Dhaka, the overwhelmingly poor majority, 70%, has access to only a fraction of the city's land. This poorer 70% is defined as those with total monthly household incomes below Tk. 3,000 (in 1987). They occupy no more than 20% of the city's residential land. We have used this basic breakdown between the relatively rich and the poor in our distribution of population increase. It is apparent from an examination of the development that has taken place in the past decade that almost all planned development is for the relatively rich. The poor are crowded into smaller, unplanned areas. We are assuming that development processes will not change sufficiently over the next few years to allow significant provision of new urban land to be allotted to the poor, majority, portion of population increase during the nineties. New provision for the top 30% will be in planned and for the lower 70% in unplanned areas.

2) A comparison of the built up area on the 1983 - 84 aerial photograph with the built - up area indicated on the 1990 - 91 land use survey shows that for three quarters of the 1981 - 90 period, development of new land was very much in a peripheral fashion (as forecast by DMAIUDP). Certainly the amount developed was in no way commensurate with a population increase, estimated at 59% between 1981 and 1990. Very roughly, urban land increase was under 20%. Clearly then, there would have been considerable increases in density in existing areas to accommodate population growth.

   Because of the anticipated continuing massive rate of urbanization (the population being forecast to increase 113% over 20 years) densities will progressively increase in existing areas. Similarly, development of new areas will increasingly be at higher densities, reflecting this pressure. Between 1981 and 1990 population density increased from 233 p.p.ha overall to 319 p.p.ha, a 37% increase.

3) Densities will not, nowever, become uniformly higher. Particularly in some of the more developed zones, there may be limits, or at least constraints to the capacity to absorb extra population. These limits are likely to be considerably higher than existing densities, but they are unlikely to have been reached during 1981- 90.

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* ref: Oriental Geographer. Vols XXIX - XXX. 1985 - 86.

4) Greater development opportunities for the relatively rich in new areas mean that density increases in existing rich areas should not be as great as in existing poor areas. Only when substantial quantities of serviced land are made available for the poor is it possible to speculate that densities in poor areas will stop increasing. At earliest, this will be after 2000.

5) For the majority of the city's inhabitants, the need to live near to work, or near to transport to work, determines the place of habitation. Thus densities will continue higher in inner city zones and near major public transport corridors. The other factor determining likelihood of urbanization is freedom from flooding. High land, or relatively flood free land, close to the city and major work zones will be rapidly developed.

Both these factors will determine which new areas will be developed over the next decades. Recent trends suggest that proximity to the city is more significant than freedom from floods (individual action may reduce flood proneness but cannot improve location). The provision of mass transit to more distant flood free areas would however increase the attraction of higher, more distant land relative to lower lying, more central locations. The relative importance and likely impact of each is difficult to quantify : there is little evidence which permits any detailed quantification. Still, the broad outline of the future development pattern should be in response to these influences.

6) However, a more favorable assumption is made on land allocation between rich and poor, post - 2000. Long range planning requires some degree of optimism: there is little point in planning long - range on the basis of a scenario of unrelieved gloom. It is therefore assumed that, during the nineties, measures will be taken which will allow significant amounts of serviced land to be made available to the poor post - 2000. But, even if such areas are not made available, the need for new urban land will remain as population grows in subsequent periods. Further, the basis of any long term flood prevention plan has to be the maximum probable distribution of urban uses rather than the minimum.

7) For those parts of the study area outside the `pull area' (that is, rural areas which will stay rural) it is assumed that population increase will be the same as natural increase, and will stay `in-zone'.

The distribution of population increase in the following sections is on the basis of these considerations.

6. Distribution of 1981 - 1990 Population Increase

In the distribution of this population increment (2.34 million) a distinction is made between the relatively rich and the poor, and between existing areas and new areas. Comparison of the 1983/4 and 1990/91 boundaries of urban areas (see.Fig.C.5.and C.6) shows that the increase in new area developed was not proportionate to population increase. Thus, a high proportion of the increase is distributed in existing built - up areas.

6.1 Distribution of Anticipated Increase in the Relatively Rich

The increase in the relatively rich is assumed as 30% of total increase. This amounts to 702,000.

6.1.1 A reasonably complete record exists of the major new planned developments undertaken for this upper 30%. The two main sources of information are RAJUK and the comparison of the 1983-84 aerial photos with the 1990-91 land use survey. On the basis of capacity estimates, we consider that a third of the increase in the relatively rich was housed in new areas in the period 1981-90. These major new planned areas, and their population increments, are estimated as :

a) Baridhara	15000
b) Uttara (50% developed)	47000
c) Savar	10000
d) DND Triangle (over 50% for the relatively rich)	104000
e) Mirpur	15000
f) Senparaparbata	20000
g) Goran/Khilgaon	15000
h) Cantonment	10000
Total relatively rich in new planned areas	236000

The location of these areas is shown on Fig.C.6. Subsequently, these totals have been sub-divided between the zones which make up these particular areas.

6.1.2 The remaining 466,000 increase of the relatively rich will have been housed at higher densities in existing better areas, including the infill of smaller bits of undeveloped land. The distribution of this increment is in accordance with the distribution of the top 30% of the housing categories contained in the '81 census.

6.2 Distribution of Anticipated Increase in the Poor

The increase in the numbers of the poor between 1981 and 1990 is estimated around 1.64 million. Limited development of new land means that most of this increase has been accommodated in existing areas. Distribution is into three categories:

6.2.1 The natural increase element of population growth between 1981 and 1990 is an estimated 38.6%, and amounts to an increase of 625,000 in the 70% poor. This has been distributed as higher density in existing areas, based on the distribution of the lower 70% of the 1981 census housing categories.

6.2.2 The remaining increase of over 1 million has been divided between new areas and the very poorest concentrations of bad shelter in existing areas. A classification of housing types and a distribution of the lowest category settlements are contained in two studies already mentioned* . These studies estimate that nearly a third of Dhaka's population lives in very poor slum/squatter concentrations, and they are the basis of our distribution of the increase in the very poor. Thus 30% of the total 1981-90 population incase, 709,000, has been distributed in these illegal, unauthorized, and unplanned pockets. The detailed distribution per zone is based on the percentage of these settlements within each zone, as taken from the slum and squatter distribution map (see C.4).

6.2.3 The residual 304,000 poor has been distributed in new unplanned areas. Comparison of the two land use maps for 1983-4 and 1990-91 suggest the main areas developed by the poor. On the basis of a constant density, the distribution is assumed as follows :

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* Op.Cit. Nazrul Islam.`The Poor's Access to Residential Space ....
Op.Cit. Mahbub & Islam. Migration & Impact.

Western periphery : development into higher risk areas from Mohammadpur in the South to Amin Bazar in the north	+ 42,000
Eastern periphery : from Badda south to Gandaria	+ 19,000
DND Triangle	+ 95,000
Linear development E of Katchpur Bridge	+ 7,000
Kamrangir Char	+ 35,000
Mirpur area	+ 16,000
Tongi-Uttara : linear development north of the Airport	+ 38,000
Uttara East area	+ 23,000
Scattered smaller areas	+ 29,000
Total	+ 304,000

These areas are shown on Fig.C.6.

The largest concentration is in the DND Triangle. On the basis of land use changes between 1979 and 1989, it was assumed that total development here accommodated 199,000 people* . In section 6.1.1 it was estimated that 104,000 were relatively rich, with the remainder in the lower income categories. Subsequently, these totals have been sub-divided between the zones within which the development has occured.

In the rural areas (outside the Dhaka `pull' zone but within the study zone) are a further 13 zones with a 1981 population of 320,000. In these zones, the 2.5% national annual increase (amounting to 25% over the 81-90 period) is assumed to stay in zone throughout.

The table below summarizes the distribution of the population increase during this 1981-1990 period. Table C.1 summarizes population and urbanization trends in the same period.

* Based on comparison of 1979 1:50,000 Topographic Map with maps in Feasibility Report on Rehabilitation of DND Irrigation Project. (November 1989) plus 90/91 land use survey.

	1981	Increase	1990
RELATIVELY RICH	1194,000	+ 702000	1,896,000
in major new identified planned areas (on basis capacities)		+ 236000	
in existing areas (residual as higher density/infill)		+ 466000	
POOR	2,786,000	+1638000	4,424,000
higher densities in existing poor areas (all the natural population increase element)		+ 625000	
poorest slum and squatter areas (maintains same % of total inc. in these areas as % of existing population)		+ 709000	
new peripheral poor unplanned areas (residual distributed in identified main areas)		+ 304000	
TOTAL URBAN `PULL' AREA	3,980,000	+ 2340000	6,320,000
STUDY AREA TOTAL (including rural areas outside pull area)	4,126,000	2,374,000	6,530,000

7. Distribution of 1990 - 2000 Population Increase

The distribution of the anticipated 1990 - 2000 population increase (3.54 million) is done in a similar fashion to 1981 - 90. A distinction is drawn between existing areas and new areas and between the relatively rich and the poor.

7.1 Distribution of Anticipated Increase in the Relatively Rich

The total increase in the relatively rich (assumed to stay at 30%) is estimated at 1.062 million. Part of this increase has been apportioned to existing planned areas in the form of higher densities and part to known new commitments.

7.1.1 Our estimates of the capacity of proposed new `rich' areas (following), suggest that it may be over three times as much as for 1981 - 1990. Thus, pressures for higher densities in existing better - off areas will be less. Still, it cannot be assumed that no densification will take place. It is assumed that half the natural increase in the relatively rich for the period will remain `in -zone' in the form of higher densities. Half the natural increase is 18.45% of population increase. Thus, 196,000 people are distributed per zone in proportion to existing 1990 distribution of better-off areas.

The density increase is less than for 1981- 90. In 1981 - 90, densification in the rich areas was estimated at +38% (an extra 466000 people in areas with a population of 1,226000). For 1990 - 2000, densification is forecast as 10%, (an extra 196000 in areas with a population of 1,928,000). This is because continuing increase gets more difficult as areas become more highly developed, and because alternative possibilities (at least for the rich) exist.

7.1.2 The major planned new developments for the upper 30% are:

1) Panchibati : This area partly overlaps the DND Triangle. It consists of 189 hectares to be developed for commercial and residential purposes by RAJUK. At the average 1981 net urban density * of 233 persons/hectare, capacity would be 44,000.

2) Katchpur : This area south of the Katchpur Bridge on the eastern side of the Lakhya River, is currently being surveyed by RAJUK. It is intended for mixed residential and industrial development, but is dependant on flood protection. Assuming half the area is for housing (212 ha) and development at the net urban density, the capacity would be 49,000.

3) A further 90 hectares is to be developed by RAJUK in Baridhara and Badda, in two portions on Rampura Road. Some development has already started on 200ha. at Basundara. Again at the average city density, this would cater for some 68,000, mainly from very high income groups.

4) Uttara East : This is an area of 485 ha, usually flood - free, which will be developed for upper income groups. We are assuming that 36,000, half the RAJUK target population, will be accommodated here during this decade.

5) Savar : A development plan has been prepared for RAJUK for the Savar area and will soon be approved. It is intended that most of the land be privately developed, but RAJUK will also implement some of its own projects in the area. The target population for the plan area is 250,000. The 1900 population is estimated at 124,000 and a considerable area has been earmarked for development by various organizations and associations. A further 126,000 should therefore be accommodated in this area. However a substantial portion in the south is low-

* Total population divided by total built up area (all uses)

lying and would need extensive flood protection. We are therefore reducing capacity to an additional 100,000.

6) Senparaparbata : RAJUK have a plan covering some 650 hectares in this area. The area is substantially flood free, within the urban envelope, and should be attractive to middle income groups (considered as part of the top 30%). The plan, which allows intensified development in a more rational fashion, should accommodate at least an additional 100 persons per hectare during the next decade. This equals 65,000 people.

