Government of the people's Republic of Bangladesh
Ministry of Housing and Public Works
Urban Development Directorate
82 Segunbagicha, Dhaka-1000

PREPARATION OF DEVELOPMENT PLAN FOR MEHERPUR ZILLA

REPORT ON ASSIGNMENT-6

A Report of Population Projection based on review of projection methods & justification of approved projection method for Gangni Upazila

March 2025

Rakibul Hasan
Junior Urban Planner

Population Projection for Gangni Upazila

1.1. Introduction:

1.1.1. Linear Method:

The linear method assumes that population growth is growing at absolute equal increments per year, decade, or other unit of time. It also assumes that growth will follow a similar pattern in future years.

1.1.2. Cohort Method:

The “cohort component population projection” method follows the process of demographic change and is viewed as a more reliable projection then those that primarily rely on census data or information that reflects population changes. It also provides the type of information that needed to plan for services to meet the future demands of different segments of the population.

1.2. Population Projection of Gangni Upazila:

1.2.1 Linear Method formula:

$$P_{t+n} = P_t(1+r)^n$$

Here,

P_{t+n} = Projected population

P_t = Current year population

r = growth rate

n = year interval

$$r = \sqrt[n]{\frac{P_{t+n}}{P_t}} - 1,$$

P t + n = Current year population.

Pt = Last year population.

n = Time interval

Growth rate of 2022:

Here,

P_{2001}=269085

P_{2022}=322701

Growth Rate r = $\sqrt[n]{\frac{P_{t+n}}{P_t}}$ - 1

= $\sqrt[21]{\frac{P_{2022}}{P_{2001}}}$ -1

= $\sqrt[21]{\frac{322701}{269085}}$ -1

= 0.008

1.2.1.1. Population Projection of 2027:

Projected population of 2027= $P_{t+n}(1+r)^n$

=322701(1+0.008) ^{5}

= 335817

1.2.1.2. Population Projection of 2032:

Projected population of 2032= $P_{t+n}(1+r)^n$

=335817(1+0.008) ^{5}

= 349466

1.2.1.3. Population Projection of 2037:

Projected population of 2037= $P_{t+n}(1+r)^n$

=349466(1+0.008) ^{5}

= 363670

1.2.1.4. Population Projection of 2042:

Projected Population 2042 = $P_{t+n}(1+r)^{n}$

= 363670 $(1+.008)^{5}$

= 378451

1.2.1.5. Population Projection of 2047:

Projected Population 2047= $P_{t+n}(1+r)^{n}$

= 378451 $(1+.008)^{5}$

= 393833

There is used High Growth Rate for population projection.

1.2.2. Population Projection by different growth rate: (Gangni Upazila)

Year	2001-2022 Population: (269085-322701) Growth rate: 0 .008	2011-2022 Population: (299607-322701) Growth rate: .007
2027	335817	332499
2032	349466	342594
2037	363670	352996
2042	378451	363714
2047	393833	374757

Table: Population Projection by different growth rate. (Source: Population of 2001, 2011 and 2022 from census)

