1. INTRODUCTION

1.1 The Department of Statistics Malaysia (DOSM) released the first population projection data for Peninsular Malaysia for the period 1957-1982, using the 1957 Population Census data as the base year. The first Malaysia level population projection publication (Peninsular Malaysia, Sabah and Sarawak) was for the period 1970-1990 based on the Population and Housing Census Malaysia (MyCensus) 1970. Subsequently, this publication has been released every ten years based on the MyCensus conducted at that time.

1.2 Population projections is the main input used for formulation, implementation and monitoring of policies at national and international levels. Population projections also serve as the basis for long term planning in government and private sectors as well as individuals for academic and research purposes.

1.3 The Population Projections, Malaysia, 2020-2060 is the sixth publication, following the previous Population Projections, Malaysia, 2010-2040 which was released in 2016 (based on the MyCensus 2010). This publication presents statistics and the population structure for the 40-year period after the MyCensus 2020, which was conducted from July 2020 to October 2021 due to the COVID-19 outbreak and the nationwide Movement Control Order.

2. CAVEAT

The population projections produced by the Department are not intended to serve as precise forecasts of future demographic developments. This publication presents illustrative scenarios that depict the potential trajectory of Malaysia's population, based on a set of well-considered assumptions concerning key demographic components such as fertility, mortality and migration. It is essential to acknowledge that the accuracy of population projections is subject to a range of unforeseen factors which can substantially influence population dynamics. The factors include economic crisis, public health issues and natural disasters. In light of this, the Department regularly revises its population projections to ensure that it remains responsive to changes in the demographic, social and economic environment.

3. METHODOLOGY

3.1 These population projections are prepared using a bottom-up approach through the cohort component method, disaggregated by state, age, sex and ethnic group. However, the total population of Malaysia and each state is initially projected based on population time series trends to ensure that the projection patterns produced are aligned with current population trends. Finally, the sum of the population projections by state is adjusted to ensure that the total matches the overall projected population.

3.2 *The preparation of population projections involves four main components, which are the base population, live births, deaths, and migration (internal and international migration). The base data used are obtained from agencies and ministries, such as birth and death data from the National Registration Department (JPN), internal migration data (Migration Survey conducted by DOSM) and international migration data (Immigration Department of Malaysia (JIM), Ministry of Higher Education (KPT) and JPN).*

3.3 *The basic formula of cohort-component method is as follows:*

$$\boldsymbol{P_t = P_{t-1} + B_{t-1,t} - D_{t-1,t} + M_{t-1,t}}$$

where;

$\boldsymbol{P_t}$	=	*population at time t;*
$\boldsymbol{P_{t-1}}$	=	*population at time t-1;*
$\boldsymbol{B_{t-1,t}}$	=	*births for the period of t-1 to t;*
$\boldsymbol{D_{t-1,t}}$	=	*deaths for the period of t-1 to t; and*
$\boldsymbol{M_{t-1,t}}$	=	*net migration for the period of t-1 to t.*

3.4 *Each component of live births, deaths and migration is projected separately based on specific assumptions, serving as input for the preparation of population projections for Malaysia and states, in line with demographic time series trends. The population projections are calculated using a simulation model via the Spectrum – Demographic Projection (DemProj) software developed by the United States Agency for International Development (USAID).*

3.5 *The variety of assumptions used in preparing projections for these components aims to reflect the uncertainty in future demographic changes.*

3.5.1 Base Population

3.5.1.1 *The Population Projections, Malaysia, 2020-2060 use the estimated population data for 2024 based on the MyCensus 2020 as the base population.*

3.5.1.2 *Four steps involved in preparing the base population that are:*

i. *Data from MyCensus 2020 is adjusted with under-enumeration rates from the Census Coverage Evaluation Survey;*

ii. *Next, the data is adjusted to the midyear population (30th June 2020) by adding the number of deaths (1st to 6th July 2020) and subtracting the number of births (1st to 5th July 2020);*

