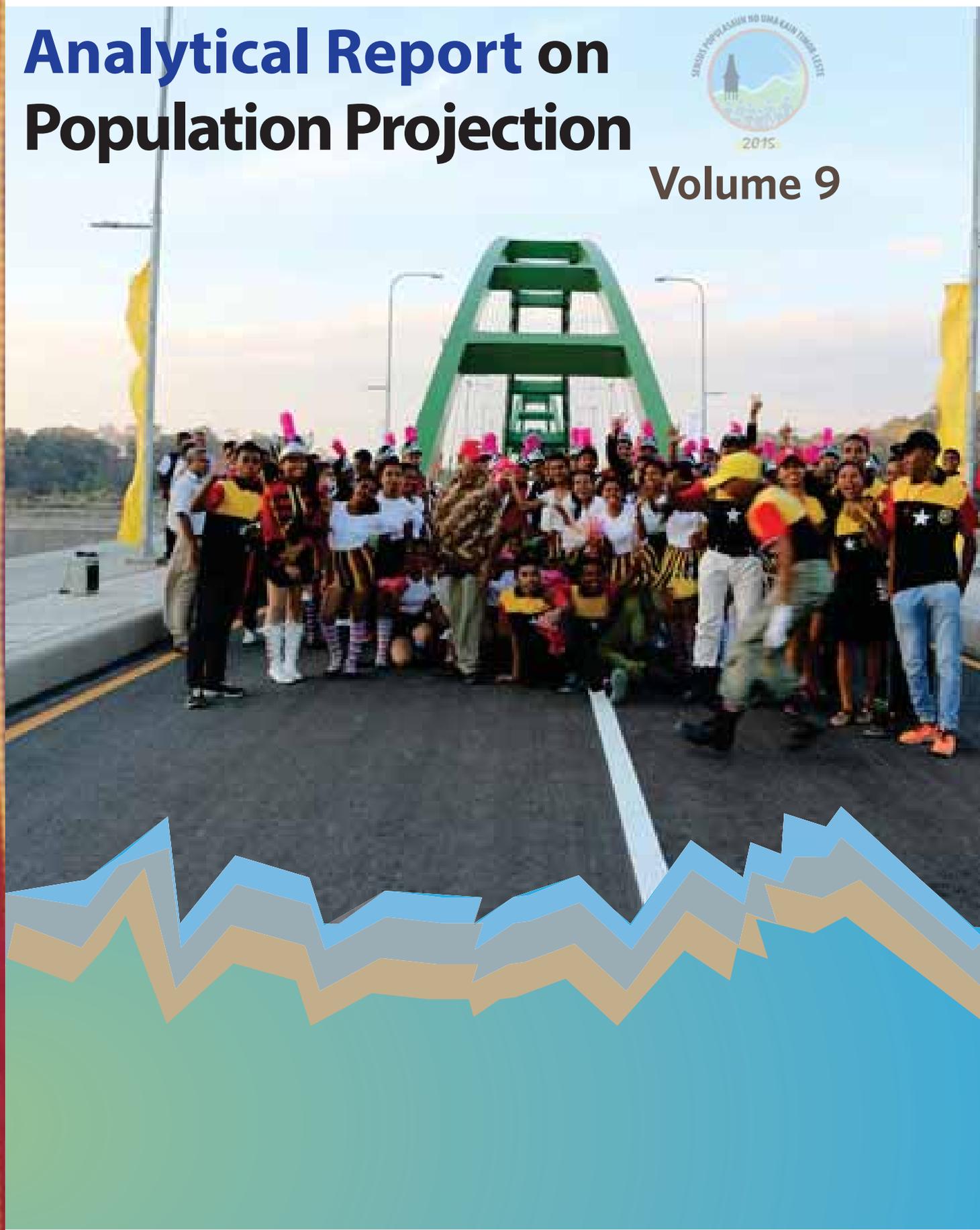


Timor-Leste Population and Housing Census 2015

Analytical Report on Population Projection



Volume 9



2015 Timor-Leste Population and Housing Census

Thematic Report Volume 9

Population Projections by age and sex: National level (2015 – 2050) and Municipality level (2015 - 2030)

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Foreword

The 2015 Timor-Leste Population and Housing Census with the theme “**Census from people to people: Be part of it**” was conducted in July 2015 on a *de facto* basis by the General Directorate of Statistics, Minister of Finance. The 2015 Census is the third after those conducted in 2004 and 2010 (post independent Timor-Leste) and fifth after the 1980 and 1990 Censuses, both taken in Indonesian times. This Census was undertaken within the provision of the Statistics Decree Law No. 17/2003 and the 2015 Population and Housing Census Government Resolution no. 11/2014 of 9 April 2014.

The main objective of the 2015 Census was to collect, analyze and effectively disseminate demographic and socio-economic information required for policy and programme formulation, decision making in planning and administrative processes, and research. The Census preliminary results were published in Volume 1 on 21 October 2015 and were launched by His Excellency the Prime Minister of RDTL Dr. Rui Maria de Araújo. The 2015 Census priority tables were published in three volumes: 2, 3 and 4, and launched by the Vice Minister of Finance Eng. Helder Lopes on 17 November 2016. The ‘Sensus fo Fila fali’ (returning back the results of the Census) was launched by His Excellency Minister of State Dr. Deoniso Babo Soares on behalf of the Prime Minister of RDTL on 2 March 2017. After that an ambitious “Sensus Fo Fila Fali” project was undertaken by the General Directorate of Statistics, Ministry of Finance that culminated in a Census report for each of the 442 sucos in the country.

This fourth phase comprises drafting of analytical reports covering Census thematic topics including fertility, marriage, mortality, migration, population projections, education, labour force, housing, agriculture, gender, youth and an atlas. The preparation of these reports was a collaborative effort between the Government of Timor-Leste, the United Nations Population Fund (UNFPA), the United Nations Children’s Fund (UNICEF), the International Labour Organisation (ILO) and the Food and Agriculture Organisation (FAO). Drafting of the thematic reports involved local and international experts. The reports were authored under the supervision and guidance of the Census Technical Specialist from UNFPA. The authors were recruited on a competitive basis, ensuring that they had adequate knowledge of the topics they were to analyse.

All staff at the General Directorate of Statistics, Ministry of Finance and especially the Director General and the Director of System and Reports and his team are commended for their commitment and tireless efforts to successfully undertake all phases of the Census including the thematic analysis exercise.

The Government of Timor-Leste wishes to extend its sincere gratitude to the United Nations Population Fund (UNFPA), the United Nations Children’s Fund (UNICEF), the International Labour Organisation (ILO) and the Food and Agriculture Organisation (FAO) for providing technical, financial and administrative support throughout the Census process, and in particular acknowledges the contribution of the authors of each thematic report.

Last but not least, all Timorese people deserve special praise for their patience and willingness to provide the requisite information which forms the basis of these reports and hence benchmark information for development. We in the Ministry of Finance and Government as a whole hope that the data contained in these thematic reports will be fully utilized in the national development planning process by all stakeholders for the welfare of the Timorese people.


Sara Lobo Brites
Vice - Minister and Acting Minister of Finance



Executive summary

Population projections are empirically based calculations of the future size of the population under specified assumptions about changes in the components of population growth of fertility, mortality and migration.

The method used to carry out these projections was the cohort-component method, which involves independent projections of fertility, life expectancy and migration. The software used was 'Rural-Urban Projections' (RUP), as part of 'Demographic Analysis and Population Projection System' (DAPPS), as developed by the U.S. Census Bureau.

Population projections have direct applications in planning for allocation of basic resources among functional age groups such as infants (health services and vaccinations), the school age population (schools and teachers), young adults (housing and employment) and the elderly (social protection and health care). Projections also provide a foundation for the distribution of resources between areas in relation to population size, and determining the need or scope for investment by Municipality.

These population projections are based on the 2015 Population and Housing Census. The projections at the national level, cover the period from 2015 to 2050, and at Municipality level cover the period 2015 to 2030. Results are provided for each year of the projection period by age and sex. The projection results are provided in detail in Excel spreadsheets, which are available on the General Directorate of Statistics website at: <http://www.statistics.gov.tl/category/publications/census-publications/>

An important outcome of population projections is the generation of analysis of the effects of changing fertility rates, life expectancy and net-migration rates on the size and age-sex composition of the population and the social and economic consequences of these changes. The text in this report presents and analyses the results of the projections using selected tables of demographic indicators and figures that facilitate and clarify the analysis.

Fertility mortality data for the projections were obtained from analysis of the 2004, 2010 and 2015 Censuses using indirect methods on past trends that help to propose future tendencies. Information from the United Nations Population Division's World Population Prospects (United Nations Population Division, 2015) were also used to propose future tendencies and place the results into broader context.

National Level Projections

In the projections conducted at the national level, three scenarios were constructed based on assumptions around changes in fertility rates in the future. They are referred to as the high, medium, and low fertility scenarios. The medium scenario constitutes the most probable future fertility trend and rate of population growth. The other two scenarios represent higher or lower fertility rates that represent plausible upper and lower bounds of what may be reached in future, considering the characteristics of the Timor-Leste population.

- In the high fertility scenario, the Total Fertility Rate (TFR) will decline from 4.4 live births per woman in 2015 to 3.0 live births per woman in 2050.
- In the medium fertility scenario, the TFR will decline from 4.3 live births per woman in 2015 to 2.5 live births per woman in 2050.
- In the low fertility scenario, the TFR will decline from 4.3 live births per woman in 2015 to 2.0 live births per woman in 2050.

Analytical techniques applied to 2010 and 2015 Census data were used to propose a rate and pattern for future international migration by age, sex and Municipality and an assumption made through analytical techniques and examination of the 2015 revision of the United Nations Population Division's World Population Prospects (United Nations Population Division, 2015) estimates for international migration.

All projections start with an initial or base population. The population enumerated in the 2015 Census was adjusted for age misreporting and under-enumeration to define the base population.

After preparing the inputs (fertility, life expectancy, net migration counts and the base population), the national population was projected by age and sex for the three scenarios. From a base of 1.2 million in 2015, in only five years the population is projected to increase to approximately 1.3 million (with a range of 10,000 between the high and low scenarios). In 2030, the medium scenario will reach just below 1.5 million people, with a range between the high and low scenarios of approximately 90 thousand people. By 2050, the medium scenario population will increase by a further 370 thousand people to 1.85 million and there will be a range between the high and low scenarios of approximately 380 thousand people. Compared with 2015, in the high fertility scenario, the population will almost double in size by 2050, whereas in the medium scenario the population will increase by just over one-half and in the low fertility scenario the population will increase by two-fifths of the 2015 population.