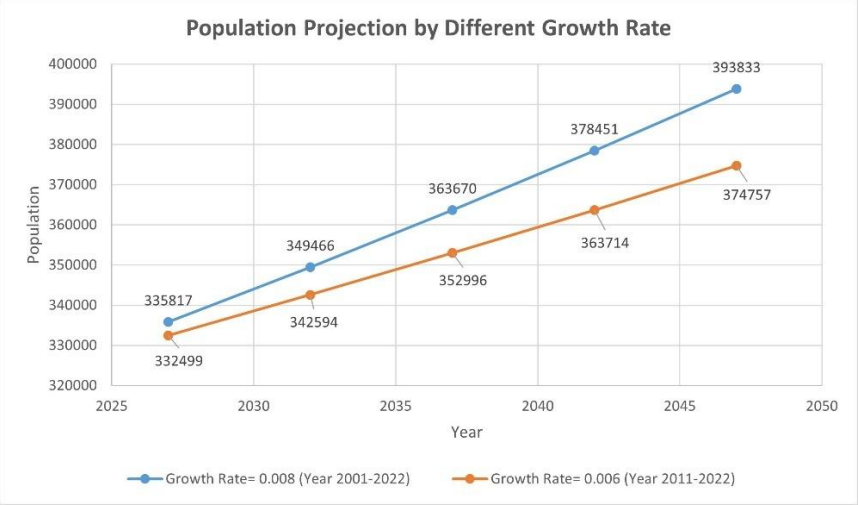

Figure: Population Projection by Different Growth Rate

1.2.3. Cohort component method:

Cohort Component Summary Equation:

P_{t+n} = Survived population + Births + Net migrants

Here,

Survived population = The number of persons alive at the beginning of the age interval.

Birth = Number of births taking place during the projection interval.

Net migrants = Movement of people across political boundaries that are semi-permanent or permanent in nature.

Residual method of migration:

Net migrants = (Population $_{t+n}$ – Population $_{t}$) - (Births - Deaths)

Population $_{t+n}$= Current population

Population $_{t}$ = Last census

1.2.3.1. Population projection of Gangni Upazila:

Age group	L_x (Population Gangni upazila, year 2022)	${}_n d_x$ (Number of deaths)	$L_x = l_x - {}_n d_x$ (Existing population)	Survived population $=L_x$*survival rate
0-4	24041	27	24014	24014
5-9	23686	14	23672	23672
10-14	28462	17	28445	28445
15-19	30043	28	30015	30015
20-24	25106	23	25083	25083
25-29	23848	18	23830	23830
30-34	23041	25	23016	23016
35-39	27430	35	27395	27395
40-44	24654	69	24585	24585
45-49	20717	94	20623	20623
50-54	20040	150	19890	19890
55-59	14973	207	14766	14766
60-64	13908	221	13687	13687
65-69	9423	232	9191	9191
70-74	6519	227	6292	6292
75-79	2807	172	2635	2635
80-84	2227	177	2050	2050
85-89	807	95	712	712
90+	968	114	854	854
Total	322700	1946	320754	320754

Table: Abridged Life Table for Both Sexes Combined.

(Source: BBS 2022)

l_x: The number of persons alive at the beginning of the age interval

L_x: The total number of person-years in the stationary population for each age interval. It can be viewed as the average population size between birthdays, taking into account the distribution of deaths throughout the year.

${}_n d_x$: The number of persons dying during the age interval.

Age specific number of births, death and migration is constant for each year population projection.

Formula:

$$\textbf{Survival Rate} = \frac{5Lx+5}{5Lx}$$

$$= \frac{(5*320754)+5}{5*320754}$$

= 1.00

Net Migrants = (Population $_{t+n}$ – Population $_{t}$) - (Births - Deaths)

= (322701 $_{2022}$ – 299607 $_{2011}$) – (6002 – 2091)

(Source: BBS 2011, 2022)

= 19183

1.2.3.2. Projected population of 2027:

Population$_{2027}$ = Survived population + Births + Net migrants

= 320754 + 6002 + 19183

= 345939

1.2.3.3. Projected population of 2032:

Population$_{2032}$ = Survived population + Births + Net migrants

= 345939 +6002 + 19183

= 371124

1.2.3.4. Projected population of 2037:

Population$_{2037}$ = Survived population + Births + Net migrants

= 371124 + 6002 + 19183

= 396309

1.2.3.5. Projected population of 2042:

$Population_{2031}$ = Survived population + Births + Net migrants

= 396309 + 6002 + 19183

= 421495

1.2.3.6. Projected population of 2047:

$Population_{2047}$ = Survived population + Births + Net migrants

= 421495 + 6002 + 19183

= 446680

1.3. Process of cohort component method that used for the calculation:

- Age specific population is collected from census 2022 of Gangni Upazila and age specific number of deaths collected from Census of 2022 of Meherpur district.
- Survived population (L_x) calculated by subtracting ${}_n d_x$ from l_x.
- Survival rate is calculated by this formula $=\frac{5Lx+5}{5Lx}$, survived population calculated by this formula = (L_x * survival rate), net migrants calculated by this formula = (population $_{t+n}$ − population $_t$) - (Births - Deaths), projected population calculated by this formula = Survived population + Births + Net migrants.