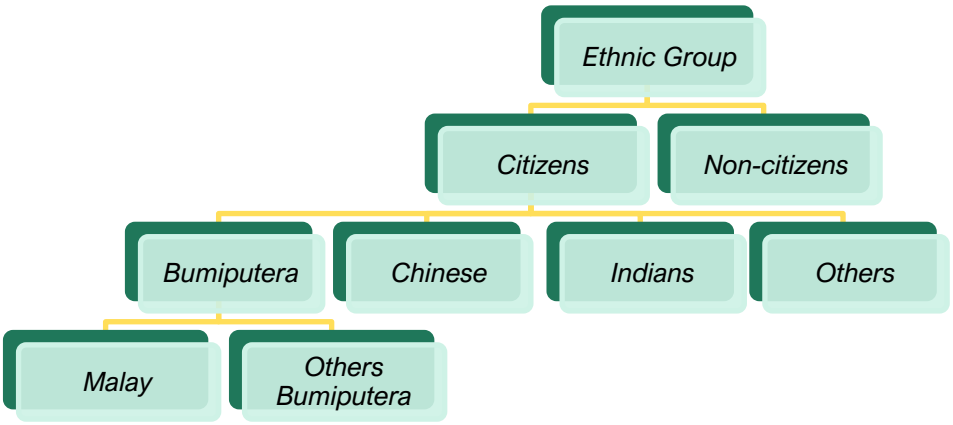
iii. *Then, age smoothing methods are applied to minimize age misreporting especially for the age ending with '0' and '5'; and*

iv. *Finally, the population aged 0 to 9 years are reviewed and updated based on the Current Population Estimates 2020 based on MyCensus 2010.*

3.5.1.3 *The base population is prepared according to ethnic group, sex and age at both the national and state levels.*

3.5.1.4 *Classification of major ethnic groups and citizenship is based on the classification used during MyCensus 2020.*

Diagram 1: Classification of major ethnic groups and citizenship



3.5.2 Live Births

3.5.2.1 *To define plausible future demographic trajectories, quantitative methods are combined with qualitative insights. In particular, the assessment of future fertility levels involves the analysis of time series data on the total fertility rate (TFR), which provides a basis for identifying trends and informing projection assumptions. In addition to the total fertility rate (TFR), age-specific fertility rate (ASFR) patterns and the sex ratio at birth are also utilised as key inputs in the formulation of population projections.*

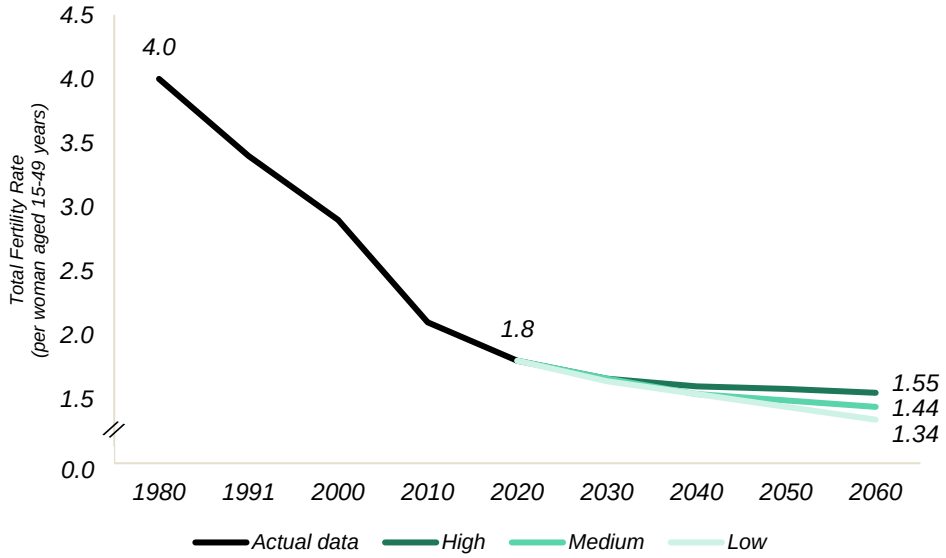
3.5.2.2 *Birth projections are derived based on TFR at both national and state levels, disaggregated further by ethnic group within each state. To estimate future TFR for Malaysia, three fertility assumption scenarios - high, medium and low have been developed. These scenarios consider observed trends in socioeconomic conditions, government policies, and health factors that will influence fertility behaviour.*