Even although fertility is declining in all scenarios, due to high fertility rates in the recent past, Timor-Leste will continue to experience population growth through momentum, because children born in the past enter the adult population. In fact, the proportion of women of reproductive age will actually increase. Thus, between 2015 and 2030, population momentum will increase the population by 36 per cent of the 2015 population size. Across the period, the proportion of growth attributable to momentum will be 65 per cent for the medium projection scenario, with (above replacement level) fertility, life expectancy improvement and net international migration contributing only 35 per cent of growth.

Population momentum is inevitable, and net international migration and improvements in life expectancy will have less impact on Timor-Leste's growth rate in comparison to fertility. Therefore, reducing fertility rates by providing universal access to reproductive health services, including modern contraceptive methods, can make the biggest contribution towards constraining population growth rates to more manageable levels. This is demonstrated by comparing the proportional effect of population momentum under the high and low fertility scenarios. Under the high fertility scenario, the proportional contribution of momentum is lower, at 50 per cent across the 2015 to 2030 period, with (above replacement level) fertility responsible for adding the vast majority of an additional 422 thousand people to the population by 2030. By contrast, under the low fertility scenario, the proportional contribution of momentum is 91 per cent by 2030 and only 9 per cent of growth is due to demographic factors. Indeed, from 2032 onwards, the TFR in the low scenario falls below replacement level, so all growth will be because of improvements in life expectancy (offset by the loss of five thousand international migrants annually).

Reducing fertility impacts upon the proportional size of the child population. Thus, the projected changes in the age structure are especially evident for the low fertility scenario, and to a lesser extent the medium scenario. The least change can be observed for the high fertility scenario. This is demonstrated through examining the child dependency ratio. The proportion of children to the working age population falls from 7:1 in 2015 to 3:1 by 2050 in the low fertility scenario as opposed to reaching 4:1 in the medium fertility scenario and almost 5:1 in the high fertility scenario.

Greater change in age structure will generate higher potential for a ‘demographic dividend’. This occurs when the proportion of the young population shrinks and the proportion of the working age population increases. These changes can put Timor-Leste in a good position to grow the economy, but only if the right investments are made in young people’s health and education. To take advantage of this dividend, we as the Government must also plan for creation of adequate job opportunities matched to the skillsets of the cohorts of young people entering the labour force. In the low fertility scenario this needs to occur by the 2029, and in the medium fertility scenario, by 2034.

In the high scenario, opportunity will not arrive until 2049 and the continued absolute growth of the population through fertility will posit serious challenges to the scale of the dividend (because larger numbers of children will still need to be supported by the working age population). Only rapid and substantial fertility decline will allow the country to benefit from a demographic dividend commencing around 2030.

Despite fertility reduction, in all three scenarios, population momentum will inevitably cause substantial expansion of the working age population. This will impose huge challenges on the capacity of the economy to create enough jobs to absorb the growing numbers of young people entering the labour force. The government needs to devise ways to absorb such growth. Fortunately, reduced fertility can free up scarce public and private resources to make such development easier for both our Government and Timor-Leste’s families to manage. These projections provide all of Government and other development partners with the tools to develop strategies to manage Timor-Leste’s population expansion.

Municipality Level Projections

Population projections were also developed for the Municipalities to provide the necessary data to plan interventions at this level. One set of projections were produced for the period 2015 to 2030. It is the usual practice to produce one set of projections at sub-national level for a shorter time frame than at the national level because of the higher degree of uncertainty (mainly due to migration) as compared to the national level.

The base population utilized for the Municipalities was adjusted by reconciling the combined Municipality populations measured in the 2015 Census to the national base population used in the national projections. For each year between 2016 to 2030, each Municipality’s projected population was reconciled with the output of the national medium fertility scenario projected population for that year. This means that the Municipality populations were modified to ‘force’ their sum to equal the medium scenario projected population (by age groups and sex) for each year. Similar adjustments were made to the projection derivatives (births and deaths) for each Municipality.

All Municipalities will experience a population increase across the projection period. However, there are substantial differences in the rate of growth caused by a combination of different fertility and migration rates across Timor-Leste and through time (life expectancy improvement has less of an impact). All Municipalities will continue to lose population to Dili through internal migration (a constant set of migration flows is assumed over the projection period). It is important to note that across the projection period, combined international and internal migration rates are projected to be higher from Municipalities furthest from, or less well connected with, Dili, and projected to be lowest for Municipalities adjacent to Dili. Oecusse is an exception to this pattern.

Population growth in Dili is projected to continue to be substantial until 2030. Fertility (either through momentum or above replacement level growth) will on average be more important than migration as a

determinant of population growth in Dili. However, migration is the main reason expansion of the population of Dili is at a much higher rate than the national average. The projected increase in the size of the population of Dili and particularly the substantial growth of the working age population will present a particular planning challenge for the Government in terms of supply of job opportunities. The growth of the child dependent population will pose financial challenges for families and developmental challenges for the Government, and the expansion of the elderly dependent population will also increase social protection needs. We as a Government should develop strategies that reduce push and the pull factors that underpin the sustained flows of migration to Dili.

It is critically important that we as the Government develop Municipality-specific strategies that can address differential rates of growth and the combinations of fertility and mortality change that underpin the growth rate. For example, in remoter Municipalities such as Lautem and Viqueque, the focus should be geared towards developing local infrastructure, services, sustainable agricultural systems, and a diversified economy so that lower proportions of the population need to migrate to Dili for education and work opportunities. Through such regional development, the growth rate of Dili can also be reduced to more manageable levels than observed in the Dili projection.

Conclusions

We as a Government should not wait to act. The time to prepare for opening of the ‘window of opportunity’ for the demographic dividend commencing is now, because we need to start to invest in the cohorts who are currently children or have yet to be born and who will enter the working age population when the window of opportunity is opening. We as a Government should ensure that all children have their births registered and receive a birth certificate. This strategy will facilitate development of a population register for local planning purposes around health, education and other services. The whole of Government should utilize the subnational population projections for their local planning strategies.

The Sustainable Development Goals (SDG) framework offers a mechanism within which to make these preparations. The Government should focus on:

- SDG 3 (good health and wellbeing) to ensure that all women have their reproductive health needs met and all children and young people are healthy;
- SDG 4 (quality education) to ensure that all children and young people are well educated;
- SDG 5 (gender equality) to ensure that all women and girls are empowered and reach their full potential;
- SDG 8 (decent work and economic growth), and SDG 9 (industry, innovation and infrastructure) to make progress in creating employment for the expanding working age population.

The time to prepare for the opening of the ‘window of opportunity’ for the demographic dividend chimes perfectly with SDG 2030 agenda.

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¹ Excel versions of these tables are available in the ‘2015 Population Projections Report Tables Annex’ which can be accessed at: <http://www.statistics.gov.tl/category/publications/census-publications/>

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Chapter One

Introduction

1.1 Overview

Many countries have recognized that demographic variables and population dynamics need to be integrated in all aspects of development planning. The first stage towards this effort is to produce reliable and timely demographic indicators, then prepare population projections to provide reliable information on what is likely to occur in the future, to know what to expect and, if possible, to highlight changes of importance to national development. Considering this necessity, the General Directorate of Statistics (GDS) has prepared this population projection report at the national level for the period 2015–2050 and at the Municipality level for the period 2015–2050. The results are presented by age and sex for each year of the periods under consideration.

1.2 Population projections at the national level

At the national level, like in most projection exercises, three scenarios were constructed based on hypotheses regarding changes in fertility, life expectancy and migration. These hypotheses and scenarios are constructed based on assumptions of how the rates are likely to behave in the future. They are labeled here as the high fertility, medium fertility and low fertility scenarios. The medium fertility scenario is the most likely to occur in the future. The other two represent maximum or minimum values that fertility rates may take in the future considering the characteristics of the Timor-Leste population under study. The high and low scenarios are calculated for their analytical value and to set an upper and lower limit within which population growth is virtually certain to remain (Shryock and Siegel, 1976). The projected fertility range between the high and low scenarios is one birth per woman in 2050.

- Under the high fertility scenario, the Total Fertility Rate (TFR) will decline from 4.4 live births per woman in 2015 to 3.0 live births per woman in 2050.
- Under the medium fertility scenario, the TFR will decline from 4.3 live births per woman in 2015 to 2.5 live births per woman in 2050.
- Under the low fertility scenario, the TFR will decline from 4.3 live births per woman in 2015 to 2.0 live births per woman in 2050.

Analytical techniques applied to 2010 and 2015 Census data were used to propose a rate and pattern for future international migration by age, sex and Municipality and an assumption made through analytical methods and assessment of the 2015 revision of the United Nations Population Division's World Population Prospects estimates (United Nations, 2015). The net international migration rate has been set at -5,000 persons per annum for the duration of the projection period.

1.3 Population projections at the Municipality level

Population projections were also developed for the Municipalities so that data users have the necessary data to plan interventions at this level. One set of projections were produced and reconciled against the national medium fertility scenario population for each year of the projection (see section 2.3). It is the usual practice to produce one set of sub-national projections only.

Both internal migration and international migration are factored into the projections at the Municipality level. Annual net internal migration counts were based upon an average of population movements reported

in the 2015 Census as having occurred between the 2011 and 2015, by age and sex. Net international migration counts were calculated as a pro-rata proportion of all net international migration for Timor-Leste by age and sex and combined with the internal migration data to provide a single set of net migration counts by age and sex for each Municipality.

1.4 Population projections and demographics

Population projections take advantage of two strong points of demography: the accurate recording of demographic processes in many settings over a relatively long period of time and the momentum that links demographic processes for one time-period with those of another (George, et al., 2004 and Smith, et al, 2001). In fact, because the future is intimately tied to the past, projections are usually based on observed past trends of fertility, life expectancy and migration. Projections based on past conditions provide a forecast of population change that are usually accurate enough to support good decision-making.

Population projections are constructed to provide an indication of the size, structure, and distribution of a population if certain assumptions regarding fertility, life expectancy and migration occur. Projections should not be considered as a forecast of the exact population size in the future, but demonstrate the direction of travel if demographic changes occur as proposed in the scenarios. Therefore, a population projection is more of a prospective exercise than a prediction (Romaniuc, 1990). Their key value is in giving planners the necessary tools to make informed short, medium, and longer-term decisions around where, when and at what level of magnitude future resource requirements will be required to ensure sustainable development.