7) Considerable additional capacity exists in the DND Triangle. This area, amounting to 5860 ha, is currently being surveyed and planned by RAJUK. The area was protected for irrigation purposes, and was substantially flood - free during 1988. Subsequently, an embankment wall has been built around the area. It is therefore land of considerable value for urban development. This is reflected in land speculation, particularly around the Asian Highway, which cuts across the Triangle and provides good access to the northern portion. There is currently a freeze on development but much development had already occured beforehand. A population increase of 199,000 has already been estimated for 1981 - 90. Development will be accelerated by the road currently under construction southwards from the Asian Highway through the middle of the Triangle. RAJUK intends developing 800 hectares itself in two separate portions.

Clearly, at the reported price levels for some areas, development in parts of the Triangle for low-income groups is unlikely. But only part of the DND Triangle is likely to prove attractive to the relatively rich. Some is likely to be developed for those on lower incomes. To the south, the industrial plots allotted by RAJUK at Postagola, and the further 286 plots proposed at Shyampur (Narayanganj Road) should attract lower income group settlement. Development of a second container depot , as suggested in the JICA Study, on the opposite bank of the Buriganga, should also foster development within the Triangle, only a short ferry trip away from any industries located in proximity to the depot.

Of the total 5860 hectares in the Triangle, some 15% would need to be reserved as retention ponds. This leaves 5000 hectares for development, At the 1981 average net urban density (233 p.p.ha) the total capacity of the area would be 1.165 million. An estimated 2960 hectares has already been developed, albeit not fully, and at fairly low densities. The present population is estimated as 219,000

(1981) plus 199,000 (81-90 increase). The extra capacity could then easily be 747,000. It is assumed that development will be in accordance with the relative proportions of relatively rich and poor (30/70) in the population. Thus an additional 224,000 of the upper income group may be accommodated in this area.

8) Half of Uttara Centre has already been developed. Additional capacity is estimated at 47,000.

9) A start has also been made on Uttara West. We estimate the capacity of this area at 30,000.

10) Mirpur : areas already earmarked for development, with an estimated capacity of 30,000.

11) Goran area : sizeable portions in the low lying area East of the Rampura Road are known to have been purchased for housing development, urbanization extending incrementally towards the Balu River. We assume that development capacity during the whole decade in this area will be 49,000, twice the capacity of areas currently being developed.

12) A similar assumption is made regarding additional capacities in Tongi, estimated at 8,000.

13) The completion of the new embankments, south of the Aricha Highway to the Rayer Bazar area, will create an additional area of flood-free land in a good central location. We consider that this will be largely developed for upper income groups and estimate its capacity as 60,000.

Total upper income capacities of these thirteen areas is 810,000. The average density used in determining most of the capacities is the net urban density for 1981. The 1981 figure has been used in preference to 1990 as, irrespective of densification pressures, densities will be lower in the first stages of new development.

14) In addition, some land will probably be developed for upper income groups within that area between the International Airport and Mirpur, currently being flood-protected. Much of the remaining 1990-2000 population increase in the relatively rich could be accommodated here. But this is unlikely given other alternatives and only the residual 56,000 is distributed here for this period.

These areas are shown on Fig.C.7.

7.2 Distribution of Anticipated Increase in the Poor

By the year 2000, an additional two and a half million poor people will be living in Dhaka. Most of the increase will continue to be accommodated at even higher densities in existing unplanned and slum developments and in new, unplanned, more marginal zones at peripheral locations.

There are some signs of change. RAJUK propose part of their plan for the DND Triangle for the poor. Other, externally funded, projects will improve conditions in poor areas. The World Bank Urban Development Project will improve and rehabilitate services in Old Dhaka, while the ADB funded Urban Infrastructure Improvement Project will improve municipal services for some 300,000 as well as develop residential plots in Mirpur. Overall, however, most of the increase in the poor will be housed in unplanned areas, new and existing.

A similar approach to 1981-90 has been followed for distributing the 1990-2000 increment of poor people, at higher densities in existing areas, in slum and squatter settlements within the city, and in new marginal and peripheral locations.

7.2.1 The natural increase element of population growth between 1990 and 2000 is estimated at 36.9% of total growth. This amounts to 916,000 in the poorer category. We estimate that all this natural increase will be accommodated, unevenly, as higher densities in existing poorer areas. Further density increase will become increasingly difficult but there is still some scope for increases as currently a wide range of densities prevail for similar housing types.

However, we assume that continuing density increases will be less where densities are already high. Because of current high densities and continuing change from residential use, we assume that a ceiling of an extra one-third of 1990 population will operate in the central zones (11-31). Density increases would be greater in other zones as a result. In general, a move towards an overall levelling, with higher density increases taking place outside the central zone, should occur.

7.2.2 It is assumed that a continuing 30% of the total population increase will be in slum and squatter areas. 30% of total population increase amounts to 1.062 million. For 1981-90 we assumed that this increment was in accordance with the distribution of slum/squatter settlements per zone. However, for the next ten years we cannot assume a static

location and number for existing slum/squatter areas within the city. They will grow proportionately. New slum/squatter areas will develop within the built - up area. We are assuming that the distribution of this segment of increase will be in proportion to total population per zone for 1990.

7.2.3 The third (remaining) portion of population increase amongst the poor amounts to 501,000. This is distributed amongst new or extended peripheral `trend areas. The potential areas are :

1) Mirpur. This is untypical, being a planned development for the lower income groups. Its planned population is 50,000.

2) DND Triangle. It has already been estimated that at the net urban density, a further 523,000 can be accommodated in this area.

3) Tongi-Joydebpur. Linear development is taking place along the Mymensing Road on land commonly flood free. Industrial development is already proceeding on this axis and will attract residential development in its wake. The current commitments/plans for upper income developments elsewhere, and the peripheral industrial development here, would point to this area being developed for lower income groups.

4) East of Katchpur Bridge : Similar linear industrial development is taking place on both Sylhet and Chittagong Roads, and is also likely to attract growth. The RAJUK proposed Katchpur industrial development would further accelerate growth here.

5) Turag River : A substantial area between the Turag River and the International Airport/Uttara is being protected by embankment. While the embankment is largely complete, work is still required on sluice gates, strengthening, pumping stations and retention ponds. The area is very low lying. Large portions may continue being unsuitable for development for some considerable time. Nevertheless, on completion of the embankment and all associated features, much additional flood - free land will be available. At least part will be developed. 56,000 of the relatively rich have already been apportioned here, but the area is sufficiently large to accommodate lower income groups.

6) Eastern periphery : Some upper income development has already been apportioned here, as land purchases have already been made by private developers. This is likely to be accompanied by unplanned, low - cost shelter in peripheral, more marginal locations, particularly in view of the urban poor's need to live close to work. Continuing development in incremental stages is likely to continue at some speed, but some restrictions will be required to reserve retention pond areas.

7) Karmarangir Char has been developed rapidly over the last few years. This is a reflection of the limited choices available to the urban poor. Kamrangir Char is outside the line of the GOB funded embankment currently under construction, despite a rapidly increasing population. Its location, and continuing restriction on other choices, should ensure its continuing growth.

8) Western periphery, north of Kamrangir Char. RAJUK have proposed a development plan for all this area, north to Mirpur Bridge. This totals some 1600 hectares. The alignment of the new embankment however cuts this area in half. Most of the protected area will, because of high land values, be developed for upper income purposes. An estimate for the rich has already been made. However, unplanned development is likely on and beyond the embankment in such a central location, irrespective of risk.

9) Uttara East (peripheral) : Continuation of trend development in this area to take advantage of proximity to growing industrial development in Tongi.

These areas are shown on Fig.C.7.

The degree of development in each of the areas will depend on their comparative advantages in terms of cost, proximity to jobs, risk, and amount of development land. As we cannot with any confidence gauge the comparative advantages, we have distributed the residual increase equally amongst areas 2) to 9) with 56,000 in each.

These developments are unlikely to use much additional land. We have already mentioned that 80% of the population gets only 20% of the land. It is unlikely that this situation will dramatically change in the nineties. With such allocation, estimating an additional 3700 hectares planned for the better - off (866,000 people at 233 p.p.ha), this increment of 501,000 poor people in peripheral areas be accommodated in less than 1000 hectares.

For the rural areas, outside the 'pull' zone, the distribution of the increase is 'in-zone' and estimated on the basis of the national population increase.

The table below summarizes the distribution of the 1990 - 2000 population increase.

	1990	Increase	2000
RELATIVELY RICH	1,896,000	+ 1062000	2,958,000
in major new identified planned areas (on basis capacities)		+ 866000	
in existing areas (residual as higher density/infill)		+ 196000	
POOR	4,424,000	+2479000	6,903,000
higher densities in existing poor areas (all the natural population increase element)		+ 916000	
poorest slum and squatter areas (maintains same % of total inc. in these areas as % existing population)		+ 1062000	
new peripheral poor unplanned areas (residual distributed in identified main areas)		+ 501000	
TOTAL URBAN `PULL' AREA	6,320,000	3,541,000	9,860,000
STUDY AREA TOTAL (including rural areas outside pull area)	6,530,000	3,300,000	9,830,000

8. Distribution of 2000 - 2010 Population Increase

For the period 2000 to 2010, a population increase of 3.618 million is forecast. This compares with 3.54 million for 1990 to 2000.

Our assumptions on population distribution and urbanization for 1990-2000 were essentially similar to 1981-90:

1) almost all new land developed would be for the relatively rich, but there would also be density increases in existing rich areas.

2) the lack of new land for the poor would result in higher densities in poorer areas, more slum and squatter settlements, and more unplanned peripheral development.

Overall, the increase in the urbanized area was not forecast to keep pace with the increase in population.

Two major studies are scheduled for 1991. These are the Metropolitan Planning Study and the Transport Study. Decisions based on these studies plus decisions already taken on flood protection and to be taken on the basis of the current studies, will provide the framework for long term urban growth. Here, however, we need to decide on this framework without the benefit of the metropolitan planning and transportation studies. While it is relatively straight forward to predict a continuation of existing trends between 1990 and 2000, it is more difficult to predict the likeliest changes long term.

Major change is assumed by 2000. During the nineties, financial, legal, institutional and other measures will be effected so that a fairer distribution of new urban land will be possible post - 2000. The poor will get a larger share of new land. Population increase will be high, but it is assumed that the amount of new land becoming available will also be much higher. Potential development areas post-2000 are therefore being considered on the basis of accommodating all income groups.

8.1 Increased Density in Existing Areas

The availability of new urban land should reduce the pressure for increasing density in existing areas. Nevertheless, some pressure will still remain, particularly in more favoured locations. The assumptions are stated below :

8.1.1 For the rich 30%, a distinction is made between areas already developed by 1990, and those developed between 1990 and 2000.

1) in the pre-1990 developed areas, it is assumed that density increases will be less than previously, as the greatest opportunities have already taken place. A 5% density increase (half that of 1990-2000) is assumed. This would accommodate an additional 96,000. It is distributed in proportion to the 2000 population of relatively rich people in these areas, with the exception of the inner city zones with a density already above 1500 persons per hectare. In these high density areas, it is assumed that the density ceiling has been reached and that further population absorption will not occur.

2) in the parts of the city developed between 1990 and 2000, an average density of 233 p.p. ha. was assumed, the equivalent of the 1981 density, as any first phase development would be at a lower density than the 1990 city average. Post 2000,

opportunities for increasing density will be much greater in these areas than in older parts of the city. It is assumed that the increase will be as for 1981-1990, from 233 to 319 p.p.ha. Such an increase, of 86 p.p.ha. applied to the year 2000 population in these areas (866,000) will amount to another 320,000 people.

8.1.2 The increase in the poor, in the period 2000 to 2010, is forecast at 2,533,000.

The pressures on the poor to live near to work will still operate post - 2000, though provision of mass transit would modify this to some extent. Over twenty years there may also be changes in distribution of work places, but the existing concentrations are likely to remain. There may be constraints on increased densities in some existing areas. Overall however, the trend towards higher densities will continue.