Table 1: Three fertility level assumptions, Malaysia, 2020-2060

Assumption	2020	2030	2040	2050	2060
High	1.8	1.66	1.60	1.58	1.55
Medium		1.66	1.54	1.49	1.44
Low		1.64	1.54	1.44	1.34

3.5.2.3 *For this publication, the **medium fertility assumption** was adopted, projecting a total fertility rate (TFR) of 1.44 in 2060. This assumption is based on the expectation that fertility will gradually decline or stabilise at levels or below the replacement rate.*

Chart 1: Total fertility rate by assumptions, Malaysia, 1980-2060



3.5.2.4 *The TFR assumptions for state and ethnic group within the states are projected by considering the changes in Malaysia's TFR for 2020-2050 and assumed to remain constant through 2060.*

Table 2: Fertility level assumption by state, Malaysia, 2020-2060

State	2020	2030	2040	2050-2060
Johor	1.9	1.75	1.62	1.57
Kedah	2.1	1.88	1.75	1.71
Kelantan	3.0	2.63	2.50	2.45
Melaka	1.8	1.60	1.47	1.43
Negeri Sembilan	1.8	1.68	1.55	1.51
Pahang	2.2	2.08	1.96	1.91
Perak	1.9	1.68	1.56	1.51
Perlis	2.0	1.62	1.50	1.45

State	2020	2030	2040	2050-2060
Pulau Pinang	*1.3*	*1.19*	*1.07*	*1.02*
Sabah	*1.6*	*1.41*	*1.28*	*1.24*
Sarawak	*1.8*	*1.53*	*1.40*	*1.36*
Selangor	*1.6*	*1.45*	*1.32*	*1.28*
Terengganu	*3.2*	*2.86*	*2.74*	*2.69*
W.P. Kuala Lumpur	*1.3*	*1.23*	*1.11*	*1.06*
W.P. Labuan	*2.0*	*1.67*	*1.55*	*1.50*
W.P. Putrajaya	*1.8*	*1.73*	*1.60*	*1.56*

3.5.2.5 For ASFR of Malaysia and state levels, the projections consider the increasing average age at first marriage and the rising average age of mothers at first live birth. Women aged 30–34 years are projected to have the highest fertility rate in 2060. Its followed by those in the 25–29, 35–39 and 20–24 age groups.

3.5.2.6 The sex ratio at birth in 2020 is assumed to remain constant each year for projecting the number of live births by sex.

3.5.3 Deaths

3.5.3.1 The mortality component assumptions are constructed based on life expectancy at birth for both males and females.

3.5.3.2 Two calculation methods are used to derive the life expectancy at birth assumptions for the projection period 2025–2060, namely:

i. ***Assumption 1:*** *Moving average method*
Life expectancy at birth for 2025 to 2060 is projected using the moving average trend line method based on actual life expectancy data from 1991 to 2024; and

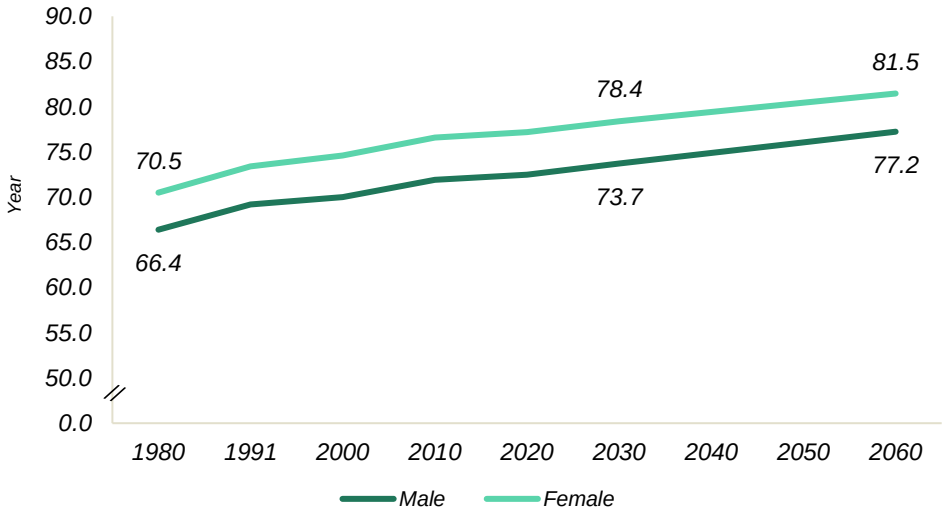
ii. ***Assumption 2:*** *Method based on World Population Prospects (WPP) 2024*
Projections for the period 2025 to 2060 are developed using actual data 2024 as the base year, incorporating the annual increase in life expectancy as projected by WPP 2024.