1.5 Organization of the report

This thematic report consists of five additional chapters. Following this chapter, Chapter 2 provides the assessment of data quality, definition, and concepts as well as the methods used for the population projections are discussed. The estimates and projection of the components are outlined in Chapter 3. The derivation of the base population is conveyed in Chapter 4, and Chapter 5 presents the results of the projections and Chapter 6 constitutes a summary and set of conclusions.

Detailed tables (projections by single years of age, five-year age groups and special age groups and annual and quinquennial demographic indicators) have been generated in Excel format for each of the three national and 13 Municipality projections for ease of future use. The Excel tables are available to download from the GDS website at:

<http://www.statistics.gov.tl/category/publications/census-publications/>

Chapter Two

Methodology

2.1 Methodology

A cohort-component method was used to prepare the projections, both at national and at Municipality level. This is the most commonly used technique for producing population projections by age and sex. It involves independent projections based on three components of population change: fertility, life expectancy and migration. Each five-year cohort from a base population (usually from the most recent census) is advanced through time in five-year increments by adding births, subtracting deaths and accounting for net migration. The method thus generates a projected population by sex and five-year age groups for the end of each quinquennium of the projection period. The 2015 Census of Timor-Leste was adjusted according to several considerations explained in Chapter 4. This adjusted population was projected up to the year 2050.

2.2 Data entry and analysis

The software 'Rural-Urban Projections' (RUP), developed by the U.S. Bureau of the Census is the population projections component of the larger package called 'Data Analysis and Population Projection System' (DAPPS) (from here-on referred to as RUP/DAPPS). This software was used to produce the projections (see Arriaga and Associates, 1994). The advantage of RUP is that it also projects the population by single years of age. This feature allows obtaining data for special age groups that do not fall into conventional five-year age groups. It also enables the tracking of population cohorts that may be smaller or larger than the surrounding cohorts due to past demographic events. In addition, the projection is performed year by year. This feature makes it possible to enter information on demographic events for a particular year without forcing the effect over a five-year period. It also provides planners with estimates for each year without having to interpolate between data for surrounding years. Input data for the population and components can be provided in either single years or five-year age groups. The age grouping of each item is independent, so it is possible to input five-year data for some items and single-year data for others. The program converts all data to single years of age before performing the projection.

2.3 Municipality projections adjustment

The cohort-component method and the software RUP/DAPPS were also used for projecting the population in each Municipality. A 'top-down' approach was adopted whereby the national population medium fertility scenario was projected before the Municipalities were projected. The top-down approach is more frequently used because it is considered that the components at the national level are more reliable than those at the sub-national level (George, et al., 2004). However, there are always some discrepancies between the total population and the sum of the projections of the sub-national parts, since they are projected independently. Therefore, it is necessary to adjust the sub-national projections to assure that the differences are removed to derive a final consistent set of projections. This involves 'forcing' the sub-national totals to sum-up to the national totals for each year of the projection period. In the case of the Municipalities and the medium projection scenario, the differences observed were small, rising from zero in 2015 to only 1.4 per cent at the end of the 15-year projection period. A method of pro-rata adjustment by Municipality, age and sex was thereafter applied to achieve a match between the sum of the Municipalities by single year of age and sex and the national medium scenario for each year of the projection period.

Chapter Three

The Estimates and Projection of the Components

3.1 Overview

As in most developing countries, the vital registration system provides quite limited information on births and deaths in Timor-Leste. Hence fertility rates and life expectancy estimates needed for the projection were obtained from analysis of the 2004, 2010 and 2015 Censuses (GDS, 2018a; 2018b). During the past 50 years, demographers have developed reliable methods for estimating fertility rates and life expectancy from census data. These so called indirect methods not only allow obtaining cross-sectional measures, but also past trends that help to propose future tendencies. Information from the 2003, 2009–10 and 2016 Demographic and Health Surveys (DHS) and the 2003 Multiple Indicator Cluster Survey (MICS) were also used to evaluate past component trends. In addition, information from the United Nations Population Division’s World Population Prospects 2015 revision was used to propose future tendencies.

3.2 Fertility estimates and their projection at the national level

In the cohort component method, the measure of fertility used is the Total Fertility Rate (TFR). The TFR is the total number of live births a women currently of reproductive age (between ages 15 and 49 years) is likely to have throughout her reproductive lifetime based on current age specific birth rates (Haupt and Kane, 2004). Table 1 shows fertility trends from 1996 to 2015 according to seven data sources: the 2004, 2010 and 2015 Censuses, the 2003 MICS and the 2003, 2009–10 and 2016 DHSs.

Table 1: Total Fertility Rates (TFR) from multiple sources, Timor-Leste, 1996 to 2015

Period	Year ¹	MICS 2002	Own children method			DHS 2003	DHS 2009-10	DHS 2016
			Census 2004	Census 2010	Census 2015			
1996-1997	1996.5		5.7					
1997-1998	1997.5		6.0					
1998-1999	1998.5		5.6					
1998-2000	1999			6.8				
1999-2000	1999.5		6.1					
2000-2001	2000.5		6.6					
2001-2002	2001.5	7.4						
2001-2003	2002			6.6		7.8		
2001-2005	2003				7.0			
2004-2006	2005			6.5				
2007-2008	2007.5			5.9				
2007-2009	2008						5.7	
2007-2011	2009				5.6			
2009-2013	2011				5.1			
2011-2015	2013				4.7			
2014-2016	2015							4.2

¹ Corresponds to the middle of the period for which TFR was estimated.

Fertility was recently very high in Timor-Leste, one of the highest in the world. However, fluctuation can be observed during the past two decades. Despite being from different sources, the trend is quite clear as revealed by Figure 1. Fertility experienced an increase during the end of the 1990s and a subsequent decline in the 2000s and 2010s.

Figure 1: Total Fertility Rates (TFR) from multiple sources, Timor-Leste, 1996 to 2015

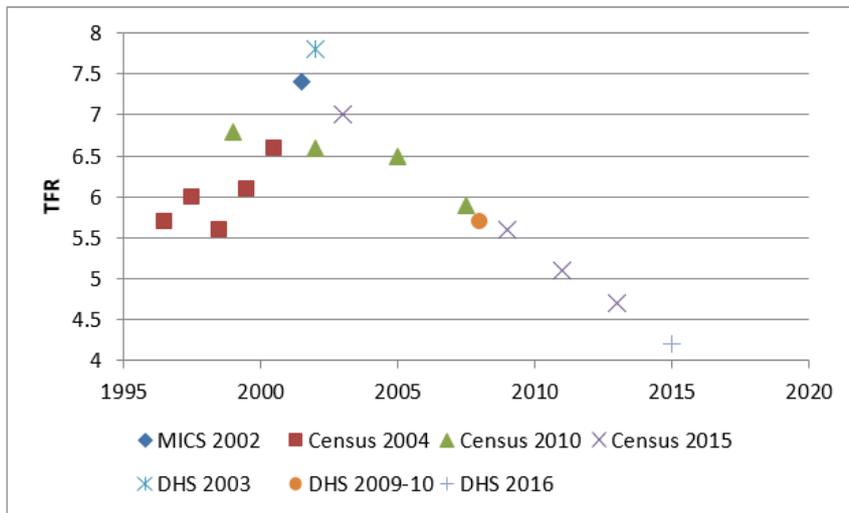
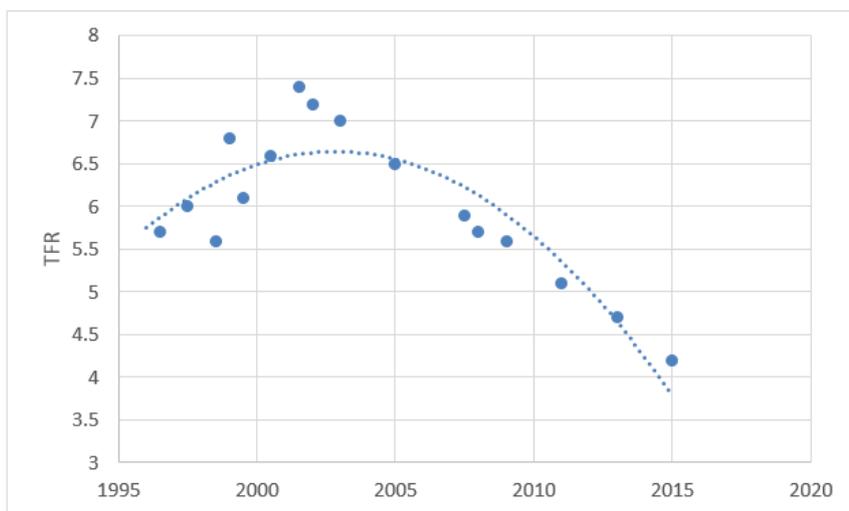


Figure 2 shows the same information as Figure 1, but this time a trend line was introduced (second degree polynomial) to evaluate the trend more clearly.

Figure 2: Total Fertility Rates (TFR) from multiple sources and trend line, Timor-Leste, 1996 to 2015



It is likely that these fluctuations are related to the political instability that the country experienced before and after its independence in 2002 leading into a long-term fertility decline as reproductive patterns shift towards smaller family sizes. Access to reproductive health services may also have contributed since modern

contraceptives are currently being used by almost one in four married women (2016 DHS REF).

Considering the trend of rapidly declining fertility since the early 2000s, the experience of other countries, and the trajectory for fertility decline proposed by the United Nations Population Division in the 2015 revision of World Population Prospects (United Nations, 2015) it is assumed that under the medium fertility scenario, fertility will decrease from 4.3 live births per woman in 2015 to 2.5 in 2050. In the high fertility scenario, it is assumed that fertility will reach 3.0 live births per woman in 2050 and in low fertility scenario, it is assumed that fertility will reach 2.0 live births per woman in 2050.

Table 2 shows four estimates of TFR during the period 2004 to 2015. These estimates were computed with the own children method using 2010 Census data (see National Statistic Directorate, 2012b). They cover the period of fertility decline in Timor-Leste. The table also includes the TFR assumed in the three scenarios for the end of the projection period.