The degree of such pressure will depend on how much new land will be available for the urban poor following the measures assumed taken during the nineties. If large amounts of land are released, then densification pressures will ease. If only small amounts are released, then densification pressures will intensify and numbers living in unplanned peripheral settlements will grow even more.

We have already elected to make more favourable assumptions for the period after 2000. On that basis, it is assumed that density increase in existing poor areas will be half that for 1990-2000. That is, half the estimated natural increase in the bottom 70% will stay in-zone as opposed to all of it. The natural increase proportion of 2000-2010 growth is estimated at 49%. Half this increase applied to the increase in the poor 70% is 620,000 (3.62 million x 70% x 24.5%).

On the basis of these calculations, the extra numbers (rich and poor) accommodated by higher density will be 1.036 million. As the total population increase forecast is 3.618 million, the numbers needing additional new urban land will be 2.582 million. 669,000 will be relatively rich and 1.913 million poor.

8.2 Potential Development Areas

What are the areas which could be developed to accommodate this population increase? Is it necessary to develop all these areas or do choices exist?. The major areas are shown on Fig.C.8. Their potential capacities are discussed below :

1) Yusufganj New Town.

This is a proposal by RAJUK for an area of some 6,000 acres east of the Balu River. A land use survey and plan is currently being prepared. The consultants quote town size as 350,000. The area will not need to be protected from floods as it is relatively high land. It will however need a bridge across the Balu River.

2) Tejgaon Airport :

This is an extensive and strategic area of 215 hectares in a central location. Proposals for its redevelopment have been considered for some time. Its development at a density of 233 p.p ha. would increase population by 50,000.

3) Uttara East :

It was estimated that half this development would be implemented during 1990 - 2000. The other half would accommodate a further 36000 people.

4) DND Triangle :

For 1990 - 2000 an additional 280,000 were distributed here in an area with an estimated total capacity of 747,000. There should therefore be room for an additional 467000 in this area at 1981 average densities.

5) Keraniganj is particularly low lying and needs flood protection before development. The completion of the Friendship Bridge in 1989 opened up this area close to the city's commercial centre, on a main radial out of the city. Consideration is now being given to the construction of another bridge to cross the Dhaleswari. Further impetus to development should come from the proposed container depot some 3.6 km to the South. This should attract industrial and service developments, which in turn would attract residential growth to Keraniganj. Keraniganj is rated as mostly poor agricultural land (see fig. C.9).

Currently, RAJUK has frozen development in the area, prior to the preparation of a master plan for the larger part of Keraniganj. What area would be developed would depend very much or what area would be poldered. For a first assessment of capacity a possible maximum has been assumed. Such an embankment would protect existing developed areas, maintain a distance of 1 km from the Dhaleswari, safeguard the container depot site and use existing road lines as embankment where possible. The area, excluding what is already developed,

minus a 15% allowance for retention ponds, and developed at 233 p.p.ha, would accommodate 1.022 million.

6) Mirpur - International Airport.

This is a sizeable area east of the Turag River embankment and Mirpur, South of Tongi Khal embankment, and west of the Cantonment and the International Airport. The area will be fully flood protected following the completion of the embankment. The total area, excluding the existing built-up area, known commitments, and the Cantonment makes up the additional potential development area of 3280 hectares. However, a minimum 15% of the whole drainage zone should be retained as a retention pond prior to pumping outside the embankment. This amounts to some 900 hectares. The remaining potential development area is 2380 hectares. The area adjacent to Tongi and east of Mirpur is likely to be the most attractive.

From the land use survey, some 10% of this area is already developed as peripheral and village settlements. A further allowance has to be made for the assumed population increment here between 1990 and 2000. This is estimated at 112,000 and at the average density of 233 p.p.ha, would amount to 480 hectares.

The remainder, available post - 2000, would thus amount to around 1660 hectares. At the same density, post - 2000 capacity would be 387,000.

7) Savar Phase II.

A RAJUK phase II development is intended for Savar, post - 2000, which would house a further 300,000 people. No survey or plan has been prepared. An estimated 7300 ha. of high land, located between RAJUK's Savar phase I and the Turag River, has potential for further development without requiring flood protection. At the average density of 233 p.p.ha., capacity would be 1.9 million, rather than 300,000. This area is a substantial portion of DMAIUDP's Northern Expansion Strategy area. According to the land capability survey, (see fig C.9) most of the land in this area is good or very good agricultural land.

8) Tongi - Joydebpur Northern Expansion.

This constitutes the remainder of the DMAIUDP's Northern Strategy area. While the southernmost part would be protected by any Tongi Embankment, the major

portion does not require flood protection. The whole area, on the basis of DMAIUDP'S rough outline, amounts to 14300 hectares (excluding existing developed area). At 233 p.p.ha, its capacity would be around 3.33 million. Clearly the development potential of the area would be enhanced by any linear road or rail based mass transit. This may be in place pre-2010. This potential development area could in fact extend further north, particularly with mass transit, and is not limited to 14300 hectares. This area contains a mixture of agricultural land types.

9) Flood - Protected Eastern Expansion.

This is mostly very low lying land east of any embankment line drawn to protect the existing city and 1990-2000 additions. There is a total of some 7246 hectares between such a line and the Balu River. When allowance is made for retention ponds for this whole drainage basin (2495 hectares within the lowest land in this additional area) 4750 hectares would be available for development. At 233 p.p ha this would accommodate an additional 1.107 million. The area would be divided into three basins, with two internal embankments. Most of this area is ranked as poor agricultural quality.

10) East of Katchpur Bridge :

Linear growth along Chittagong and Sylhet Roads has already started and should continue. There is no reason why it should stop in the year 2000. Accelerated unplanned residential development is likely to follow the industrial growth currently taking place. If such development continues for 3 km at 100 meters back from each main road, 120 hectares would be developed. At 233 p.p.ha. this would house 28,000. Again, development would not necessarily be confined to these boundaries.

The density used here for making capacity calculations in potential new areas has been 233 persons per hectare. This was the average density for all built up areas in 1981. By 1990 we estimated that average densities would have increased to 319. By 2000 they would be higher still. Clearly, at the initial stages of any development, densities would be lower, and might well be lower than 233. But, even at half this average density, there would still be room for the anticipated population increase in these ten areas, even making no allowance for increased densities in existing area. Thus, even with the most generous assumptions there is sufficient potential land to cater for the anticipated increase : it is not essential to develop fully all the ten potential areas.

Further, justification of flood protection of new areas cannot be totally on the basis that it is absolutely essential to cater for urban growth up to 2010.

A summary of capacities is given below :

1)	Yusufganj New Town	350,000	
2)	Tejgaon Airport	50,000	
3)	Uttara East	36,000	
4)	DND Triangle	467,000	
5)	Keraniganj	1,022,000	
6)	Mirpur - Turag	387,000	
7)	Savar II : N. Expansion	1,700,000	
8)	Tongi : N. Expansion	3,330,000	+
9)	Eastern Expansion (Balu River)	1,107,000	
10)	East of Katchpur Bridge	28,000	+
	Total capacity	8,477,000	+

Probably all these areas will be developed to some extent, but some are clearly more attractive than others. A comparative analysis of the potential areas should provide a better indication of post - 2000 possibilities.

8.3 Comparison of Potential Development Areas

The construction of an Eastern Embankment would aid the development of Yusufganj, in that it would absorb road access (but not bridge) costs in an internal embankment. Yusufganj is not on a major route, its location is not favourable for the location of industry and its development would be largely as a dormitory town for upper income groups. In view of other possibilities in more favoured locations, we would consider this development unlikely. The completion of the Uttara East project may however be confidently predicted, and with the development pressures likely over the next twenty years, it is probable that Tejgaon will be developed. Continuation of existing trends will also see further growth along the Sylhet and Chittagong Roads.

The lack of development to date in most of the Savar-Northern Expansion area is due to its peripheral location and distance from Dhaka (Savar Center is 20km. from Farmgate). Though the completion of the Tongi-Savar Road will improve access to Tongi, it will not substantially improve access to the city, which will continue to be via

the Aricha Road. It is reasonable to assume an improvement in public transport between Tongi and Narayanganj during the next decade, but while this would improve the attractions of Tongi, it would not particularly improve accessibility to Savar. The nearest point of any Savar phase II to Tongi is 8 kilometers. Similarly, the construction of an Uttara - Savar link, as now being envisaged, would hardly increase Savar's centrality.

Thus, we do not see Savar II being developed to its full capacity. It has limited appeal for any lower income group development, in view of distance to main work zones. Even for access to Tongi, better located potential housing areas can be found to the east of the Turag River. The area is more likely to be developed for upper income groups. Even then, the potential has to be considered in the light of other opportunities in more convenient central locations.

A major strategic choice is required between the components within a full flood protection strategy and a northern expansion strategy. DMAIUDP showed a preference for the latter compared to developing flood protected areas in the DND Triangle, the Eastern Embankment, land north of Mirpur and land to the west of the city. This preference was based on the following considerations :

1) both strategies provide sufficient capacity for long term expansion, but the northern expansion strategy, which creates new industrial locations within the main communications corridor, would more effectively create an industrialization base.

2) concern for basic needs is easier achieved in the flood protection strategy in the short term because of easier access to existing facilities. In the long term new facilities would be needed in either strategy.

3) as regards a more equitable redistribution of resources, the major resource in urban development is land. Northern expansion provides for more potential development in different locations as opposed to the rigid phasing of any flood protection strategy. A continuing inflationary spiral of land prices is also considered more likely under the latter.

4) both strategies are considered equal in maintaining the efficient performance of the city's role in supporting rural development.

5) the northern strategy is favoured as regards maintaining a balance between urban employment and population, because of its potentially greater contribution to national output.

6) In addition, elsewhere in DMAIUDP, reference is made to the element of risk in any strategy which encourages people to live behind embankments on land below flood level.

Overall, the northern strategy was deemed to have the balance of advantages, with lower costs, lower risks and fewer problems likely. But DMAIUDP argued the case in 1981, on the basis only of urban expansion. Considerations of protecting the existing city were not then crucial. Subsequently, two disastrous floods have taken place. The damage caused by these floods to existing urban areas and the possibility of further more extreme patterns of flooding, means that a high priority is now being given to protecting existing urban areas. To some extent, circumstances have changed and the choices are now different:

1) The DND Triangle is now largely flood protected and being developed rapidly. Because much basic infrastructure is in place and a plan is being authorized, further development appears certain.

2) In the Mirpur - Airport zone, a new embankment will protect large new areas. Peripheral development has already taken place and is likely to continue, with priority being in the better located southern portion and adjacent to Uttara. While completed flood protection measures would accelerate development, improved access would also be required. The area is somewhat cut off to the east by the barrier of the International Airport and the lack of access though the cantonment. The provision of a road through the cantonment plus an Uttara-Savar-Mirpur link would enhance development prospects. Comparison of the area with other areas suggests that it will still not be fully developed, even post - 2000.

3) As regards the Eastern Embankment, there is a commitment, or at least a very strong pre-disposition, towards a Balu River alignment. While there may be no absolute need to `create' additional urban land by embankment here, it may be economically justified. The length of an embankment needed to protect existing plus peripheral development now underway, would be some 25 kilometers. The length of any Balu River aligned embankment, which protects a further 7246 hectares would also be 25 km. Assuming similar unit construction costs, the additional area could apparently be made available at no extra cost. However development of the area would likely be on a 3-compartment system, with

additional internal embankments of 6.5 kilometers. Extra embankment costs at Tk. 30 million per kilometer, would be Tk. 195 million. In addition, some land fill would still be necessary, as determined by calculations of surface levels of retention ponds and pumping capacities. Such landfill would, of course, be much less than currently needed in the area, without an embankment. Very crudely, an additional 4750 hectares of potential development land (total area minus retention ponds area) could be obtained for Tk. 195 million, plus any landfill cost.