Table 3: Two life expectancy at birth assumptions, Malaysia, 2020-2060

Assumption	Sex	2020	2030	2040	2050	2060
1	Male	72.6	73.7	74.9	76.1	77.2
	Female	77.3	78.4	79.4	80.4	81.5
2	Male	72.6	74.1	76	77.9	79.7
	Female	77.3	78.7	80.1	81.4	82.7

3.5.3.3 *In 2020, life expectancy at birth was 72.6 years and 77.3 years for male and female, respectively. Assumption 1 was used in calculating the population projections for the period 2025-2060, considering the time series trend of life expectancy from 1991 to 2024. Based on this assumption, life expectancy at birth is projected to increase to 77.2 years for males and 81.5 years for females by 2060.*

Chart 2: Life expectancy at birth, Malaysia, 1980-2060



3.5.3.4 *The life expectancy at birth assumptions by state are as follows:*

Table 4: Life expectancy at birth assumptions by, Malaysia, 2024-2060

State	2024		2030		2040		2050		2060	
	M	F	M	F	M	F	M	F	M	F
Johor	72.8	77.4	73.5	78.0	74.7	79.0	75.9	80.0	77.0	81.1
Kedah	70.3	76.0	71.0	76.6	72.2	77.6	73.4	78.6	74.5	79.7
Kelantan	70.7	76.0	71.4	76.6	72.6	77.6	73.8	78.6	74.9	79.7
Melaka	71.8	77.0	72.5	77.6	73.7	78.6	74.9	79.6	76.0	80.7
Negeri Sembilan	71.4	77.0	72.1	77.6	73.3	78.6	74.5	79.6	75.6	80.7
Pahang	70.9	75.8	71.6	76.4	72.8	77.4	74.0	78.4	75.1	79.5

State	2024		2030		2040		2050		2060	
	M	F	M	F	M	F	M	F	M	F
Perak	71.0	76.9	71.7	77.5	72.9	78.5	74.1	79.5	75.2	80.6
Perlis	70.9	76.2	71.6	76.8	72.8	77.8	74.0	78.8	75.1	79.9
Pulau Pinang	72.5	77.3	73.2	77.9	74.4	78.9	75.6	79.9	76.7	81.0
Sabah	73.2	77.3	73.9	77.9	75.1	78.9	76.3	79.9	77.4	81.0
Sarawak	72.8	77.8	73.5	78.4	74.7	79.4	75.9	80.4	77.0	81.5
Selangor	76.1	80.3	76.8	80.9	78.0	81.9	79.2	82.9	80.3	84.0
Terengganu	69.8	75.0	70.5	75.7	71.7	76.6	72.9	77.6	74.0	78.7
W.P. Kuala Lumpur	74.1	78.8	74.8	79.4	76.0	80.4	77.2	81.4	78.3	82.5
W.P. Labuan	76.4	79.4	77.1	80.0	78.3	81.0	79.5	82.0	80.6	83.1
W.P. Putrajaya	72.3	74.5	73.0	75.1	74.2	76.1	75.4	77.1	76.5	78.2

Notes:
M - Male
F - Female

3.5.4 Migration

3.5.4.1 *Migration, or population movement, is a key factor influencing changes in population structure and shaping the social and economic dynamics of a given area over time. In general, variations in migration patterns and characteristics can produce differing impacts on both the areas of origin and destination.*