Table 2: Estimated (2004–2015) and Projected (2050) TFR according to three scenarios, Timor-Leste

Period	Year	Observed	Fertility Scenario		
			High	Medium	Low
2004-2006	2005	6.5			
2007-2008	2008	5.9			
2009-2013	2011	5.1			
2011-2015	2013	4.7			
Projected	2050		3.0	2.5	2.0

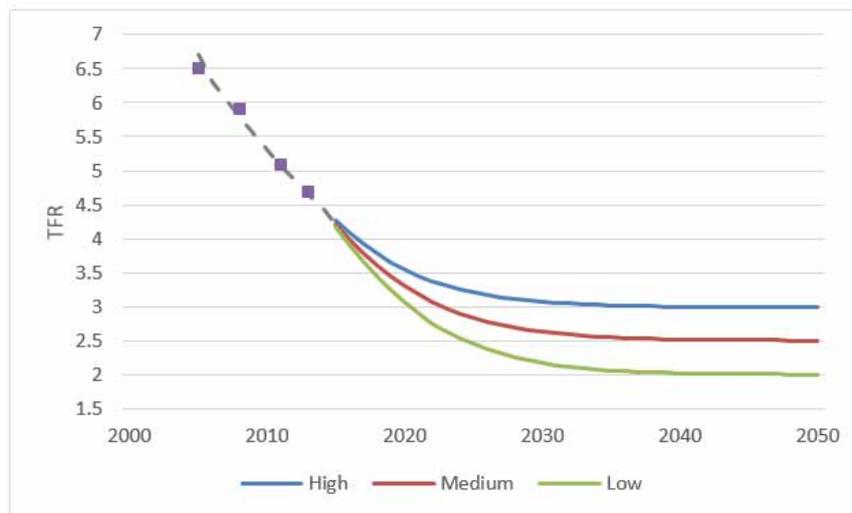
Table 3 includes four estimates of TFR during the period 2004 to 2015 and TFRs for each quinquennium of the three projection scenarios.

Table 3: Estimated (2005–2013) and projected (2015–2050) TFRs according to three scenarios, Timor-Leste

Year	Estimated	Fertility Scenario		
		High	Medium	Low
2005	6.50			
2008	5.90			
2011	5.15			
2013	4.69			
2015		4.37	4.29	4.29
2020		3.55	3.31	3.07
2025		3.21	2.84	2.45
2030		3.07	2.63	2.17
2035		3.02	2.55	2.06
2040		3.01	2.52	2.02
2045		3.01	2.51	2.01
2050		3.00	2.50	2.00

Figure 3 shows four census based estimates of TFR (purple blocks) for the period 2004 to 2015 and the curves for TFR decline through the three fertility projection scenarios. The fertility decline curves were derived by applying 2010 and 2015 Census fertility estimates within the U.S. Census Bureau Population Analysis System (PAS) spreadsheet ‘TFRLGST’. This spreadsheet extrapolates TFR by applying a logistic function between upper and lower TFR asymptotes (boundaries).

Figure 3: Estimated (2005–2013) and projected (2015–2050) TFRs according to three scenarios, Timor-Leste



The projection of fertility also involves proposing a future trend for age-specific fertility rates (ASFR) and incorporating these into each projection scenario. The Census ASFR age pattern was retained as a starting point and the United Nations Population Division age pattern for ‘Asia’ (as derived from the World Population Prospects 2015 Revision dataset; United Nations, 2015) was chosen as the target ASFR for 2050. This decision was made for consistency with the 2010 projection methods, and because the shape of the ASFR age distribution for Timor-Leste suggests that the Asian pattern is the most appropriate to use in the projections. The age pattern of fertility for ‘Asia’ from the World Population Prospects low medium and high variant projection outcomes for 2045–50 are presented in Table 4. This pattern was transformed to an Asian ASFR age structure for the corresponding TFR for each of the three scenarios and assigned to the end of the projection period. A process of iterative adjustment was applied until the target TFR was reached (to three decimal places).

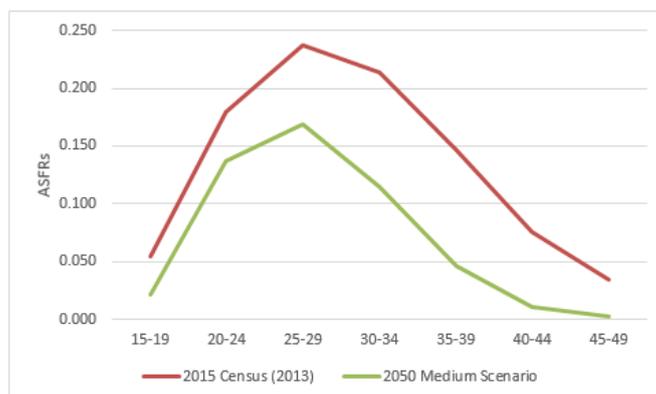
The projection software RUP/DAPPS interpolates between the observed ASFR for the 2011–2015 (2013) fertility estimate and the Asian ASFR age structure for the TFR for each of the three scenarios at the end of the projection period. In Table 4, a direct comparison between the World Population Prospects (WPP) 2045–50 low and medium Variant ‘Asian’ age structure data and the 2050 adjusted and projected low and medium scenario data clearly illustrates the effect of the adjustment i.e. the structures are practically identical.

Table 4: Age Specific Fertility Rates (ASFRs), observed (2013), WPP 2045–50 adjustment age structure and projected ASFRs (2050), Timor-Leste

Age Group	Observed	WPP 2045-50 'Asian' Age Structure			Projected ASFRs (2050) with WPP 2045-50 'Asian' Age Structure		
	2011-2015 (2013)	Low Variant	Medium Variant	High Variant	Scenario		
					Low	Medium	High
15-19	0.054	0.018	0.022	0.030	0.018	0.022	0.026
20-24	0.179	0.111	0.137	0.191	0.111	0.136	0.164
25-29	0.237	0.135	0.169	0.236	0.135	0.168	0.203
30-34	0.214	0.091	0.115	0.161	0.091	0.115	0.137
35-39	0.146	0.036	0.046	0.064	0.036	0.046	0.054
40-44	0.075	0.009	0.011	0.015	0.008	0.011	0.012
45-49	0.034	0.001	0.002	0.002	0.001	0.002	0.002
TFR	4.7	2.0	2.5	3.5	2.0	2.5	3.0

Figure 4 shows the relative distribution of ASFRs corresponding to the observed 2015 Census data (2013) and adjusted and projected data for the 2050 medium fertility scenario. The observed data has higher fertility at all ages. The ASFR rises sharply to peak at age group 25–29. The decline in fertility into the older age groups is shallower, due to high rates of child bearing in the older age groups. The 2050 shape has a shallower increase in fertility for women in their early 20s, and fertility is concentrated between ages 25 to 29. For women in their 30s and particularly their 40s, child bearing is absolutely and relatively much less prevalent as compared to the Timor-Leste structure from the 2015 Census.

Figure 4: ASFRs, 2015 Census observed data (2013) and medium fertility scenario adjusted and projected data (2050), Timor-Leste



3.3 Fertility estimates and their projection at the Municipality level

The synthetic parity method was used to estimate TFRs for the Municipalities for the period 2010–14, centred upon the year 2012. As for the national level, the PAS spreadsheet ‘TFRLGST’ was used to project fertility. The decline in TFRs for the Municipalities corresponds approximately to the national level medium fertility scenario. The results are presented in Table 5.

Table 5: Projection of TFRs by Municipalities, 2013 to 2030

Municipality	Year				
	2013	2015	2020	2025	2030
Aileu	5.5	5.0	4.0	3.4	3.1
Ainaro	5.5	4.7	3.4	3.1	3.0
Baucau	4.7	4.1	3.1	2.7	2.6
Bobonaro	4.7	4.1	3.1	2.7	2.6
Covalima	4.7	4.5	3.8	3.2	2.6
Dili	3.9	3.6	3.0	2.5	2.1
Ermera	5.4	4.9	3.7	3.2	3.0
Lautem	5.2	4.7	3.5	3.0	2.8
Liquica	5.1	4.6	3.6	3.1	2.8
Manatuto	4.6	3.9	2.9	2.6	2.5
Manufahi	4.9	4.3	3.2	2.8	2.7
Oecusse	4.2	3.3	2.5	2.3	2.3
Viqueque	4.6	3.9	2.9	2.6	2.5

As no Municipality level ASFRs were available for use, the age structure of ASFRs for the Municipalities were modelled on the observed age structure from the 2015 Census for 2011–15 (2013), as presented in Table 4 and Figure 4. As for the national projections, the United Nations Population Division age pattern for Asia (as derived from the World Population Prospects 2015 Revision dataset; United Nations, 2015) was chosen as the target ASFR for 2030. As for the national projections, the same adjustment techniques were applied through a process of iterative adjustment until the target TFR was reached (to three decimal places). In contrast to the national methodology, for the Municipality projections, both the start and end ASFR age structures had to be developed. The ASFRs used as inputs for the projections (2015) are outlined in Table 6.

Table 6: Projection of ASFRs by Municipality, 2012 and 2030

Age Group	Municipalities												
	Aileu	Ainaro	Baucau	Bobonaro	Covallima	Dili	Ermera	Lautem	Liquica	Manatuto	Manufahi	Oecusse	Viqueque
Age Specific Fertility Rates, 2010-14 (2012)													
15-19	0.063	0.063	0.054	0.054	0.054	0.044	0.062	0.060	0.059	0.053	0.056	0.048	0.053
20-24	0.209	0.209	0.179	0.179	0.179	0.145	0.206	0.199	0.194	0.175	0.187	0.160	0.175
25-29	0.277	0.277	0.237	0.237	0.237	0.192	0.273	0.263	0.258	0.232	0.248	0.212	0.232
30-34	0.250	0.250	0.214	0.214	0.214	0.173	0.246	0.238	0.233	0.210	0.224	0.192	0.210
35-39	0.171	0.171	0.146	0.146	0.146	0.118	0.168	0.162	0.159	0.143	0.153	0.131	0.143
40-44	0.088	0.088	0.075	0.075	0.075	0.061	0.086	0.083	0.081	0.074	0.078	0.067	0.074
45-49	0.040	0.040	0.034	0.034	0.034	0.028	0.039	0.038	0.037	0.033	0.036	0.030	0.033
TFR	5.5	5.5	4.7	4.7	4.7	3.8	5.4	5.2	5.1	4.6	4.9	4.2	4.6
Age Specific Fertility Rates, 2030													
15-19	0.032	0.032	0.027	0.027	0.028	0.022	0.032	0.029	0.029	0.026	0.028	0.024	0.026
20-24	0.203	0.201	0.172	0.172	0.177	0.140	0.199	0.186	0.186	0.164	0.177	0.152	0.166
25-29	0.206	0.204	0.175	0.175	0.180	0.142	0.202	0.189	0.189	0.166	0.180	0.154	0.168
30-34	0.111	0.110	0.094	0.094	0.097	0.077	0.109	0.102	0.102	0.090	0.097	0.083	0.091
35-39	0.044	0.044	0.037	0.037	0.039	0.030	0.043	0.040	0.040	0.036	0.039	0.033	0.036
40-44	0.014	0.014	0.012	0.012	0.012	0.010	0.014	0.013	0.013	0.011	0.012	0.010	0.011
45-49	0.003	0.003	0.002	0.002	0.002	0.002	0.003	0.002	0.002	0.002	0.002	0.002	0.002
TFR	3.1	3.0	2.6	2.6	2.6	2.1	3.0	2.8	2.8	2.5	2.7	2.3	2.5

As outlined in subsection 2.4, adjustments to each year of the Municipality projections were required because there are always discrepancies between the total population and the sum of the projections of the sub-national parts, since they are projected independently. This adjustment also applies to other projection outputs including births. The U.S. Census Bureau has provided two spreadsheets within the Population Analysis System which can be used to derive TFRs and ASFRs from adjusted projection outputs:

TFR-GFR – this spreadsheet can estimate TFR from projection outputs including the Crude Birth Rate and;

ADJASFR – this spreadsheet can adjust a model ASFR (in this case the WPP Asian age structure) to reproduce a desired number of births (a projection output).