The measure of gain or benefit is the increase in land values. To show a benefit, land values in this area would have to increase by more than the extra embankment/ land cost.Given the cost difference between urban flood-protected land and agricultural land, such an increase would seem likely. Indeed, the potential for a vastly increased value is evident from the current rate of development in these peripheral zones, despite much larger levels of landfill being needed*. On a very crude economic assessment therefore, the eastern embankment can probably be justified. In addition, as development in such a fairly central area is likely to proceed in any case, this might as well be recognized and appropriate measures taken.

In the past decade, growth trends have been more peripheral than northern. While there has been development north of Tongi, a comparison of the 1983-84 and 90-91 maps show that it has been limited. To bring about such a development would require a level of strategic planning powerful enough to counter - act current trends, and would be more difficult to bring about than a strategy which follows such trends. The main item in a northern strategy would be the provision of mass transit linking Tongi-Joydebpur with the city centre, and indeed continuing south to Narayanganj. Such a system would foster linear growth on a north-south axis, on largely flood free land. Ideally therefore, the costs of a transport system which would allow this should be considered against Eastern Expansion embankment and infill costs, prior to assessing comparative benefits. This issue could be investigated in the proposed urban master plan and transportation studies.

In the meantime, we consider that development within an eastern embankment strategy is likely and has some arguments in its favour. This eastern expansion zone has a capacity, as previously mentioned, of some 1.1 million. The southern basin (43% of the total) has the greatest potential. It is likely to be fully developed. Parts of the two

* Current land values in the Goran - Khilgaon peripheral area for land with development potential is around Tk. 750 - 1,120,000 per hectare. This compares to Tk. 400,000 per hectare for land with no urban development potential.

other basins, nearest to Uttara and Baridhara respectively, also have potential. This potential however is less. It is therefore estimated that only half the area in these two basins will be developed.

Overall then, development of a full flood protection strategy area is taking place and is likely to continue. The revised post - 2000 development areas are shown on Fig.C.10. The revised capacities are shown below :

a)	Yusufganj	Unlikely to be developed	-
b)	Tejgaon Ariport	development assumed	50,000
c)	Uttara East	completion assumed	36,000
d)	DND Triangle	completion assumed	467,000
e)	Mirpur - Turag	part developed, say 50%	195,000
f)	Savar II	limited upper income development, say	50,000
g)	Eastern Expansion	all of s. part, 50% of rest	786,000
h)	E of Katchpur	trends continue	28,000
		Total	1,612,000

This compares with the estimated 2.582 million who will need new urban land between 2000 and 2010. A further 970,000 will then need new urban land outside these seven areas.

The table below summarizes the distribution of the forecast population increase between existing and new areas, in the period 2000 to 2010.

	2000	increase	2010
RELATIVELY RICH	2,958,000	+ 1085000	4,043,000
in pre `90 existing areas (+5%		+ 96000	
in areas developed 1990-2000		+ 320000	
in new urban areas		+ 669000	
POOR	6,902,000	+ 2533000	9,435,000
higher densities in existing poor areas (50% of natural increase)		+ 620000	
remainder in new areas		+ 1913000	
TOTAL URBAN `PULL' AREA	9,860,000	+ 3618000	13,478,000
STUDY AREA TOTAL (including rural areas outside `pull' area)	9,830,000	3,570,000	13,400,000

9. Strategic Choice for Urban Development Post 2000

9.1 Options

Population distribution in our confirmed areas has now been estimated. But for distributing the remaining 970,000 a choice is possible between a Northern (Tongi-Joydebpur) Strategy and Keraniganj. Keraniganj did not feature in DMAIUP's considerations as it was not then linked by the Buriganga Bridge. DMAIUDP in fact argued that such a link was premature. Now, with such a link, reclaiming potential urban land is a possibility. Is this an alternative to a northern strategy? What considerations should determine this? Can a recommendation be made on the basis of the information available, prior to a flood protection proposal?.

The capacity of the `maximum' Keraniganj scheme has been estimated at an additional 1,022,000 While the potential Northern (Tongi - Joydebpur) area capacity is very large indeed, its total development is unlikely. In part, its development continues to be pre-empted by development in more central locations. Nevertheless, continuation of current trends should see more intensive linear development. Given other possibilities elsewhere, it is unlikely that much of the area will be developed for upper income housing. Post - 2000, development here would be for lower income groups, in planned or unplanned fashion, largely in the area between the railway line/Hyderabad Khal to the east and the Turag River to the west and as far north as the Joydebpur turnoff. Provision of public transport would intensify such a trend. Very roughly, this smaller potential development area consists of 5560 hectares, with (at 233 p.p.ha.) a capacity of some 1.3 million.

Both locations are on major radial routes out of the city. Both would require major infrastructure development. In both instances, action should be taken to ensure that most of the benefits arising from public investment should go to the public at large and not to a small minority. But the locations have their own particular advantages and disadvantages as development areas :

9.1.1. Keraniganj

1) Advantages :

- more central location, potentially more attractive, higher increase in land values would result * .
- as offers more central development alternative, likely greater curb on density increases in existing areas.
- does not need development of mass transit system.
- maximizes existing investment in Buriganga Bridge.
- once a major decision made on the embankment, trend development would then follow.
- includes an area of potential industrial growth, balanced development possible.

2) Disadvantages :

- embankment, pumping and landfill pre-development costs.
- part of area lost to development as retention ponds needed.
- while danger may be slight, it could be catastrophic.
- additional Buriganga Bridge might be needed.
- fixed limits to development determined by embankment.

9.1.2. Northern Strategy

1) Advantages:

- cheaper to develop, as no protection/landfill costs, therefore likely more affordable to low income groups.
- no safety problems
- based near a major industrial area.
- proximity to road, rail and airport.
- no fixed limits to development, expandable without major threshold investments

2) Disadvantages:

- needs development of a mass transit system
- less attractive area as more distant.

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* Current land values adjacent to the Buriganga Bridge are Tk. 7 million/hectare compared to Tk. 400,000/ hectare for agricultural land.

- requires more planned decisions, less trend development.
- smaller ameliorating effect on central Dhaka densities.

All these advantages and disadvantages have costs and benefits. The selection of a strategy should be based on their comparison. These comparative costs and benefits are not known to us in any detail. To make a major strategic decision without such data would be unwise. As previously stated, a transportation study and a metropolitan planning study will be initiated this year. These studies should consider these issues, amongst others, and their recommendations will contribute towards a framework for long term urban development.

One justifiable decision therefore is that no poldering decision on Keraniganj should be taken prior to the completion of these studies. They will take two years. Thus, any decision on a Keraniganj embankment, at earliest, would be in 1993-94. But as, in any case, development in Keraniganj is proposed post - 2000, such a decision could be postponed without harm. As Tongi-Joydebpur is largely flood-free (apart from the need to protect some existing development at Tongi) no crucial flood-protection decision would be needed for this area.

There is a second possibility if the protection of an existing urban area (Jinjira) is regarded an urgent priority. A number of alternative embankment alignments may be considered, which not only protect Jinjira but also protect additional land with development potential.

1) the immediately obvious alignment is one which protects most of the existing built up area along the Buriganga. This would include an extra non-urban 540 hectares and (at 233 p.p.ha) have an extra capacity of 126,000 (alternative a in other reports).

2) however, a considerable additional amount of potential urban land could be claimed at little additional cost by using and where necessary modifying existing road embankments. Total embankment length would be slightly more with some extra costs incurred in internal embankments. The extra area safeguarded (minus 15% for retention ponds) would amount to some 3840 hectares, with an additional capacity of 896000 (at 233 p.p.ha) (alternative c in other reports).

3) while the larger scheme appears more cost effective, it could have serious hydrological implications, as it would affect a large area of flood plain and could divert flood water. Clearly, diversion of flood water to the east could affect

The recommended alternative alignment is that which protects the existing built-up area but also extends south to include the proposed container depot, where further industrial and associated development may be anticipated. This additional area (minus retention ponds) amount to 1430 ha and have a capacity of 333,000. (This is alternative b in other chapters).

The three alternatives are illustrated on Fig.C.11.

9.2 Alternative Distributions of Keraniganj & Northern Strategy and Recommendations

In both instances, the distribution of population increase between the already determined new areas remains the same. The remaining 970,000 increase would be distributed as per the following table. We assume that Keraniganj, because of its location, would be more attractive to development, with the residual going into Tongi-Joydebpur rather than vice-versa.

		Keraniganj	N. Expansion
a)	Minimum embankment in Keraniganj + promotion of Northern Development strategy.	+ 126,000	+ 851,000
b)	Recommended Keraniganj embankment	+ 333,000	+ 637,000
c)	Maximum phase I embankment Keraniganj (+ 1.022 million)	Most of 970,000	natural growth only.?

As a decision is not immediately needed, we recommend that any decision on the embankment in Keraniganj awaits the two major studies. However, if protection of Jinjira has high priority, then, alternative b) is recommended.

10. Summary Tables of Population/Land Use Forecasts

The tables C.2 to C.4 are worksheets for land use and population distribution for the study area for 1981, 1990, 2000, and 2010. The 1990 and 2010 data is used by the study team in the master plan study. The 1981 and 2000 sets provide continuity. Fig. C.19 summarizes the distribution of populaltion growh between 1981 and 2010.

11 Detailed Study for Future Land Use

11.1 General

11.1.1 Purpose

The purpose of the section is the detailed descriptions of land use and urban development of the proposed future urban area.

a) preparation of indicative land use map 2010
b) provision of land use guidelines for future urban development

11.1.2 Findings and Considerations

1) Findings

Referring to the preceding sections of the chapter, the total population of Dhaka Metropolitan Area is forecasted to increase to 13 million persons, or 345,000 persons per year between 1990 and 2010. 94% of the total population increase would be accommodated within the future urban area.

Around 70% of those population increase(nearly 5 millions) would be poor persons including people of slums and squatters, who are expected to earn only less than 4,200 Tk(*) per month of household income. (* as of 3,000 Tk/month in 1986)

These persons will put tremendous pressure on the existing built-up areas especially unplanned and high density areas such as Old Dhaka quarter and the other central areas.

Those areas are usually already overcrowded (population density is more than 1,000 persons/ha) and are facing crucial problems on living environment such as low standard of housing, narrow roads, inadequate supply of potable water, and poor conditions of sanitation, drainage, solid waste, health, education and recreation.

Other uncontrolled growth areas are on urban fringe zone where there are presently agricultural lands such as Goran, Badda, Kamrangi Char, Uttara etc., and those areas are faced another crucial problems on flooding because most of those areas are very low lying land (below 3 m GTS) in addition to the shortage of public infrastructure, utilities and services.

It is assumed that, between 1981 and 1990, around three-quarters of the total population increase has been settled in the existing built-up area by densification and only one quarter of those in newly developed area.

These problems have been caused by an extreme shortage of flood free land for settlement, particularly for low income group within the urban area of the Metropolitan Area.

Although, many efforts on provision of planned residential areas have been made by both the government and private sectors, however, most of these housing schemes did not reach to the low income range of population and that which did comprises only a small amount of housing as compared to huge requirements.

The vast majority of low income households in these growth zones built housing of low standards and often "illegally" ie. contrary to government policy. Present land values do not allow low income households to legally acquire enough land for their house lots. These problems are made more difficult because of uncertainty regarding land tenure and registration systems.

In addition, because of no up-dated and integrated master plan for urban development and land use regulation, the present system of land development controls and law for development of land for public purposes are not well functioned. Thus it is difficult to pre-identify lands to be allocated for public purpose.

Under the upcoming (1991) UNDP/UNCHS assisted project for preparation of Structure Plan and Detailed Area Plan, and Greater Dhaka Metropolitan Integrated Transportation Study (UNDP) will provide comprehensive policies, strategies and plan for future urban development of the Study Area involving the above issues.