3.5.4.2 ***International Migration***

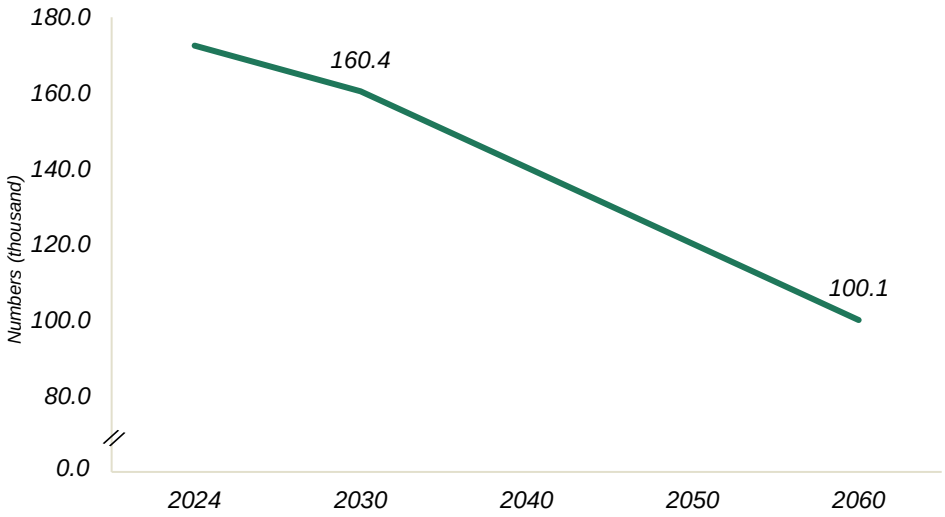
i. *International migration refers to the movement of an individual or a group of people across national borders to reside temporarily or permanently in another country.*

ii. *Outflows (emigration) and inflows (immigration) of a country involve both Citizens and Non-citizens (BWN). The net international migration of a country is defined as the difference between immigration and emigration.*

iii. *The net international migration projection for the period 2025-2060 involves only the projection of BWN, based on the current stock of BWN in Malaysia.*

iv. *Assumption of new migrant entries each year is derived from the total number of active pass holders of the Temporary Employment Visit Pass (PLKS) is considered in the calculation.*

Chart 3: International migration, Malaysia, 2024-2060



3.5.4.3 *Internal Migration*

i. *Population projections at the national level take into account international migration, while state-level projections also incorporate internal migration.*

ii. *Data for internal migration projections are sourced from the Migration Survey, which provides information on in-migrants, out-migrants and net migration by state and sex for the years 1992 to 2022.*

iii. *Internal migration is projected using a linear regression method based on net migration trends from 1992 to 2022. The projected values cover the period 2024 to 2050 and are assumed to remain constant through 2060.*

4. CONCEPTS AND DEFINITIONS

4.1 Average annual population growth rate

Refers to the change in population over time and can be quantified as the change in the number of individuals in a population using "per unit time" for measurement.

$$r = \frac{1}{n}\, ln\, [\frac{P_{t+n}}{P_t}] \times 100$$

where;

r	=	*average annual population growth rate;*
P_t	=	*population at year t;*
P_{t+n}	=	*population at year t+n;*
n	=	*number of the year; and*
ln	=	*natural logarithm.*

4.2 Median age

Age that divides the population in two parts of equal size, with there are as many persons with ages above the median as there are with ages below the median.

4.3 Dependency ratio

The dependency ratio is the ratio of dependents to the 100 persons in the working age population. This ratio can be disaggregated into the total dependency ratio, youth dependency ratio and the old-age dependency ratio.