These tools were utilized on the Municipality projection outputs, and adjusted quinquennial TFRs are included in Table 35 for each Municipality.

3.4 Life expectancy estimates and their projection at the national level

The cohort-component projection method requires a life table for the beginning of the projection period. A life table is a tabular display of several related mortality measures or functions by age groups. The most important functions for projection purposes are the probability of dying at each age, the probability of surviving at each age and life expectancy.

The national projections used a life table prepared for the mortality thematic report based on the 2015 Census (GDS, 2018b). The male life table is displayed in Table 7 and the female life table is displayed in Table 8.

Table 7: Male Life Table, Timor-Leste, 2013

Age	$m(x,n)$	$q(x,n)$	$l(x)$	$d(x,n)$	$L(x,n)$	$T(x)$	$e(x)$
0	0.062	0.059	100,000	5,856	95,198	6,364,273	63.64
1	0.004	0.015	94,144	1,388	372,898	6,269,075	66.59
5	0.004	0.020	92,756	1,890	459,055	5,896,177	63.57
10	0.002	0.010	90,866	870	452,153	5,437,123	59.84
15	0.003	0.013	89,996	1,158	447,083	4,984,969	55.39
20	0.003	0.016	88,838	1,451	440,561	4,537,886	51.08
25	0.003	0.017	87,387	1,486	433,218	4,097,325	46.89
30	0.004	0.019	85,901	1,603	425,496	3,664,106	42.66
35	0.005	0.023	84,298	1,900	416,739	3,238,610	38.42
40	0.006	0.029	82,398	2,356	406,098	2,821,871	34.25
45	0.008	0.038	80,041	3,008	392,686	2,415,773	30.18
50	0.010	0.051	77,033	3,914	375,381	2,023,086	26.26
55	0.014	0.069	73,119	5,034	353,011	1,647,705	22.53
60	0.020	0.096	68,085	6,519	324,126	1,294,694	19.02
65	0.029	0.134	61,566	8,264	287,169	970,567	15.76
70	0.041	0.188	53,302	10,014	241,474	683,398	12.82
75	0.060	0.261	43,288	11,295	188,201	441,925	10.21
80	0.088	0.361	31,993	11,553	131,082	253,723	7.93
85	0.167	...	20,440	20,440	122,641	122,641	6.00

$m(x,n)$ = Age-specific mortality rates, that is, death rates calculated of each age groups (from x to $x+n$)

$q(x,n)$ = Probability of dying between exact ages x and $x+n$

$l(x)$ = Number of survivors at age x out of 100,000 births

$d(x,n)$ = Number of deaths occurring between age x and $x+n$

$L(x,n)$ = Number of person-years lived between ages x and $x+n$

$S(x,n)$ = Survival ratio for persons aged x to $x+n$

$T(x)$ = Number of person-years lived after age x

$e(x)$ = Life expectancy at age x

Table 8: Female Life Table, Timor-Leste, 2013

Age	$m(x,n)$	$q(x,n)$	$l(x)$	$d(x,n)$	$L(x,n)$	$T(x)$	$e(x)$
0	0.056	0.053	100,000	5,312	95,644	6,616,900	66.17
1	0.005	0.019	94,688	1,770	374,062	6,521,256	68.87
5	0.004	0.019	92,918	1,794	460,106	6,147,194	66.16
10	0.002	0.008	91,124	769	453,699	5,687,089	62.41
15	0.002	0.011	90,355	1,026	449,211	5,233,390	57.92
20	0.003	0.014	89,329	1,258	443,502	4,784,178	53.56
25	0.003	0.016	88,072	1,365	436,945	4,340,676	49.29
30	0.004	0.017	86,706	1,506	429,768	3,903,731	45.02
35	0.004	0.020	85,201	1,681	421,801	3,473,963	40.77
40	0.005	0.023	83,520	1,916	412,808	3,052,162	36.54
45	0.006	0.029	81,604	2,325	402,206	2,639,354	32.34
50	0.008	0.038	79,278	2,996	388,903	2,237,148	28.22
55	0.011	0.052	76,283	3,974	371,480	1,848,245	24.23
60	0.015	0.074	72,309	5,318	348,251	1,476,765	20.42
65	0.023	0.107	66,991	7,151	317,078	1,128,514	16.85
70	0.034	0.157	59,840	9,424	275,639	811,436	13.56
75	0.053	0.233	50,416	11,729	222,756	535,798	10.63
80	0.083	0.342	38,687	13,237	160,342	313,041	8.09
85	0.167	...	25,450	25,450	152,699	152,699	6.00

Life expectancy is the average number of additional years that a person could expect to live, if current mortality trends were to continue for the rest of that person's life. The most used measure is life expectancy at birth (Haupt and Kane, 2004). Tables 7 and 8 illustrate that life expectancy at birth was 63.64 years for males and 66.17 years for females in 2013. For comparison, the life expectancies at birth for 2002 from the 2004 Census data were 57.4 years for males and 58.9 years for females and 2008–09 data from the 2010 Census data were 58.72 years for males and 60.35 years for females.

Figure 5 illustrates that by 2013, males were living more than six years longer and females were living more than seven years longer than they were in 2002. Between 2002 and 2008–09, male life expectancy increased by only 1.3 years, and female life expectancy by only 1.5 years. By contrast, between 2008–09 and 2013, male life expectancy rose by almost five years and female life expectancy rose by almost six years, demonstrating that life expectancy improvement is gathering pace. Indeed, life expectancy gained almost one year per annum between 2008–09 and 2013, whereas between 2002 and 2008–09, the annual rate of increase was less than one year in five years. It is implausible to assume that the high rates of increase in life expectancy experienced between 2008–09 and 2013 (close to one year of improvement per annum) will continue across the duration of the projection period.

Figure 5: Improvement in life expectancy between the 2004 and 2010 Censuses (blue) and between the 2010 and 2015 Censuses (red), Timor-Leste



For the starting point of the three national projection scenarios, estimates of life expectancy at birth for 2013 from the 2015 Census were used. The PAS spreadsheet ‘E0PRJ2’ was used to project male and female life expectancy. This spreadsheet extrapolates life expectancy by applying a logistic function between upper and lower life expectancy asymptotes. The results of this exercise are presented in Table 9.

Table 9: Estimated and projected life expectancy at birth, males and females, Timor-Leste, 2013 to 2050

Year	Estimated		Projected					
	2015 Census (2013)		Scenario					
	Male	Female	High		Medium		Low	
		Male	Female	Male	Female	Male	Female	
2013	63.64	66.17						
2015			64.45	67.14	64.45	67.14	64.45	67.14
2020			66.01	69.01	66.01	69.01	66.01	69.01
2025			67.49	70.78	67.49	70.78	67.49	70.78
2030			68.88	72.45	68.88	72.45	68.88	72.45
2035			70.18	74.02	70.18	74.02	70.18	74.02
2040			71.39	75.47	71.39	75.47	71.39	75.47
2045			72.50	76.81	72.50	76.81	72.50	76.81
2050			73.53	78.03	73.53	78.03	73.53	78.03

In order to assess the results of this exercise, the pattern of improvement in life expectancies in World Population Prospects 2015 Revision (United Nations, 2015), and the 2010 projections were examined for comparison. Table 10 illustrates that the results for 2050 are very close to the 2045–50 World Population Prospects projection results and the ‘Optimistic’ 2010 projections for Timor-Leste (which, in keeping with the 2015 medium fertility scenario, also have a final TFR of 2.5).

Table 10: Comparisons of projected life expectancy, Timor-Leste, 2050

Projection	2050	
	Males	Females
2015 E0PRJ2 Projection	73.53	78.03
2010 Census Projection (Optimistic)	73.92	77.35
World Population Prospects (2015 Revision)	73.38	77.29

3.5 Life expectancy estimates and their projection at the Municipality level

Life expectancy estimates for males and females were produced for each Municipality for 2013 for the 2015 Census thematic report on mortality (GDS, 2018b). As for the national projections, the PAS spreadsheet 'E0PRJ2' was used to project male and female life expectancy. These life expectancies were used in the projections. Tables 11 and 12 display the probability of dying by sex from the derived life tables.