2) Considerations

Under these circumstance, the outline of the JICA proposal for future urban development shall be noted to address the following points as a result of the pre-study for further investigations of urban development including upcoming UNDP programme ;

a) designation of future urban area,
b) inventory of urban development and land use issues,
c) identification of development requirements by type of land use,
d) study of urban structure and land use guidelines, and
e) preparation of indicative land use map 2010

11.2 Designation of future urban area

The proposed urban area for future development is designated in the course of the studies for population forecast and its distribution, flood mitigation policy, drainage policy and other related policies. The major criteria on urban and land use aspects for the designation of the future urban area were as follows;

1) the future urban area is where structural measures for flood protection will be proposed and it contains most of the area expected to be urban and most of the future population increase to be accommodated by 2010.

2) existing urban area will continue to densify by infilling as it is observed as a trend between 1981-1990 at least for these 10 years.

3) development of fringe zone will be accelerated by structural measures for flood protection as it is observed at DND.

4) current major development schemes by RAJUK and other development sectors such as Uttara East/West, Savar, Baridhara, Senparaparbata etc, will be carried out as planned.

5) in general, priority area for residential development would be close to the existing urban center particularly for poor group ie, majority of increased population.

6) Joydebpur and part of Savar will be take time to be major urban development areas which was proposed as "Northern Expansion Strategy" in DMAIUDP to accommodate the majority of increased population

Based on the above criteria on urban development aspect and other aspects, it is proposed that the future urban area should be involved the most of existing built up areas and those neighbouring areas including low-lying agricultural lands where the potential urban area, having good accessibility to the existing urban centers, and also comparatively poor land capability for agricultural areas. (see Fig. C.9)

The area of proposed future urban area is approximately 45,640 ha involving the following 5 districts and administrative units (unions/wards);

(1) Greater Dhaka District

-Dhaka Municipal Corporations (Ward No. 1-56)
-Uttar Khan
-D. Khan Cantonment
-D. Khan Gulshan
-Hariampur
-Cantonment (No.1-3)
-Beraid Union Gulshan
-Gulshan 57
-Beraid Demra
-Demla
-Matuail
-Sultanganj

(2) Narayanganj District

-Narayanganj Municipality (Ward No. 1-8)
-Narayanganj Municipality (Ward No. 9-12)(part)
-Syampur
-Siddirganj
-Simulpara
-Kutubpur
-Godnail
-Fatullah
-Enayetnagar(part)
-Kashipur(part)
-Tarabo(part)
-Kachpur(part)

(3) Tongi District

-Tongi Municipality

(4) Keraniganj District

-Jinjira

-Kalindi(part)
-Subhadiya(part)
-Tegria(part)
-Konda(part)

(5) Savar District

-Savar
-Biralia(part)
-Dhamsona(part)
-Kashimpur(part)
-Ashulia(part)
-Pathalia(part)

11.3 Inventory of urban development and land use issues

The basic issues in the management of urban development and land use for the future urban area are summarized as follows;

1) to delineate and authorize the future urban area as "planned development control area" by the government.

2) to protect the area by structural measures of flood protection as proposed in this study.

3) to facilitate stormwater drainage channels and necessary ponds and pumps as principal infrastructure.

4) to prepare urban development and land use guidelines particularly for development of low-lying zone including;

a) minimun ground level for land reclamation
b) minimum standard for preparation of public and institutional facilities such as road, education, health, recreation, water supply, sewage etc,.
c) provision of model development area as a typical development scheme.

5) formulation of land use map as an indication of future urban development pattern

6) institutional set-up for the management of the future urban area.

11.4 Identification of development requirements by type of land use

11.4.1 Residential

1) Housing

Around 836,200 of new housing units or 41,810 units/ year of those will be required in addition to rebuild or improve the existing housing stock between 1990 and 2010 as shown in the table below;

Housing requirement (No. of housing units/plots)

Year	1990 existing	2010 require't	Additional require't
Greater Dhaka	560,200	1,082,900	522,700
Narayanganj	132,400	316,100	183,700
Tongi	17,400	82,300	64,900
Keraniganj	27,900	57,700	29,800
Savar	16,600	51,700	35,100
Total	754,500	1,590,700	836,200

Notes; 1) no. of households=6.1 x population
2) no. of housing units/plots=1.3 x no. of households
Source; JICA

2) Residential area

Around 9,630 ha or 480 ha/year of additional residential area will be required to accommodate the estimated future population up to the year 2010 as shown in the table below;

Residential area requirement (ha)

Year	1990 existing	2010 require't	Additional require't
Greater Dhaka	5,890	11,120	5,230
Narayanganj	1,470	3,330	1,860
Tongi	270	820	550
Keraniganj	240	780	540
Savar	300	1,750	1,450
Total	8,170	17,800	9,630

Up to now, it is assumed that approximately 2,200 ha of planned residential areas and 70,000 of housing units/plots have been supplied in Greater Dhaka, and of which 900 ha and 10,000 plots by RAJUK such as in Gulshan, Banani, Baridhara, Uttara etc., and the rest by the other formal developers including both government organizations and private housing developers such as in Mirpur, Dhanmondi, New Eskaton, Mohmadpur etc.

The existing total residential area of Greater Dhaka district is approximately 5,890 ha, and the number of total housing units/plots are assumed 560,200, so that approximately 37% of residential area and 13% of housing units/plots were provided by these formal sectors as shown in the table below;

Assumed existing supply of residential area and housing units/plots

Sectors	residential area(ha)	share(%)	units/plots	Housing	share(%)
Formal					
1) RAJUK	900	(15%)		10,000	(2%)
2) Others	1,300	(22%)		60,000	(11%)
Informal					
1)Individual	3,360	(57%)		322,100	(57%)
2) Slum etc.	330	(6%)		168,100	(30%)
Total	5,890	(100%)		560,200	(100%)

Source; JICA

The table below shows an assumption of housing and residential area supply schedule between 1990 and 2010 based on the past achievement as shown in the above table and an assumed target;

Districts/Sectors	required residential area(ha)	assumed share (%)	required housing units/plots	assumed share (%)
Greater Dhaka	5,230		522,700	
Formal Sectors	2,610	(50%)	156,810	(30%)
1) RAJUK	1,050	(20%)	52,270	(10%)
2) Others	1,560	(30%)	104,540	(20%)
Informal Sectors	2,620	(50%)	365,890	(70%)
Other Urban Areas	4,400		313,500	
Formal Sectors	1,540	(35%)	62,700	(20%)
1) RAJUK	660	(15%)	15,680	(5%)
2) Others	880	(20%)	47,020	(15%)
Informal Sectors	2,860	(65%)	250,800	(80%)
Total in Urban Areas	9,630		836,200	
Formal Sectors	4,150	(43%)	219,510	(26%)
Informal Sectors	5,480	(57%)	616,690	(74%)

Source; JICA

The population density is described in the next items.

11.4.2 Requirements for the other types of land use

The following table shows the existing areas of residential, commercial, industrial, institutional roads and other types of urban land use within the present municipality areas in the study area;

Existing land use of the present municipality areas

District	Dhaka 1) (ha)	N'ganj 2) (ha)	Tongi (ha)	Total (ha)	Share (%)
Residential	4,260	480	270	5,010	(30)
Commercial	450	80	60	590	(4)
Industrial	340	100	300	740	(4)
Institutional	960	20	20	1,000	(6)
Others	820	100	30	950	(6)
Roads	860	110	80	1,050	(6)
Village	50	480	290	820	(5)
Agriculture	1,300	560	2,590	4,450	(27)
Water	1,880	60	50	1,990	(12)
Total	10,920	1,990	3690	16,600	(100)

Notes;
1) involves ward no. 1-56 of Dhaka municipality
2) involves ward no. 1-12 of Narayanganj municipality
3) involves Tongi union

Source;JICA calculation on the land use survey map made by JICA.

As described before, those areas other than residential in the existing municipalities area are quite small in size and in proportion to those of other urban areas in the other countries in general.

The Bangladesh government has issued a planning guideline for preparation of master plans for urban areas.

The following is the statements of the existing planning standards for the urban development of municipal areas extracted from the TERMS OF REFERENCE FOR CONSULTANCY SERVICES FOR PREPARATION OF MASTER PLANS FOR POURASHAVAS prepared by the Ministry of L.G.R.D. and Co-operatives, Local Government Division, Local Government Engineering Bureau of the Government Bangladesh in February 1990.

Standard-1. Overall proportions for land use composition

In general terms the proposed urbanized (including existing urban land use) part of the Pourashava area is expected to be subdivided into the following broad categories of land use:

Category	Percentage(%)
- Large scale industry	2 to 5
- Commerce and industry(light scale, services)	8 to 12
- Social, admini'tion, cultural and urban services	20 to 30
- Roads(excluding local)	8 to 15
- Residential	35 to 45
- Urban deferred	about 10

Standard-2. Specific provision standards

		Acres	Served pop.
(a) Commerce and Industry			
- Market, shop, office, small scale industry		1.5	1,000
(b) Social, Administrative, Cultural and Urban Services			
- Education	+ nursery	2.0	5,000
	+ primary school	2.0	5,000
	+ secondary school or college	5.0	20,000
- Health	+ dispensary	1.0	5,000
	+ maternity, child care	1.0	5,000
	+ health centre	5.0	20,000
	+ hospital	5.0	20,000
- Administrative		12.0	per Upazila Sahar
- Recreation	+ parks, openspace	1.0	1,000
	+ cinema, closed space	0.5	20,000
	sports stadium	3.0	20,000
- Social Cultural	+ community centre	1.0	20,000
	+ religious facility	0.5	5,000
	+ cemetery	5.0	20,000
- Urban Services	+ post office	0.5	20,000
	+ telephone exchange	0.5	20,000
	+ police station	2.0	20,000
	+ bus, ghat, rail station	1.0	20,000
	+ others	1.0	20,000

The table below compares major land uses in Dhaka municipal area with these government standards.

	Area (ha)	Share (%)	(1) (%)	(2) (ha)	remarks
Residential	4,310	(39%)	35-45	24,520	250p/ha *2)
Commercial	450	(4%)	8-12	3,720	6.07 sq.m/p *2)
Industrial	340	(3%)	2-5	380	3.5% *1)
Institutional	960	(9%)	20-30	26,820	43.8 sq.m/p *2)
Others	820	(8%)			
Roads	860	(8%)	8-15	1,000	11.5% *2)
Openspaces	3,180	(29%)	10	1,310	10% *2)
Total	10,920	(100%)		55,750	

(1) Government guideline for overall proportions of land use composition
(2) required area based on the government standards
*1) as stated per government standards as overall proportion of land use composition
*2) as specific provision standards in the government guidelines

Source;JICA

It is observed from the above table that;

a) if it is estimated that the preferable areas for each land use category is based on the above standards, the required area for Dhaka municipality needs 55,750 ha which is 5 times the present municipality area.

b) the present population density of different categories are as follows;

Areas	Gross *1) (p/ha)	Urban *2) (p/ha)	Residential *3) (p/ha)
Dhaka municipality	360	506	920
Dhaka district	170	370	670
Urban Area	130	300	530
Study Area	80	270	450

Notes; *1) Gross density=total population/total area (persons/ha)
*2) Net Urban Density=total population/built-up area (persons/ha) built-up area involves residential, commercial, industrial, institutional, roads and other types of urban uses such as grave yard, openspaces in urban area and cantonment and village
*3) Net Residential Density=total population/residential area (persons/ha) including village .

Source; JICA

As shown in the above table, the present situation of population density is very far from the government standard for net residential density of 250 persons/ha. JICA study team propose that the population density of the future urban area should keep at least with the present situation as far as possible as the present figure of 300 p/ha and 530 p/ha for net

urban and net residential density respectively as shown in the above table of the urban area.

b) existing commercial and institutional areas are quite small while residential, industrial and road areas are adequate in proportionally. It would be necessary to increase the proportional share of commercial and institutional areas for the future land use planning.

c) Specific provision standards-2 are at a very high level if compared with the existing size of areas in all type of urban use except roads and agricultural/water areas as for urban deferred. It would be required to have an immediate achievable target for the level of those land use as a "Modified Standards".

The table C-5 shows the provision of modified standards for commerce and industry, and institutional facilities to be applied to the development of future urban area and also shows the required areas and number of facilities for those land use based on the modified standards up to the year 2010.