4.3.1 Total dependency ratio

The total dependency ratio is the number of persons under age 15 plus persons aged 65 years and older per one hundred persons aged 15 to 64 years.

$$\textit{Total dependency ratio}$$

$$= \frac{(Number\ of\ persons\ aged\ below\ 15\ years + number\ of\ persons\ aged\ 65\ years\ and\ over\ in\ year\ t)}{Number\ of\ persons\ aged\ 15\text{-}64\ years\ in\ year\ t} \times 100$$

4.3.2 *Young dependency ratio*

The young dependency ratio is the number of persons aged below 15 years per one hundred persons 15 to 64 years.

$$\textbf{Young dependency ratio}$$

$$= \frac{Number\ of\ persons\ aged\ below\ 15\ years\ in\ year\ t}{Number\ of\ persons\ aged\ 15\text{-}64\ years\ in\ year\ t} \times 100$$

4.3.3 *Old-age dependency ratio*

The old-age dependency ratio is the number of persons 65 years and above per one hundred persons 15 to 64 years.

$$\textbf{Old-age dependency ratio}$$

$$= \frac{Number\ of\ persons\ aged\ 65\ years\ and\ over\ in\ year\ t}{Number\ of\ persons\ aged\ 15\text{-}64\ years\ in\ year\ t} \times 100$$

4.4 *Sex ratio*

Refers to the number of males per 100 females.

$$\textbf{Sex ratio} = \frac{Number\ of\ males\ in\ year\ t}{Number\ of\ females\ in\ year\ t} \times 100$$

4.5 *Age-specific fertility rate*

Refers to the number of births to mothers in a specific age group in a given year, per one thousand females in the same age group.

$$\textbf{Age Specific Fertility Rate}$$

$$= \frac{Number\ of\ live\ births\ by\ specific\ age\ group\ of\ mother\ in\ year\ t}{Mid-year\ female\ population\ of\ the\ specific\ age\ group\ in\ year\ t} \times 1000$$

4.6 *Total fertility rate*

Refers to the average numbers of children which would be born if women survived to the end of their reproductive period and throughout that period are subject to the schedule of age-specific fertility rates for the given year.

This rate is derived by adding up the age-specific fertility rates of women aged 15-49 years (by five-year age groups) and multiplying by 5.

$$\textbf{Total fertility rate} = 5 \sum_{i} [\ Age - specific\ fertility\ rate\ ]$$

where; i = *(15 – 19), (20 – 24), …, (45 – 49)*

4.7 Life expectancy

Life expectancy is the average remaining age (years) for a person is expected to live at the beginning of the certain age if the age-specific death rates of the given period continued throughout his or her lifetime.

4.8 Survivors

Survivors is the number of survivors at the beginning of the certain age.

4.9 Survival ratio

Survival ratio is the proportion of survivors from age group x to x+n.

4.10 Ageing population

4.10.1 Based on the United Nations (UN), ageing is categorized into three groups:

4.10.1.1 Ageing Society: when the population aged 65 years and over reached 7 per cent of the total population;

4.10.1.2 Aged Society: when the population aged 65 years and over reached 14 per cent of the total population; and

4.10.1.3 Super-aged Society: when the population aged 65 years and over reached 20 per cent of the total population.

4.10.2 Based on Dasar Warga Emas Negara (DWEN), ageing occurs when the population aged 60 years and over reaches 15 per cent of the total population.

4.11 Population pyramid

Population pyramid is divided into four main forms that are progressive, steady, regressive and intermediates. Each of these forms reflects certain demographic characteristics.

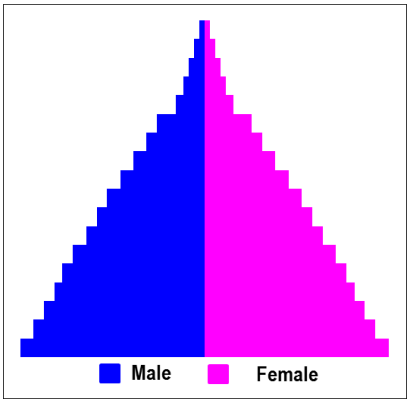
*4.11.1 **Progressive pyramid***

Portraying population distribution in less developed countries, the characteristics of progressive pyramid are:

*4.11.1.1 **Wide base** – wide base describes the larger number of young populations as result of a high birth rate and low mortality rate. This scenario occurs mainly in less developed countries. High birth rate resulting to the rapid growth of the country's population.*

*4.11.1.2 **Sharp peak** – sharp peak reflects the lower life expectancy of the population. It also reflects the lower numbers of people who live to reach old age (over 60 years).*