Table 11: Male probability of dying by Municipality, 2013

Age	Aileu	Ainaro	Baucau	Bobonaro	Covalima	Dili	Ermera	Lautem	Liquica	Manatuto	Manufahi	Oecussi	Viqueque
0	0.058	0.069	0.065	0.068	0.078	0.041	0.059	0.050	0.057	0.065	0.056	0.044	0.063
1	0.019	0.025	0.023	0.024	0.030	0.011	0.019	0.015	0.018	0.023	0.018	0.012	0.022
5	0.006	0.008	0.008	0.008	0.010	0.004	0.007	0.005	0.006	0.008	0.006	0.004	0.007
10	0.004	0.006	0.005	0.005	0.007	0.003	0.005	0.004	0.004	0.005	0.004	0.003	0.005
15	0.007	0.009	0.008	0.008	0.010	0.004	0.007	0.006	0.007	0.008	0.007	0.005	0.008
20	0.010	0.012	0.012	0.012	0.014	0.006	0.010	0.008	0.010	0.011	0.010	0.007	0.011
25	0.011	0.014	0.013	0.014	0.016	0.008	0.012	0.009	0.011	0.013	0.011	0.008	0.013
30	0.014	0.017	0.016	0.016	0.020	0.009	0.014	0.011	0.013	0.016	0.013	0.010	0.015
35	0.018	0.022	0.021	0.022	0.025	0.012	0.018	0.015	0.018	0.021	0.017	0.013	0.020
40	0.025	0.030	0.029	0.030	0.034	0.018	0.026	0.022	0.025	0.028	0.025	0.019	0.028
45	0.037	0.043	0.041	0.042	0.048	0.027	0.037	0.032	0.036	0.041	0.036	0.029	0.040
50	0.055	0.063	0.061	0.062	0.069	0.043	0.056	0.049	0.054	0.060	0.054	0.045	0.059
55	0.083	0.092	0.089	0.091	0.099	0.067	0.083	0.075	0.081	0.088	0.081	0.069	0.087
60	0.125	0.136	0.132	0.135	0.145	0.104	0.125	0.115	0.123	0.132	0.122	0.107	0.130
65	0.184	0.199	0.194	0.197	0.209	0.158	0.185	0.172	0.182	0.193	0.181	0.162	0.191
70	0.264	0.282	0.276	0.279	0.294	0.231	0.265	0.249	0.261	0.275	0.261	0.236	0.272
75	0.363	0.382	0.376	0.379	0.395	0.327	0.364	0.346	0.360	0.375	0.359	0.332	0.372
80	0.483	0.500	0.494	0.497	0.512	0.449	0.483	0.467	0.480	0.493	0.479	0.454	0.490
85+	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 12: Female probability of dying by Municipality, 2013

Age	Aileu	Ainaro	Baucau	Bobonaro	Covalima	Dili	Ermera	Lautem	Liquica	Manatuto	Manufahi	Oecussi	Viqueque
0	0.054	0.060	0.051	0.062	0.072	0.042	0.054	0.048	0.056	0.064	0.056	0.044	0.059
1	0.022	0.026	0.020	0.028	0.037	0.014	0.022	0.018	0.024	0.030	0.024	0.015	0.026
5	0.007	0.008	0.006	0.008	0.011	0.004	0.006	0.005	0.007	0.009	0.007	0.004	0.008
10	0.004	0.005	0.004	0.005	0.007	0.002	0.004	0.003	0.004	0.005	0.004	0.003	0.005
15	0.006	0.007	0.005	0.008	0.010	0.004	0.006	0.005	0.006	0.008	0.006	0.004	0.007
20	0.008	0.010	0.007	0.010	0.014	0.005	0.008	0.006	0.008	0.011	0.009	0.005	0.009
25	0.010	0.012	0.009	0.013	0.016	0.006	0.010	0.008	0.010	0.013	0.011	0.007	0.011
30	0.012	0.014	0.011	0.015	0.020	0.008	0.012	0.010	0.013	0.016	0.013	0.009	0.014
35	0.016	0.018	0.014	0.019	0.024	0.011	0.015	0.013	0.016	0.020	0.017	0.011	0.018
40	0.021	0.023	0.019	0.024	0.029	0.015	0.020	0.018	0.021	0.025	0.022	0.016	0.023
45	0.028	0.032	0.027	0.033	0.039	0.021	0.028	0.025	0.029	0.034	0.030	0.022	0.031
50	0.041	0.045	0.039	0.047	0.054	0.032	0.041	0.037	0.043	0.048	0.043	0.033	0.045
55	0.062	0.067	0.059	0.069	0.078	0.049	0.061	0.055	0.063	0.071	0.063	0.051	0.066
60	0.093	0.100	0.090	0.103	0.115	0.076	0.093	0.085	0.096	0.105	0.096	0.079	0.099
65	0.144	0.153	0.139	0.157	0.172	0.122	0.143	0.133	0.147	0.159	0.147	0.125	0.152
70	0.218	0.229	0.211	0.234	0.253	0.189	0.216	0.204	0.222	0.238	0.222	0.193	0.228
75	0.317	0.331	0.308	0.337	0.359	0.279	0.315	0.299	0.321	0.341	0.322	0.286	0.329
80	0.449	0.463	0.442	0.469	0.490	0.413	0.448	0.432	0.454	0.472	0.455	0.419	0.461
85+	...	...	...	...	...	...	...	...	...	...	...	...	...

The next step was to produce a life table for each quinquennium of the projection period (2015, 2020, 2025 and 2030) for each of the Municipalities. The United Nations Population Division has developed a software package for demographic measurement in developing countries with a special emphasis on mortality measurement called 'MortPak'. The package includes an application called 'MATCH' which calculates male and female life expectancy utilising a life expectancy estimate and a model life table pattern. The 'United Nations General' model life table pattern was used and the derived life tables included in the projections. Table 13 presents derived life expectancy by sex for 2013, 2015, 2020, 2025 and 2030.

Table 13: Projection of life expectancy at birth by sex and Municipality, 2008 to 2030

Municipality and Sex	2013	2015	2020	2025	2030
	Aileu				
Male	63.32	63.69	65.71	67.21	68.62
Female	65.88	66.11	68.74	70.53	72.21
Ainaro					
Male	60.60	61.47	63.16	64.78	66.33
Female	64.15	65.16	67.11	68.98	70.76
Baucau					
Male	61.52	62.37	64.03	65.61	67.11
Female	66.85	67.80	69.64	71.38	73.01
Bobonaro					
Male	61.01	61.87	63.55	65.15	66.68
Female	63.35	64.37	66.36	68.26	70.08
Covalima					
Male	58.62	59.52	61.27	62.97	64.60
Female	60.30	61.36	63.43	65.45	67.40
Dili					
Male	67.84	68.54	69.86	71.09	72.23
Female	70.11	70.98	72.64	74.19	75.63
Ermera					
Male	63.22	64.04	65.62	67.12	68.53
Female	66.10	67.07	68.94	70.72	72.40
Lautem					
Male	65.51	66.27	67.74	69.11	70.40
Female	67.98	68.91	70.69	72.36	73.93
Liquica					
Male	63.71	64.52	66.08	67.55	68.94
Female	65.32	66.30	68.21	70.03	71.75
Manatuto					
Male	61.71	62.56	64.21	65.78	67.27
Female	62.82	63.85	65.85	67.78	69.62
Manufahi					
Male	63.81	64.62	66.17	67.64	69.02
Female	65.24	66.23	68.14	69.96	71.68
Oecussi					
Male	67.22	67.93	69.30	70.57	71.75
Female	69.44	70.33	72.03	73.62	75.10
Viqueque					
Male	62.15	62.99	64.62	66.17	67.64
Female	64.35	65.35	67.30	69.16	70.93

3.6 Estimates and projections for internal migration

The source of data on internal migration for the Municipality projections was the 2015 Census, which provided information on past and present residence by Municipality. The patterns of migration that took place over the five years preceding the 2015 Census were utilised to derive average annual net migration data for each Municipality. Tables 14 and 15 present reported annual net migration by age and sex and Municipality for the period 2011–2015 expressed in terms of the absolute number of migrants. A positive value indicates that in-migrants exceed out-migrants and a negative sign indicates that out-migrants exceed in-migrants.

According to 2015 Census data, all Municipalities lost population to Dili between 2011 and 2015. Comparison with the 2010 Census data illustrates that the migration pattern has remained generally similar since 2005. However, most municipalities have seen a decline in out-migrant numbers during the 2011–2015 inter-censal period as opposed to the 2005–2010 inter-censal period and the number of migrants to Dili has decreased from 6,075 per annum between 2005–2010 to 5,607 per annum between 2011–2015. The previous round of projections had projected an increase in internal migration across the projection period. However, since the reverse has occurred it has been assumed that internal migration has stabilized at a lower level. Therefore, the data in Tables 14 and 15 have been utilized as the net migration input for each year of the duration of the projections from 2015 to 2030.

Table 14: Annual internal male migrants by age and Municipality, 2015 to 2030

Age groups	Males											
	Ainero	Baucau	Bobonaro	Covaclima	Dili	Ermera	Lautem	Liquica	Manatuto	Manufahi	Decussai	Viqueque
0-4	13	-11	-12	-19	0	63	-12	-3	5	5	3	-14
5-9	0	-7	-9	-8	-3	56	-10	-4	0	4	-2	-16
10-14	3	-11	-7	-14	-2	73	-11	-11	-1	-3	4	-14
15-19	-12	-60	-79	-70	-27	529	-72	-49	-19	-16	-13	-23
20-24	-30	-78	-149	-130	-68	948	-121	-83	-39	-45	-38	-53
25-29	-22	-52	-97	-90	-31	610	-81	-50	-24	-29	-21	-30
30-34	-9	-24	-51	-49	-13	300	-54	-36	-4	-8	-15	-41
35-39	-1	-13	-21	-16	-2	117	-11	-15	-2	-6	-2	-4
40-44	-2	-7	-16	-11	-1	88	-9	-9	-3	-4	-3	-19
45-49	-1	-7	-8	-6	-1	46	-6	-5	-1	-2	-1	-7
50-54	-2	-2	-3	-4	-2	27	-3	-4	-1	-1	-1	-4
55-59	-2	-2	-3	-1	0	17	-2	-1	0	-1	-2	0
60-64	-1	-2	-3	-3	0	16	-3	-1	-1	-1	-1	0
65-69	-1	-2	-2	-2	0	11	0	0	-1	-1	0	-2
70-74	-1	-1	-1	-1	1	8	-1	0	-1	-1	-1	0
75-79	1	-1	0	0	0	4	-1	0	0	-1	0	-1
80+	0	-1	-3	-3	0	7	0	-1	0	-1	-1	0
Total	-67	-285	-466	-427	-348	2933	-375	-380	-92	-111	-91	-137

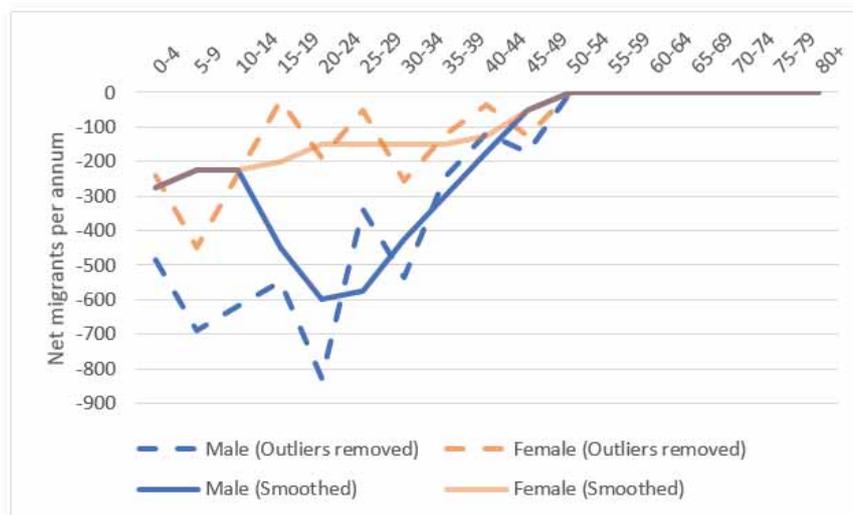
Table 15: Annual internal female migrants by age and Municipality, 2015 to 2030