2) Agricultural, water and other areas

In the government guidelines, the standard for urban deferred is described as follows;

a) approx. 10% of the total built up area to be reserved for future urban expansion. Individual land use within this category should not be identified.

b) identification of areas within the built up area which will not be used for further development purposes, for example, ponds land of agricultural importance, land liable to flooding, government reserves etc.

In addition to the above, for the purpose of flood mitigation and stormwater drainage, embankment facilities enclosing the urban area and several retarding ponds are proposed in the future urban area. Those principal facilities require the area of approx. 860 ha for embankment walls and around 4,190 ha which is 12% of the total served area of each drainage zone as summarized below;

District	Embankment(ha)	Pond(ha)
Greater Dhaka	300	2,650
Narayanganj	160	980
Tongi	160	270
Keraniganj	170	290
Savar	70	0
Total	860	4,190

* ref: Supporting Reports G and H

Due to the huge requirement of urbanization, approx. 17,640 ha of existing agricultural land or 83% of the existing cultivated area has to be changed into urban area, and thus approximately 202.9 million Tk will be lost annually up to the year 2010 as shown below;

Reduction of Agricultural Areas and its revenue

Districts	Agricultural area(ha) 1990(A)	2010(B)	Change(C=A-B)	Annual net revenue to be lost
Dhaka	11,180	1,910	9,270	106.6
Narayanganj	4,080	570	3,510	40.4
Tongi	1,350	200	1,150	15.9
Keraniganj	1,470	90	1,380	26.8
Savar	3,300	970	2,330	13.2
Total	21,380	3,740	17,640	202.9

Notes;
1) agricultural area=agricultural area to be enclosed by embankments.
2) cropping intensity and productivity per cropped area are estimated at 140% and Tk 10,000/ha, respectively.
3) value added ratio is estimated at 86.5%.
4) the average conversion factor of agricultural products is estimated at 0.95.

Source: JICA

It should be noted that although huge area of existing agricultural lands has to be changed to the proposed retarding ponds, most of the pond areas may be used for cultivation areas during pre- and post monsoon seasons which is November to May, 7 months in the year, because, during these period, the height of water of ponds will be controlled by the pumping facilities at the level of between 1.5 m and 4 m. Those cultivable area would be around 70% of the total pond areas ie, approx. 2,930 ha.(see Fig.C.12)

The table below summarizes the change of the areas of each land use categories referred to the change of population and other indications in 1990 and in 2010 as the result of the above studies;

Year	1990	2010	Increase (times)
Population	5,982,000	1,261,400	2.1
1) Residential	8,170	17,800	2.2
2) Commercial	680	1,500	2.2
3) Industrial	1,100	2,130	1.9
4) Institutional	2,040	6,850	3.4
5) Other urban *1)	2,520	3,910	1.6
6) Road	2,390	4,200	1.8
7) Village	3,080	250	0.08
8) Agriculture	21,380	3,740	0.17
9) Water	4,290	5,270	1.2
10) Built-up area *2)	19,980	36,640	1.8
11) Pop. density *3)	300	344	1.1
12) B/U ratio *4)	44%	80%	1.8

Notes; *1) including graveyard, urban openspace, cantonment
*2) 1)--7) total above
*3) net urban density=population/built up area
*4) built up area ratio=built up area/total area
Source; JICA

11.5 Study of Urban Structure and Land Use Guidelines

11.5.1 Broad zoning of the future urban area

The Fig. C-13 shows the broad zoning map for the future urban development to control the development activities into preferred geographic areas. The future urban area is composed of the following 4 zones ;

1) Environmental Improvement Zone

This zone includes Old Dhaka area and its surrounding areas with an existing population of 2.0 millions and 2.7 millions projected, and an area of 2,400 ha, where the population density is more than 750 p/ha of net urban or 1,000 p/ha of net residential and the built up area ratio is more than 90%.

Key issues in this zone would be;

a) further population increase and expansion of area by the private development should be control.

b) environmental improvement program is really necessary particularly for water supply, sewage, solid waste and also required a program for upgrading the existing housing stock.

c) institutional facilities such as educational, health, recreational and other urban services should be increased and/or upgraded to serve the huge population in this zone.

2) Densification Zone

This zone includes rest of the other existing built up areas outside Zone 1 in Dhaka, Narayanganj, Tongi, Keraniganj and Savar with an existing population of 3.3 millions and 6.2 millions projected, and an area of 16,600 ha, where the population density is between 250 and 750 p/ha of net urban and the built up area ratio is between 30 and 90%.

Key issues in this zone would be;

a) further population increase and expansion of area by the private development should be regulated by the land use and/or if possible density control measures.

b) comprehensive review of the the urban structure of this zone would be required particularly for the location of commercial centers, institutional centers, cantonment and industrial areas, and also required transportation and road network studies.

3) New development Zone

This zone includes most of the existing lowlying and highland agricultural lands except the areas of Zone-4 described below, with an existing population of 0.6 millions and 3.6 millions projected, and an area of 18,700 ha, where the population density is less than 250p/ha of net urban and the built up area ratio is less than 30%. This zone is composed of 2 sub-zones as follows;

(1) Highland development sub-zone

It includes most of Savar and the west of Tongi where the ground level is high enough to be urban with no land reclamation work. This zone is approximately 4,800 ha with future population of 461,000.

(2) Lowland development sub-zone

It includes the major part of the Eastern embankment and the north of Mirpur in Dhaka district, DND and the south of Keraniganj where the ground level is low. For development, land reclamation is needed. This zone is approximately 13,900 ha with a future population of 3.2 million.

The key issues in this zone would be;

a) Governmental initiation to facilitate infrastructure such as embankment/flood walls, retarding ponds/khal, major roads, etc., and other urban services such as public facilities.

b) Private development should be based on guidelines for land use and urban development.

4) Green and openspace Zone

This zone includes the rest of the other existing low-lying areas outside Zone 3 with few rural population and an area of 7,900 ha. Most of the areas is occupied by water with the ground level less than 3 meters. This zone will functions as;

-Agricultural and inland fishing pond area,
-Drainage facilities area including khal and retarding ponds,
-embankment wall or bank,
-recreational green and
-reserved area for future urban expansion.

Key issues in this zone would be;

a) the government should acquire the areas for embankment and pond areas before the development process. The required areas for those facilities will be more than 5,000 ha.

Outside the above zone within the study area are the following zones.

a) Flood management zone where non-structural measures for flood protection is proposed, with an existing population of 550,000 and 780,000 projected and an area of 32,800 ha.
b) Highland rural zone where no measures required for flood protection with an area of 4,300 ha.

11.5.2 Case study for model development area

Among the above zones, a detailed case study for the zone-3 was made as follows;

Based on our forecast of future population and its distribution, around half of the increased population of approx. 3 million will be settled in newly developed areas which are presently low-lying agricultural zone Planned land development initiated by the public sector is required including preparation of land use regulations, facilitation of infrastructure such as drainage channels and ponds, water supply, roads, institutional facilities and other urban services and also required land reclamation by the developers so as to change to urban use. The major lowland development areas are shown in Fig. C-14.

In this section, we made the case study for typical urban development in these new areas. The study involves;

a) identification of model development unit
b) minimum requirement of public use land of institutional and community facilities, pond/drainage and other necessary facilities.
c) requirement of urban amenities.
d) requirement for level of land reclamation, and
e) typical layout pattern of the model development area

1) Identification of model development unit

The table below shows the existing areas and population of several unions in the low-lying rural area that are proposed as part of future urban area.

Districts	Area(ha)	Population
Eastern Embankment (8 unions)	12,500	160,000
Western Embankment (1 union)	1,900	24,000
DND (4 unions)	5,200	76,000
Total	19,600	260,000
Typical Union(as an average)	1,500	200,000

As shown in the above table, an existing union in those lowland development zone has an area of 1,500 ha and a population of 20,000 on average.

Table C.6 shows the profile of a typical union in the future urban area with the existing population of 20,000 and the area of 1,500 ha describing the number of households, population density, land use conditions, no. and kinds of existing public facilities and it's future projections.

The model development unit is chosen as a small community unit having the central community facilities of a secondary school, a health centre, a neighborhood park, a post office etc., with a planned population of 20,000 and an area of 150 ha.

Fig.C.15 shows the outline of the proposed model development unit including minimum required areas for public purposes which is based on the development standards for community facilities shown in the table C.10, and an indicative layout pattern to promote the preferable development of new zones.

The 10 packages of the model development unit would be composed of one union in the future, and up to the 2010, around 150 of the model development units shall be developed in the low-lying areas,.in other word, 15 unions of rural zone will be urbanized within 20 years.

11.6 Control of Future Urban Development

Control of future urban development is essential if measures needed for flood protection are to be safeguarded. Acquisition procedures may also need to be streamlined for use when control measures are inappropriate. While current measures may well be inadequate, fragmentary, and only tentatively used, new legislation on land control and development has been prepared under the auspices of UNDP/UNCHS and

the Urban Development Directorate, but never adopted. This has already been referred to in Interim Report No. 1 of Dhaka Integrated Flood Protection Project (ADB T.A.).

The review and adoption of the draft Physical Planning (Land Use) and Development Control Ordinance of 1985 would permit safeguarding land needed for flood protection, as well as many other public purposes. The enforcement of such legislation (clearly after adequate coordination and consultation with the concerned agencies) should be under RAJUK, the agency with major responsibility for land development and control.

Issues relating to safeguards and controls as they impinge on flood protection considerations will be discussed further in the final Master Plan Report

11.7 Indicative Land Use Map of 2010

The Table C.11~14 show the population and land use data for existing(1990) and future (2010) of the future urban area.

Figs. C.16 and 17 show the built-up Areas in 1990 and 2010 and Fig. 18 shows the indicative land use map of 2010.

TABLE C.1 POPULATION INCREASE AND URBANIZATION TRENDS 1981-1990

Distrist	POPULATION		TOTAL AREA(ha)	BUILT-UP AREA(ha)		BUILT UP AREA RATIO		NET URBAN DENSITY(p/ha)		POP. INC. RATIO	B/U AREA INC. RATIO
	1981	1990		1981	1990	1981	1990	1981	1990	1981-1990	1981-1990
GREATER DHAKA	2,755,067	4,472,633	27,528	10,378	12,204	38%	44%	265	226	62%	18%
1)Old Dhaka	770,366	1,170,923	1,050	1,038	1,037	99%	99%	742	743	52%	0%
2)Central Area-West	501,358	792,673	2,602	1,740	1,865	67%	72%	288	269	58%	7%
3)Central Area-East	880,928	1,378,323	4,033	3,261	3,654	81%	91%	270	241	56%	12%
4)Cantonment	115,704	237,187	3,950	1,994	2,647	50%	67%	58	44	105%	33%
5)Mirpur	357,813	668,595	5,653	1,401	1,848	25%	33%	255	194	87%	32%
6)Eastern Dhaka	128,898	224,932	10,240	944	1,153	9%	11%	137	112	75%	22%
NARAYANGANJ	684,730	1,110,616	10,095	3,576	4,607	35%	46%	191	149	62%	29%
1)Central Area	187,723	237,775	1,028	805	812	78%	79%	233	231	27%	1%
2)Western Narayanganj	399,816	739,690	7,792	2,082	3,005	27%	39%	192	133	85%	44%
3)Bandar	97,191	133,151	1,275	689	790	54%	62%	141	123	37%	15%
TONGI	103,218	143,009	3,768	931	1,057	25%	28%	111	98	39%	14%
KERANIGANJ	358,212	441,788	17,035	2,115	2,228	12%	13%	169	161	23%	5%
1)Central Area	173,479	219,940	2,270	611	649	27%	29%	284	267	27%	6%
2)Others	184,733	221,848	14,765	1,504	1,579	10%	11%	123	117	20%	5%
SAVAR	255,982	366,270	24,318	2,609	4,176	11%	17%	98	61	43%	60%
1)Central Area	71,249	118,086	5,353	831	1,851	16%	35%	86	38	66%	123%
2)Others	184,733	248,184	18,965	1,778	2,325	9%	12%	104	79	34%	31%
STUDY AREA TOTAL	4,157,209	6,534,316	82,744	19,609	24,272	24%	29%	212	171	57%	24%
PULL AREA TOTAL	3,979,717	6,319,246	59,295	17,053	19,827	29%	33%	233	201	59%	16%