*4.11.1.3 **Concave slope** – concave shape of pyramid wall that portray the number of adults is not balanced with the number of children. This shows the percentage of adults were less than children.*

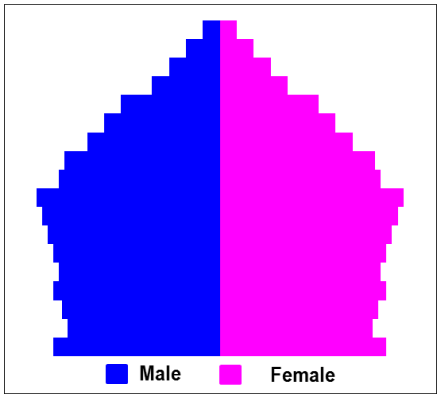


*4.11.2 **Stable pyramid***

*4.11.2.1 **Have a wide base** – but not as wide as the base of the progressive pyramid. It shows that the birth rate is still high. However, the infant mortality rate is low.*

*4.11.2.2 **Less sharp peak** – reflects the increasing percentage of older population. Life expectancy has increased more than 65 years. This situation also reflects the improvements of health status of the population.*

4.11.2.3 ***The slope was almost straight*** *– shows the ratio of the adult population, the elderly and children are more balanced. There are higher percentages of the adult population that can be absorbed into the workforce. It shows the lower mortality rate among adult population.*



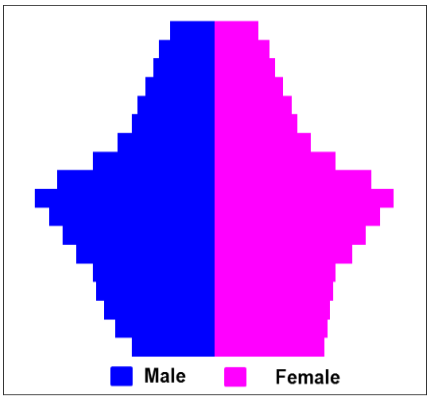
4.11.3 *Regressive pyramid*

More developed countries have a pyramid in either regressive or intermediate form. Both pyramids have almost the same characteristics.

4.11.3.1 ***Narrow base*** *– describing the low birth rate. It also explains the prevalent practice of contraception in these countries. The tendency of people to have smaller families, couples who marry at later age and postponement to have a child and sterilization have lowered the birth rate.*

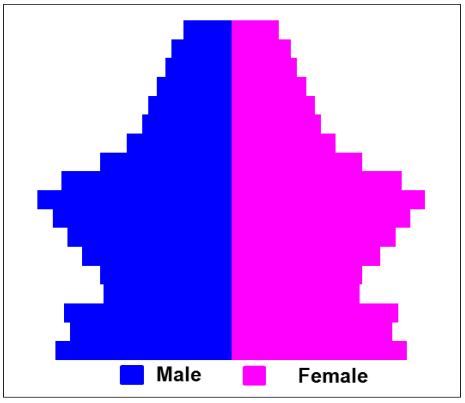
4.11.3.2 ***Broader flat tops*** *– this indicates that the higher life expectancy of the population in which at least two percent of the population can live up to the age of 80 years and led to a growing number of older populations. This situation can be attributed to good enhancement in the areas of health and population development.*

4.11.3.3 ***Convex slope*** *– describes the higher adult population. This situation reflects the lower adult mortality. The high standard of health care causes most of the population can reach old age, i.e. more than 60 years.*



*4.11.4 **Intermediate pyramid***

*Intermediate pyramid is similar with the characteristics of regressive pyramid with **convex slopes and broader flat top**. The difference is only that the intermediate pyramid has a **wider base**.*



5. ROUNDING

Population data in this publication have been rounded to the nearest thousand. However, the calculations of indicators are based on unrounded data. The sum may not equal the total shown due to rounding to one decimal point.

6. NOTES AND SYMBOLS

p	*Preliminary*
r	*Revised*
0.0	*Less than half of the smallest units shown*
-	*Nil*
W.P.	*Wilayah Persekutuan*