Age groups	Females											
	Ainero	Baucau	Bobonaro	Covaclima	Dili	Ermera	Lautem	Liquica	Manatuto	Manufahi	Decussai	Viqueque
0-4	11	-15	-12	-19	3	65	-11	-6	9	4	-4	-12
5-9	-1	-6	-11	-4	-3	53	-6	-7	0	1	0	-5
10-14	0	-8	-11	-14	-4	87	-12	-10	-2	-4	-1	-5
15-19	-10	-81	-87	-84	-32	608	-87	-70	-20	-35	-6	-27
20-24	-32	-100	-143	-137	-80	911	-99	-99	-30	-38	-44	-44
25-29	-17	-52	-81	-69	-32	516	-59	-60	-18	-15	-25	-30
30-34	-1	-19	-30	-9	-2	180	-18	-22	-5	-6	-7	-11
35-39	0	-6	-9	-8	-2	60	-6	-8	-1	-2	-5	-6
40-44	0	-6	-6	-4	-3	42	-6	-4	0	-3	-3	-2
45-49	-1	-4	-6	-3	0	29	-2	-3	0	-3	-1	0
50-54	-1	-2	-4	-4	-1	27	-3	-3	0	-2	-2	0
55-59	0	-2	-3	-1	0	18	-2	-2	0	-1	-2	0
60-64	0	-3	-4	-3	-1	21	-2	-2	0	-1	-1	0
65-69	-2	-1	-1	-1	0	17	-1	-2	-1	-3	-1	-1
70-74	-1	-1	-3	-1	0	11	-1	-1	-1	-1	0	0
75-79	-1	-1	-2	-1	0	8	-1	-1	0	0	0	-2
80+	0	-1	-1	-1	0	10	-1	-1	0	-1	-1	0
Total	-56	-308	-414	-405	-354	2723	-319	-309	-68	-109	-103	-143

3.7 Estimate for international migration and projection strategy

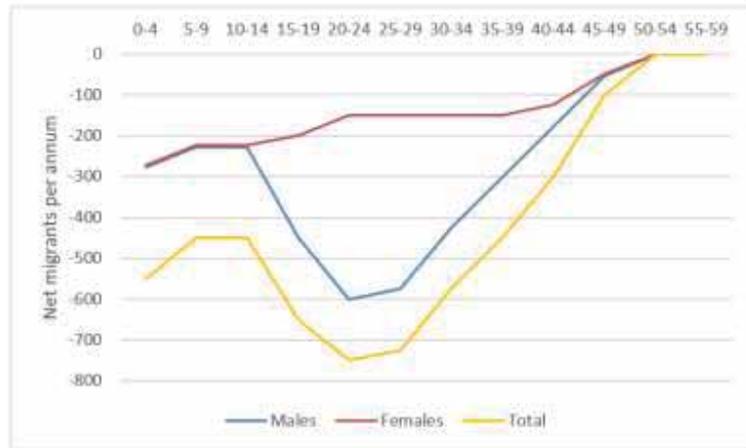
Duration of residence data is collected on international migrants living in Timor-Leste down to the lowest geographical level. Questions were added to the 2015 Census about household members living overseas. However, date of departure data were not collected. This means that international migration can only be estimated by indirect methods. For this purpose, the PAS workbook 'LTCSR MIG' was utilized to estimate net international migration using the 2010 and 2015 Census population data and inter-censal life table and fertility data. The net migration results gave an impression of the shape and scale of international migration. Outliers were removed, smoothing applied, and net migration after age 49 assumed at zero. The pattern is of out-migration. See Figure 6.

Figure 6: Unsmoothed and smoothed annual net international migration by age and sex, Timor-Leste, 2010 to 2015



The shape of the smoothed migration pattern is further illustrated in Figure 7. The smoothing method assumes that equal numbers of boys and girls aged 0–14 migrate with their families. Thereafter the PAS workbook 'LTCSR MIG' informs us that females have a greater propensity to remain in the country. Thus, the number of female migrants falls from age 15, plateaus between age 25 and 44 and thereafter reaches zero by age 50. On the other hand, 'LTCSR MIG' informs us that male emigrants increase in number and peak at age-group 20–29 before declining. The 'LTCSR MIG' data illustrates that net migration after age 49 is negligible and it was therefore determined that the smoothed profile would assume zero net migration for ages 50 and over.

Figure 7: Smoothed annual net international migration by age, Timor-Leste, 2010 to 2050



Net international migration was not included as an assumption in the 2010 Census, and therefore no comparisons can be made. However, the United Nations Population Division World Population Prospects 2015 revision (United Nations, 2015) estimates a net loss of 10 thousand migrants per annum between 2015 and 2050. If we assume that net migration is zero after age 49, this would mean that almost 1 per cent of the population aged 0–49 years leave the country annually. This seems high as it would remove approximately 350 thousand people from the population by 2050.

A more conservative assumed net migration number (-5,000 per annum, comprising -3,300 males and -1,700 females) has been adopted. The justification is confirmed since a value of 4,575 net migrants was obtained using PAS workbook ‘LTCSR MIG’ after outliers were removed and net migration after age 49 assumed at zero. As Timor-Leste may join ASEAN during the projection period, it is prudent to include an international migration assumption in the projections. The assumption will remove approximately 115 thousand males and 60 thousand females from the population by 2050. The net international migration assumption was applied equally to all three national projection scenarios.

At the Municipality level, international migration was distributed on a proportional basis using information from the 2015 Census on the number of former household residents (by sex) reported by household heads as living overseas. This was considered to be the best proxy for propensity to migrate internationally by Municipality and sex. Thereafter a Municipality net migration annual count (by sex) was estimated through pro-rata distribution of the national data and finally, the age structure outlined in Figure 7 was applied by sex in each Municipality.

Tables 16 and 17 present the international migration data used in the annual Municipality projections for 2015 to 2030.

Table 16: Annual international male net migrants by age and Municipality, 2015 to 2030

Age groups	Males												
	Aileu	Ainaro	Baucau	Bobonaro	Covalima	Dili	Ermera	Lautem	Liquica	Manatuto	Manufahi	Oecussi	Viqueque
0 - 4	-3	-8	-31	-18	-10	-131	-14	-21	-7	-7	-6	-9	-11
5 - 9	-2	-6	-25	-14	-9	-112	-11	-13	-6	-6	-5	-7	-9
10 - 14	-2	-6	-26	-14	-8	-111	-12	-12	-6	-6	-4	-7	-9
15 - 19	-5	-12	-51	-29	-17	-198	-24	-49	-13	-11	-9	-14	-18
20 - 24	-7	-16	-69	-37	-22	-281	-31	-49	-17	-15	-13	-19	-24
25 - 29	-6	-15	-65	-36	-21	-272	-30	-46	-16	-14	-12	-18	-23
30 - 34	-5	-11	-49	-27	-16	-164	-22	-70	-12	-10	-9	-13	-17
35 - 39	-4	-8	-34	-19	-11	-115	-15	-49	-8	-8	-7	-10	-12
40 - 44	-2	-4	-20	-11	-7	-67	-9	-29	-5	-4	-3	-5	-7
45 - 49	-1	-1	-6	-3	-2	-19	-3	-8	-1	-1	-1	-2	-2
50 - 54	0	0	0	0	0	0	0	0	0	0	0	0	0
55 - 59	0	0	0	0	0	0	0	0	0	0	0	0	0
60 - 64	0	0	0	0	0	0	0	0	0	0	0	0	0
65 - 69	0	0	0	0	0	0	0	0	0	0	0	0	0
70 - 74	0	0	0	0	0	0	0	0	0	0	0	0	0
75 - 79	0	0	0	-1	0	0	0	0	0	0	0	0	0
80+	0	0	0	3	0	0	0	0	0	0	0	0	0
Total	-38	-85	-376	-205	-122	-1470	-171	-347	-93	-82	-68	-103	-131

Table 17: Annual international female net migrants by age and Municipality, 2015 to 2030

Age groups	Females												
	Aileu	Ainaro	Baucau	Bobonaro	Covalima	Dili	Ermera	Lautem	Liquica	Manatuto	Manufahi	Oecussi	Viqueque
0 - 4	-4	-9	-27	-18	-12	-132	-14	-13	-8	-7	-7	-14	-11
5 - 9	-3	-7	-21	-15	-10	-110	-11	-8	-6	-6	-6	-11	-9
10 - 14	-4	-7	-21	-16	-11	-110	-11	-8	-6	-6	-6	-12	-9
15 - 19	-3	-6	-19	-13	-9	-99	-10	-7	-6	-5	-4	-10	-8
20 - 24	-2	-5	-14	-10	-7	-77	-8	-2	-4	-4	-4	-8	-6
25 - 29	-2	-5	-14	-10	-7	-77	-7	-2	-4	-4	-4	-8	-6
30 - 34	-2	-5	-15	-10	-7	-67	-7	-12	-5	-4	-3	-8	-7
35 - 39	-2	-4	-14	-10	-7	-67	-7	-12	-4	-4	-3	-7	-6
40 - 44	-2	-4	-12	-8	-5	-56	-6	-10	-3	-3	-2	-6	-5
45 - 49	-1	-2	-5	-4	-3	-22	-2	-4	-1	-1	-1	-3	-2
50 - 54	0	0	0	0	0	0	0	0	0	0	0	0	0
55 - 59	0	0	0	0	0	0	0	0	0	0	0	0	0
60 - 64	0	0	0	0	0	0	0	0	0	0	0	0	0
65 - 69	0	0	0	0	0	0	0	0	0	0	0	0	0
70 - 74	0	0	0	0	0	0	0	0	0	0	0	0	0
75 - 79	0	0	0	0	0	0	1	0	0	0	0	0	0
80+	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	-24	-53	-162	-115	-78	-817	-83	-77	-48	-45	-40	-88	-68

3.8. Combined internal and international migration inputs

Tables 18 and 19 present the combined international and internal net migration figures for the Municipalities by age and sex.