Notes; Area division, see Fig. C.16
Source: JICA

TABLE C.2 POPULATION AND LAND USE FORECAST WORKSHEET 1981 - 1990

Area	1981 population Census ('000)	*+7.7% Corrects ('000)	Good house Ratio (%)	Poor house Ratio (%)	1981 Rich Pop ('000)	1981 Poor Pop ('000)	1981-1990 population increase distribution Dens. in Rich ('000)	Dens. in Poor ('000)	Slum (Share)	Migrants increase ('000)	Poor in new ('000)	*(70%) Rich in exist. ('000)	*(30%) Rich in new ('000)	Exp. Land (Share)	1990 population Rich Pop ('000)	Poor Pop ('000)	Total Pop ('000)	1981 Built up area (ha)	1981 Net urb. density (p/ha)	'81-90 Land Ex Total (ha)	1981 Settle. area (ha)	1981 Agr/Low area (ha)	1990 LAND USE Total (ha)	Built up area (ha)	Settle. area (ha)	Agr/Low area (ha)	Embank area (ha)	Neturb. densit (p/ha)
*(1)	*(2)	*(3)	*(4)	*(5)	*(6)	*(7)	*(8)	*(9)	*(10)	*(11)	*(12)	*(13)	*(14)	*(15)	*(16)	*(17)	*(18)	*(19)	*(20)	*(21)	*(22)	*(22)	*(23)	*(24)	*(25)	*(26)	*(27)	*(28)
1) HIGH ESTABLISHED AREA	117	126	54%	46%	68	58	8	13	3%	23	0	26	0	0%	94	94	188	1,072	175	0	0	0	1,072	1,072	0	0	0	175
2) WEST EMBANKMENT	185	199	40%	60%	76	123	9	28	7%	52	5	29	0	2%	105	207	312	287	1,087	43	32	657	976	330	19	601	27	947
3) OLD DHAKA	751	809	48%	52%	358	451	41	102	28%	202	2	136	16	1%	509	757	1,266	1,133	1,117	18	0	32	1,166	1,142	0	14	10	1,109
4) COMMERCIAL/INDUST-RIAL/INSTITUTION	289	312	42%	58%	123	189	14	43	15%	109	3	47	0	1%	170	344	514	1,729	297	30	60	104	1,893	1,759	30	101	3	292
5) EASTERN DHAKA	595	641	32%	68%	192	448	22	102	20%	139	9	73	5	3%	271	698	968	1,637	592	78	0	408	2,044	1,715	0	329	0	585
6) MIRPUR AREA	332	358	33%	67%	140	218	16	49	19%	138	35	53	35	12%	229	440	669	1,407	475	325	2,260	1,986	5,597	1,732	1,935	1,853	133	385
7) OTHER CENTRAL AREA	117	126	37%	63%	47	79	5	18	5%	33	0	18	0	0%	64	130	194	312	623	0	0	59	371	312	0	45	13	623
8) EASTERN EMBANK-MENT	124	131	10%	90%	12	119	1	27	2%	13	38	5	77	13%	94	198	292	1,292	226	350	3,510	5,300	10,101	1,642	3,160	5,290	10	178
9) CANTONMENT	99	106	28%	72%	33	73	4	17	0%	0	16	13	10	5%	56	106	162	1,567	103	150	1,244	364	3,175	1,717	1,104	354	0	94
10) DND AREA	355	374	16%	84%	57	317	7	72	0%	0	96	22	83	31%	162	485	647	2,291	282	877	0	6,457	8,748	3,168	0	5,580	0	204
11) SAVAR	71	75	13%	87%	11	64	1	15	0%	0	33	4	10	11%	25	112	136	614	222	300	2,160	1,887	4,660	914	1,880	1,887	0	149
12) TONGI/JOYDEBPUR	241	258	12%	88%	38	218	4	49	0%	0	20	15	0	7%	53	287	340	1,612	139	183	7,277	1,699	10,588	1,795	7,094	1,699	0	125
13) N'GANJ/KASHIPUR	249	265	19%	81%	50	215	6	49	0%	0	8	19	0	3%	69	271	340	1,408	242	70	0	4,625	6,233	1,478	0	4,755	0	230
14) KERANIGANJ	194	202	0.1	91%	20	182	2	41	0%	0	39	7	0	13%	27	263	290	691	420	360	0	1,982	2,673	1,051	0	1621.5	0	278
PULL AREA TOTAL	3,717	3,980	28%	72%	1,226	2,754	139	625	100%	709	304	468	236	100%	1,928	4,392	6,319	17,053	371	2,784	16,542	25,757	59,295	19,827	15,200	24,128	196	319
AREA OUTSIDE PL AREA BUT WITHIN STUDY AREA	370	379	4%	96%	9	371	0	104	0%	0	0	2	0	0%	11	474	483	3,588	252	179	9,300	22,471	35,238	3,767	9,218	22,373	0	240
GRAND TOTAL	4,087	4,359	32%	68%	1,235	3,124	139	729	100%	709	304	468	236	100%	1,939	4,866	6,802	20,641	323	2,964	25,841	48,227	94,532	23,594	24,417	46,502	196	292

TABLE C.3 POPULATION AND LAND USE FORECAST WORKSHEET 1990 - 2000

Area	'90 POP Rich ('000)	'90 POP Poor ('000)	'90 POP Total ('000)	'90-2000 Rich in new ('000)	'90-2000 rich incr. in new (ha)	'90-2000 rich incr. in exist. ('000)	'90-2000 poor inc in new ('000)	'90-2000 poor inc in new (ha)	'90-2000 poor inc in exist. ('000)	'90-2000 poor incr. in exist. (ha)	2000 rich pop. total ('000)	2000 poor pop total ('000)	2000 populatic total ('000)	2000 built up area in (ha)	'90-2000 New slur distri. ('000)	2000 Re poor pop total ('000)	2000 Re populatic total ('000)	2000 Re Net urba Density (p/ha)	2000 LAND USE Built-up area (ha)	Settleme area (ha)	Agr/Low area (ha)	Ponding area (ha)	embank- ment (ha)	2000 Net urb. density (p/ha)
*(1)	*(2)	*(3)	*(4)	*(5)	*(6)	*(7)	*(8)	*(9)	*(10)	*(11)	*(12)	*(13)	*(14)	*(15)	*(16)	*(17)	*(18)	*(19)	*(20)	*(21)	*(22)	*(23)	*(24)	*(25)
DHAKA PULL AREA																								
1) HIGH ESTABLISHED AREA	94	94	188	0	0	10	0	0	20	34,768	103	149	252	1,072	27	141	244	228	1,072	0	0	0	0	228
2) WEST EMBANKMENT	105	207	312	41	175	11	40	85	43	77,263	157	367	524	590	58	346	503	853	627	67	282	40	27	803
3) OLD DHAKA	509	757	1,266	0	0	52	0	0	158	302,099	539	1,217	1,778	1,142	191	1,128	1,668	1,460	1,156	0	0	0	10	1,443
4) COMMERCIAL/INDUST-RIAL/INSTITUTION	170	344	514	4	18	17	4	8	72	163,798	191	583	775	1,786	83	503	694	389	1,807	24	59	0	3	384
5) EASTERN DHAKA	271	698	968	44	189	28	42	90	148	208,610	342	1,104	1,447	1,994	156	1,041	1,384	694	2,044	0	0	0	0	677
6) MIRPUR AREA	229	440	669	191	610	23	103	218	92	206,292	443	841	1,283	2,560	138	773	1,215	475	2,595	549	1,334	1,042	133	468
7) OTHER CENTRAL AREA	84	130	194	15	51	7	12	26	27	49,448	88	219	305	390	33	202	288	740	357	0	0	0	13	806
8) CANTONMENT	56	106	162	34	146	6	14	30	22	0	95	143	238	1,894	26	169	264	139	1,943	797	435	0	0	136
9) EASTERN EMBANKMENT	94	198	292	108	600	10	60	126	41	20,088	211	318	530	2,368	57	355	566	239	2,422	2,232	2,982	1,857	807	234
10) DND AREA	162	485	647	273	1,171	17	56	99	101	0	452	642	1,094	4,437	118	760	1,211	273	4,380	0	3,471	871	25	277
11) SAVAR	25	112	136	100	440	3	0	0	23	0	127	135	262	1,354	28	163	290	215	1,368	1,405	1,887	0	0	212
12) TONGI/JOYDEBPUR	53	287	340	8	34	5	56	119	60	0	66	404	470	1,912	51	454	520	181	1,929	6,835	1,002	398	425	270
13) N'GANJ/KASHIPUR	69	271	340	49	210	7	56	119	57	0	125	384	509	112,024	55	439	564	4,462	1,835	0	4,397	0	0	307
14) KERANIGANJ	27	263	290	0	0	3	56	0	55	0	30	374	404	1,051	44	418	448	428	1,066	0	1,348	126	135	420
PULL AREA TOTAL	1,928	4,392	6,319	866	4	196	501	1	916	1,062	2,969	6,880	9,871	134,573	1,062	6,892	9,861	73	24,602	11,909	17,195	4,332	1,376	401
AREA OUTSIDE PULL AREA IN STUDTY AREA	11	474	483	0	0	0	0	0	0	0	14	607	621	3,956	0	607	621	308	4,312	7,667	23,097	126	35	144
GRAND TOTAL	1,939	4,866	6,802	866	4	196	501	1	916	1,062	2,983	7,488	10,492	138,528	1,062	7,499	10,483	368	28,914	19,576	40,292	4,458	1,413	383