1.4. Comparison between linear and cohort component method projected population:

Year	Projected Population in Linear Method	Projected Population in Cohort Method
2027	335817	345939
2032	349466	371124
2037	363670	396309
2042	378451	421495
2047	393833	446680

Table: Comparison between linear and cohort method projected population.

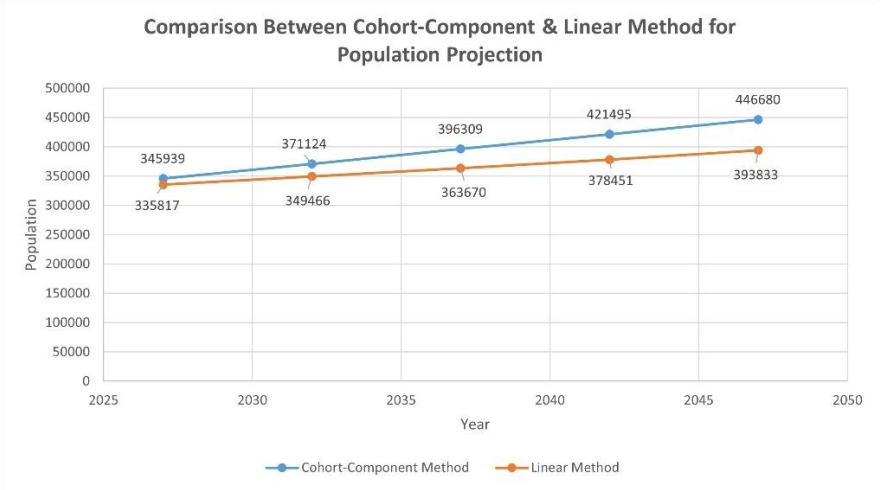

Figure: Comparison between 2 methods for population Projection

1.5. Comparison between linear projection and cohort component method:

- Cohort component method is used as a projection tool, it assumes the components of demographic change, mortality, fertility, and migration, will remain constant throughout the projection period. On the other hand, in linear projection method only population and growth rate are used as a component.
- In case of projection result, the number of populations of cohort component method is bigger than the number of populations in linear projection method. As an example, the projected population of 2042 is 378451 in linear method and 421495 in cohort component method.
- As migrations, births, deaths are used in cohort component method so the projected population number is more accurate than linear projection method. Because in linear

projection method only population and growth rate are used for projection.

- Cohort calculation is difficult than linear projection method.

1.6.1. Limitation of cohort component projection method:

- First, it is highly dependent on reliable birth, death and migration data. Thus, it may be difficult to collect the information to apply this tool.
- Second, it assumes that survival and birth rate and estimates of net migration will remain the same throughout the projection period.

1.6.2. Limitation of linear method:

- In 10-year, linear projection first ten-year population projection is approximately correct, but next ten-year population is comparatively less than before.
- Because only growth rate is taken for projection, the value is not accurate.

1.7. Conclusion

Cohort Component Method divides the population into specific groups (cohorts) based on certain characteristics (e.g., age, income). It is often used in demographic analysis to predict changes over time by tracking the behavior of these cohorts. It provides more detailed insights into specific subgroups and can track their distinct patterns. It can be complex and require large amounts of data for accuracy. On the other hand, linear method assumes a linear relationship between variables, typically focusing on trends over time. This method used in forecasting where simple, straightforward predictions are needed. The biggest advantage of this method is that it requires less data to use. It may oversimplify trends, missing more complex patterns or non-linear relationships.

In short, the Cohort Component Method is more detailed and considers group-specific changes, while the Linear Method focuses on overall trends and is simpler but may lack precision in certain cases.