TABLE C.4 POPULATION AND LAND USE FORECAST WORKSHEET 2000 - 2010

Area	2000 Rich total pop. ('000)	2000 Poor total pop. ('000)	2000 Total pop. ('000)	2000 LAND USE Built up area (ha)	Settlement area (ha)	agri/low area (ha)	embank. area (ha)	ponding area (ha)	perm wa area (ha)	total area (ha)	2000-2010 increase population distr rich in existing ('000)	rich in new ('000)	poor in existing ('000)	poor in new ('000)	2010 rich total ('000)	2010 poor total ('000)	2010 total pop. ('000)	LAND USE 2010 additional built-up area (ha)	built-up area (ha)	settlement area (ha)	agricultu lowland (ha)	embankı area (ha)	ponding area (ha)	permane water area (ha	Net urb. pop. density (p/ha)
*(1)	*(2)	*(3)	*(4)	*(5)	*(6)	*(7)	*(8)	*(9)	*(10)	*(11)	*(12)	*(13)	*(14)	*(15)	*(16)	*(17)	*(18)	*(19)	*(20)	*(21)	*(22)	*(23)	*(24)	*(25)	*(26)
1) HIGH ESTABLISHED AREA	103	141	244	1,072	0	0	0	0	0	1,072	18	0	15	0	121	156	277	0	1,072	0	0	0	0	0	258
2) WEST EMBANKMENT	157	346	503	627	0	282	27	40	0	976	27	0	37	0	184	383	567	0	627	0	282	27	40	0	905
3) OLD DHAKA	539	1,128	1,668	1,156	0	0	10	0	0	1,166	0	0	0	0	539	1,128	1,668	0	1,156	0	0	10	0	0	1,443
4) COMMERCIAL/INDUST-RIAL/INSTITUTION	191	503	694	1,807	24	19	3	0	40	1,893	33	0	54	0	224	557	781	0	1,807	24	19	3	0	40	432
5) EASTERN DHAKA	342	1,041	1,384	2,044	0	0	0	0	0	2,044	59	0	112	0	401	1,153	1,554	0	2,044	0	0	0	0	0	761
6) MIRPUR AREA	443	773	1,215	2,595	549	1,072	133	1,042	262	5,653	76	33	83	131	551	987	1,538	705	3,300	43	873	133	1,042	262	466
7) OTHER CENTRAL AREA	86	202	288	357	0	0	13	0	0	371	15	0	22	0	101	224	325	0	357	0	0	13	0	0	908
8) CANTONMENT	95	169	264	1,943	797	200	0	0	235	3,175	18	50	18	0	162	187	348	80	2,023	716	200	0	0	235	172
9) EASTERN EMBANKMENT	211	355	566	2,422	2,232	421	607	1,857	2,561	10,101	36	63	38	633	310	1,026	1,337	2,903	5,325	0	120	607	1,857	2,192	251
10) DND AREA	452	760	1,211	4,380	0	1,654	25	871	1,817	8,747	77	119	82	275	648	1,116	1,764	1,654	6,034	0	0	25	871	1,817	292
11) SAVAR	127	163	290	1,368	1,405	387	0	0	1,500	4,660	22	50	18	0	199	181	380	215	1,583	1,191	387	0	0	1,500	240
12) TONGI/JOYDEBPUR	68	454	520	1,929	6,835	410	425	396	592	10,587	11	326	48	756	403	1,259	1,662	2,545	4,474	4,438	265	425	396	592	219
13) N'GANJ/KASHIPUR	125	439	564	1,835	0	4,037	0	0	360	6,232	21	0	47	3	147	489	636	12	1,847	0	4,025	0	0	360	344
14) KERANIGANJ	30	418	448	1,066	0	924	135	126	422	2,673	5	29	45	115	84	577	661	615	1,681	0	309	135	126	422	382
PULL AREA TOTAL	2,969	6,892	9,861	24,602	11,842	9,407	1,379	4,332	7,789	59,351	416	669	620	1,912	4,054	9,424	13,479	8,728	33,330	6,410	6,479	1,379	4,332	7,420	404
AREA OUTSIDE PULL AREA IN STUDTY AREA	14	607	621	4,312	7,667	16,269	35	126	6,828	35,237	0	0	0	0	18	777	796	216	4,528	7,559	16,162	35	126	6,828	298
GRAND TOTAL	2,983	7,499	10,482	28,915	19,509	25,676	1,414	4,458	14,617	94,588	416	669	620	1,912	4,072	10,202	14,274	8,944	37,858	13,969	22,641	1,414	4,458	14,248	358

TABLE C.5: REQUIRED AREAS FOR COMMERCE & INDUSTRY AND INSTITUTIONAL FACILITIES

Year	1990	2010	Unit area/p (ha)	existing area (ha)	present achieve't ratio	modified target	required areas in the study area	required areas in the urban area	no. of total required facilities	no. of existing facilities	no. of add. required facilities
				DEVELOPMENT REQUIREMENT							
Population	5,982,174	12,614,443		5,982,174				12,614,443 94%			
1)Commerce & Industry	3,631	7,657	6.07	681	19%	21%	1,608	1,510			
2)Education	2,542	5,360	4.25	859.41	34%	68%	3,624.42	3,404.03			
nursery school	968	2,042	1.62	291	30%	60%	1,225	1,151	1,514	359	1,155
primary school	968	2,042	1.62	387	40%	80%	1,634	1,534	2,018	479	1,540
secondary school or college	605	1,276	1.01	182	30%	60%	766	719	378	90	289
3)Health	2,179	4,594	4	139	6%	13%	1,098	1,031			
dispensary	484	1,021	0.81	97	20%	40%	408	384	1,009	239	770
maternity/child care	484	1,021	0.81	24	5%	30%	306	288	757	60	697
health centre	605	1,276	1.01	12	2%	20%	255	240	126	6	120
hospital	605	1,276	1.01	6	1%	10%	128	120	63	3	60
4)Administrative	291	613	0.49	116	40%	80%	490	460			
**2)-4)total	5,011	10,567	8.38	1,115	22%	44%	5,212	4,895			0
5)Recreation	2,845	5,998	5	569	20%	40%	2,399	2,253			
parks, openspace	2,421	5,105	4.05	484	20%	40%	2,042	1,918	5,046	1,196	3,849
cinema, closed space	61	128	0.10	12	20%	40%	51	48	252	60	192
sports stadium	363	766	0.61	73	20%	40%	306	288	252	60	192
6)Social Cultural	968	2,042	2	315	33%	65%	1,327	1,247			
community centre	121	255	0.20	12	10%	20%	51	48	126	30	96
religious facility	242	510	0.40	121	50%	100%	510	479	2,523	598	1,925
cemetery	605	1,276	1.01	182	30%	60%	766	719	378	90	289
7)Urban Service	605	1,276	1	182	30%	60%	766	719			
post office	61	128	0.10	18	30%	60%	77	72	378	90	289
telephone exchange	61	128	0.10	18	30%	60%	77	72	378	90	289
police station	242	510	0.40	73	30%	60%	306	288	378	90	289
bus/ghat/rail station	121	255	0.20	36	30%	60%	153	144	378	90	289
others	121	255	0.20	36	30%	60%	153	144			
**2)-7) total	9,429	19,883	16	2,180	23%	46%	9,704	9,114			
*refer to the land use category											
Other Urban	2,845	5,998		569			2,399	2,253			
Institution	6,585	13,885		1,611			7,305	6,861			

TABLE C.6: PROFILE OF A TYPICAL UNION 1990 AND 2010

		EXISTING 1990		FUTURE 2010		INCREASE 1990-2010	RATIO	ODEL UNIT
TOTAL AREA(ha)		1,500		1,500				150
POPULATION		20,000		200,000		180,000	10	20,000
HOUSEHOLDS		3,279		32,787		29,508	10	3,279
GROSS DENSITY		13		133		120	10	13
LANU USE		Rural		Urban	930			
DETAILS (ha)	residential	30	2.0%	570	38.0%	540	19	57
	commercial	3	0.2%	60	4.0%	57	20	6
	industry	2	0.1%	30	2.0%	29	20	3
	institution	15	1.0%	300	20.0%	285	20	30
	other urban	3	0.2%	75	5.0%	72	25	8
	road	15	1.0%	150	10.0%	135	10	15
	village	120	8.0%	15	1.0%	-105	0.13	2
	agriculture	1,163	77.5%	120	8.0%	-1,043	0.10	12
	water body	150	10.0%	180	12.0%	30	1.2	18
BUILT-UP AREA		188		1,200			6.4	120
NE.U. DENSITY		107		167			1.6	167
N.R. DENSITY		133		342			2.6	342
NO. OF HOUSES		2,522		25,221		22,699	10	2,522
INSTITUTION	nursery	1		32		31	27	3
(units)	primary school	2		32		30	20	3
	secondary school	0		8		8	27	1
	college	0		2		2	27	0
	dispensary	1		24		23	30	2
	maternity	0		24		24	120	2
	health centre	0		6		6	300	1
	hospital	0		1		1	600	0
	branch office	0		10		10	25	1
	admini. office	0		2		2	25	0
	play lot	4		80		76	20	8
	children's park	1		24		23	30	2
	neighbour. park	0		6		6	30	1
	sports stadium	0		6		6	30	1
	cinema	0		6		6	30	1
	district park	0		1		1	30	0
	religious(II)	2		40		38	20	4
	religious(IV)	0		2		2	20	0
	post office	0		8		8	27	1
	tele. exchange	0		8		8	27	1
	police station	0		8		8	27	1
	bus/rail station	0		8		8	27	1
	public toilet	0		8		8	27	1
COMMERCIAL	shops(I)	57		437		380	8	44
(units)	shopping street	12		388		377	33	39
	supermarket	1		24		24	33	2
	shopping centre	0		15		14	33	1

TABLE C.7: ESTIMATION OF FUTURE LAND FOR COMMUNITY FACILITIES (standard)

LEVEL	I	II	III	IV
POPULATION	1,000	5,000	20,000	100,000
HOUSEHOLDS	164	820	3,279	16,393
FACILITIES	(acre)	(acre)	(acre)	(acre)
EDUCATION		nursery 2.0 primary 2.0	secondary 5.0	college 10.0
HEALTH		dispensary 1.0 maternity 1.0	health centre 5.0	hospital 10.0
ADMINISTRATION			branch office 1.0	adm. office 10.0
RECREATION	play lot 1.0	children's park 2.0	neighbour. park 5.0 sports stadium 3.0 cinema 0.5	district park 20.0
COMMUNITY	meeting rm 0.5	meeting hall 0.5	community hall 1.0	
RELIGIOUS		religious 0.5		religious 5.0
URBAN SERVICE			post office 0.5 tele. exchange 0.5 police station 2.0 bus/rail station 1.0 public toilet 0.1	
COMMERCIAL	shops 0.3	shopping street 2.0	supermarket 10.0	shopping centre 30.0
TOTAL	1.8	11.0	34.6	85.0

TABLE C.8: ESTIMATION OF FUTURE LAND FOR COMMUNITY FACILITIES(*tentative target*)

LEVEL	I	II	III	IV	IV total	III total
POPULATION	1,000	5,000	20,000	100,000	100,000	20,000
HOUSEHOLDS	164	820	3,279	16,393	16,393	3,279
FACILITIES	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)
EDUCATION		nursery 0.49	secondary 1.21	college 2.43	18.2	3.2
		primary 0.65			12.9	2.6
HEALTH		dispensary 0.16	health centre 0.40	hospital 0.40	5.7	1.1
		maternity 0.12			2.4	0.5
ADMINISTRATION			branch office 0.32	adm. office 3.24	4.9	0.3
RECREATION	play lot 0.2	children's park 0.32	neighbour. park 0.81	district park 3.24	29.9	5.3
			sports stadium 0.49		2.4	0.5
			cinema 0.08		0.4	0.1
COMMUNITY	meeting rm 0.04	meeting hall 0.04	community hall 0.08		5.3	1.1
RELIGIOUS		religious 0.20		religious 2.02	6.1	0.8
URBAN SERVICE			post office 0.12		0.6	0.1
			tele. exchange 0.12		0.6	0.1
			police station 0.49		2.4	0.5
			bus/rail station 0.24		1.2	0.2
			public toilet 0.02		0.1	0.0
COMMERCIAL	shops 0.03	shopping street 0.17	supermarket 0.85	shopping centre 2.55	12.7	2.0
total	0.23	2.15	5.24	13.5	105.9	18.4

TABLE C.9; ESTIMATION OF FUTURE LAND FOR COMMUNITY FACILITIES(ultimate target)

LEVEL	I	II	III	IV	IV total	III total
POPULATION	1,000	5,000	20,000	100,000	100,000	20,000
HOUSEHOLDS	164	820	3,279	16,393	16,393	3,279
FACILITIES	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)
EDUCATION		nursery 0.81	secondary 2.02	college 4.05	30.4	5.3
		primary 0.81			16.2	3.2
HEALTH		dispensary 0.40	health centre 2.02	hospital 4.05	22.3	3.6
		maternity 0.40			8.1	1.6
ADMINISTRATION			branch office 0.40	adm. office 4.05	6.1	0.4
RECREATION	play lot 0.4	children's park 0.81	neighbour. park 2.02	district park 8.09	74.9	13.4
			sports stadium 1.21		6.1	1.2
			cinema 0.20		1.0	0.2
COMMUNITY	meeting rm 0.20	meeting hall 0.20	community hall 0.40		26.3	5.3
RELIGIOUS		religious 0.20		religious 2.02	6.1	0.8
URBAN SERVICE			post office 0.20		1.0	0.2
			tele. exchange 0.20		1.0	0.2
			police station 0.81		4.0	0.8
			bus/rail station 0.40		2.0	0.4
			public toilet 0.04		0.2	0.0
COMMERCIAL	shops 0.12	shopping street 0.81	supermarket 4.05	shopping centre 12.14	60.7	9.7
total	0.73	4.45	14.00	30.4	266.3	46.4