Table 18: Annual male international and internal net migrants by age and Municipality, 2015 to 2030

Age groups	Males												
	Aileu	Ainaro	Baucau	Bobonaro	Covalima	Dili	Ermera	Lautem	Liquica	Manatuto	Manufahi	Oecussi	Viqueque
0 - 4	10	-19	-43	-37	-10	-68	-26	-26	-2	-2	-3	-23	-26
5 - 9	-2	-13	-34	-22	-12	-54	-21	-17	-6	-2	-7	-11	-25
10 - 14	1	-17	-33	-28	-10	-38	-23	-23	-7	-9	0	-13	-23
15 - 19	-17	-78	-130	-99	-44	331	-96	-98	-32	-27	-20	-37	-104
20 - 24	-37	-94	-218	-167	-90	667	-152	-132	-56	-60	-51	-72	-138
25 - 29	-28	-67	-162	-126	-52	344	-111	-102	-40	-43	-33	-54	-100
30 - 34	-14	-35	-102	-76	-29	136	-56	-106	-16	-18	-24	-28	-58
35 - 39	-5	-19	-55	-35	-13	2	-26	-64	-10	-14	-8	-14	-39
40 - 44	-4	-11	-36	-22	-8	16	-18	-38	-8	-8	-6	-6	-26
45 - 49	-2	-8	-14	-9	-3	27	-9	-13	-2	-3	-2	-3	-9
50 - 54	-2	-2	-3	-4	-2	27	-3	-4	-1	-1	-1	0	-4
55 - 59	-2	-2	-3	-1	0	17	-2	-1	0	-1	-2	0	-4
60 - 64	-1	-2	-3	-3	0	16	-1	-1	-1	-1	-1	0	-2
65 - 69	-1	-2	-2	-2	0	11	0	0	-1	-1	0	0	-2
70 - 74	-1	-1	-1	-1	1	8	-1	0	-1	-1	-1	0	-1
75 - 79	1	-1	0	-1	0	4	-1	0	0	-1	0	0	-1
80+	0	-1	-3	0	0	7	0	-1	0	-1	-1	0	-1
Total	-105	-370	-842	-632	-271	1453	-546	-627	-185	-193	-159	-260	-562

Table 19: Annual female international and internal net migrants by age and Municipality, 2015 to 2030

Age groups	Females												
	Aileu	Ainaro	Baucau	Bobonaro	Covalima	Dili	Ermera	Lautem	Liquica	Manatuto	Manufahi	Oecussi	Viqueque
0 - 4	7	-24	-39	-37	-9	-67	-25	-19	1	-3	-11	-26	-23
5 - 9	-4	-13	-32	-19	-13	-57	-19	-15	-6	-5	-6	-16	-20
10 - 14	-4	-15	-32	-30	-15	-23	-23	-18	-8	-10	-7	-17	-25
15 - 19	-13	-87	-106	-97	-41	509	-97	-77	-26	-40	-10	-37	-76
20 - 24	-34	-105	-157	-147	-87	874	-107	-101	-34	-42	-48	-52	-110
25 - 29	-19	-57	-95	-99	-39	459	-66	-70	-22	-19	-29	-38	-56
30 - 34	-3	-24	-45	-40	-16	113	-25	-34	-10	-10	-10	-19	-29
35 - 39	-2	-10	-23	-18	-9	-7	-13	-20	-5	-6	-8	-13	-16
40 - 44	-2	-10	-18	-12	-8	-14	-12	-14	-3	-6	-5	-8	-11
45 - 49	-2	-6	-11	-9	-3	7	-4	-7	-1	-4	-2	-3	-5
50 - 54	-1	-2	-4	-4	-1	27	-3	-3	0	-2	-2	0	-4
55 - 59	0	-2	-3	-1	0	18	-2	-2	0	-1	-2	0	-4
60 - 64	0	-3	-4	-3	-1	21	-2	-2	0	-1	-1	0	-5
65 - 69	-2	-1	-1	-1	0	17	-1	-2	-1	-3	-1	-1	-4
70 - 74	-1	-1	-3	-1	0	11	-1	-1	-1	0	0	0	-2
75 - 79	-1	-1	-2	-1	0	8	0	-1	0	0	0	0	-2
80+	0	-1	-1	-1	0	10	-1	-1	0	-1	-1	0	-2
Total	-80	-361	-576	-521	-242	1906	-402	-386	-117	-154	-143	-231	-393

Chapter Four

The Base Population

The base population for the national projections uses the population enumerated in the 2015 Census. In preparation for the projections, the census population had to be adjusted for age misreporting and for under-enumeration. These issues were also addressed in preparing the base population for the 2010 projections.

Young children are frequently under-enumerated in censuses. Indeed, the 0–4 age group generally has the highest level of under-counting in most countries. The PAS spreadsheet ‘BPE’ was used to address the under-enumeration of young children. This spreadsheet utilizes the enumerated population, the sex ratio at birth, and life table and fertility information from two or three points in time before the census. The spreadsheet adjusts population under 10 years of age by sex. The adjustment increased the population under 5 years of age by 17,522 (10,370 boys and 7,152 girls). The adjustment made to the population aged 5–9 was an increase of 4,815 persons (4,221 boys and 594 girls).

The 2015 Census population exhibits under-enumeration in the population aged 55–59 and over-enumeration in the population aged 65–69 for males and females. Over enumeration of the 60–64 population was also an issue in the 2010 Census. However, this does not seem to be the case in the 2015 population. The explanation given in the 2010 thematic report on projections for under-enumeration of the population aged 55–59 and especially over-enumeration of the population aged 60–64 and 65–69 was that pensions are available to all people over 60 years of age, and the lack of an operational civil registration system means that many people do not have documented evidence of their age. Thus, the preference for ages older than 60 among people aged 55–59 is understandable (NSD and UNFPA, 2012).

The distortions were corrected with a statistical method based on population distribution by age, whereby, the number of people decline as age increases because as cohorts age, they inevitably lose members because of death. Usually the decline follows a linear pattern, but this is not the case in Timor-Leste. Figures 8 and 9 and Table 20 display the distribution of the population by age groups from 50–54 to 75–79. The population 55–59 is smaller than the population 50–54, and the population aged 65–69 is larger than the population aged 60–64 or 55–59. The adjustment method for age groups 50–54 to 75–79 used regression lines fitted to scatterplots (Figures 8 and 9).

Figure 8: Male population, age groups 50–54 to 75–79, 2015 census, Timor-Leste

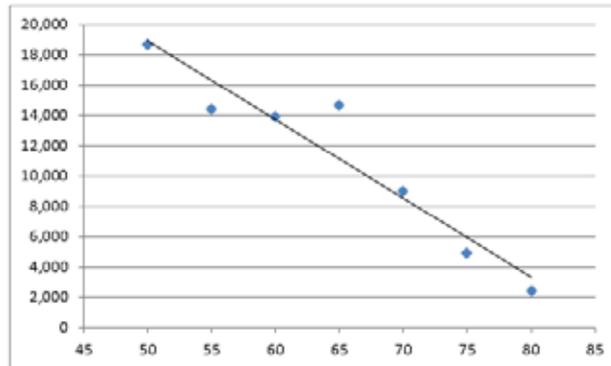
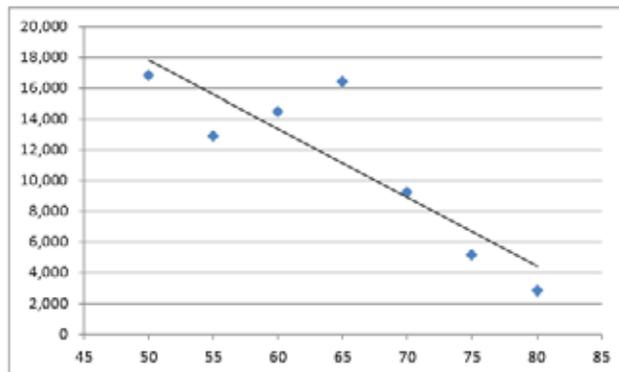


Figure 9: Female population, age groups 50–54 to 75–79, 2015 Census, Timor-Leste



Equations for the regression lines were used to adjust the male and female populations aged 55–59 and 65–69. The equations are as follows:

$$\begin{aligned} \text{Male} & \quad y = -520.35x + 44,934 \\ \text{Female} & \quad y = -448.44x + 40,247 \end{aligned}$$

The results are presented in Table 20. In contrast to the observed data, the smoothed data declines linearly as age increases, providing a more plausible age distribution. Table 21 displays the unadjusted 2015 Census population and the adjusted base population.

Table 20: Adjustment of the population aged 55–59 and 65–69, 2015 Census, Timor-Leste

Age groups	Observed			Smoothed		
	Male	Female	Total	Male	Female	Total
50 - 54	18,661	16,776	35,437	18,661	16,776	35,437
55 - 59	14,436	12,867	27,303	16,315	15,583	31,898
60 - 64	13,864	14,516	28,380	13,864	14,516	28,380
65 - 69	14,611	16,427	31,038	11,111	11,098	22,210
70 - 74	8,949	9,204	18,153	8,949	9,204	18,153
75 - 79	4,862	5,099	9,961	4,862	5,099	9,961
Total	75,383	74,889	150,272	73,762	72,276	146,038

Table 21: Unadjusted and adjusted 2015 Timor-Leste Census population

Age groups	Unadjusted census population			Adjusted census population		
	Male	Female	Total	Male	Female	Total
0 - 4	77,896	72,410	150,306	88,212	79,514	167,726
5 - 9	80,377	75,705	156,082	84,547	76,252	160,799
10 - 14	80,721	75,548	156,269	80,611	75,446	156,057
15 - 19	69,839	67,033	136,872	69,746	66,943	136,689
20 - 24	52,759	54,244	107,003	52,688	54,171	106,859
25 - 29	45,486	47,464	92,950	45,425	47,400	92,825
30 - 34	35,934	36,461	72,395	35,886	36,413	72,299
35 - 39	24,245	24,645	48,890	24,212	24,612	48,824
40 - 44	29,097	26,779	55,876	29,058	26,743	55,801
45 - 49	25,044	22,274	47,318	25,010	22,244	47,254
50 - 54	18,661	16,776	35,437	18,637	16,753	35,390
55 - 59	14,436	12,867	27,303	16,292	15,562	31,854
60 - 64	13,864	14,516	28,380	13,845	14,497	28,342
65 - 69	14,611	16,427	31,038	11,097	11,083	22,180
70 - 74	8,949	9,204	18,153	8,937	9,191	18,128
75 - 79	4,862	5,099	9,961	4,855	5,093	9,948
80+	4,331	5,079	9,410	4,328	5,076	9,404
Total	601,112	582,531	1,183,643	613,386	586,993	1,200,379

Figures 10 and 11 display the population pyramids relating to the unadjusted 2015 Census population and the adjusted base population respectively. The base axis of each pyramid is set at 100,000 males (left side) and 100,000 females (right side) to facilitate direct comparison of the population structures.

Figure 10: Unadjusted 2015 Timor-Leste Census population

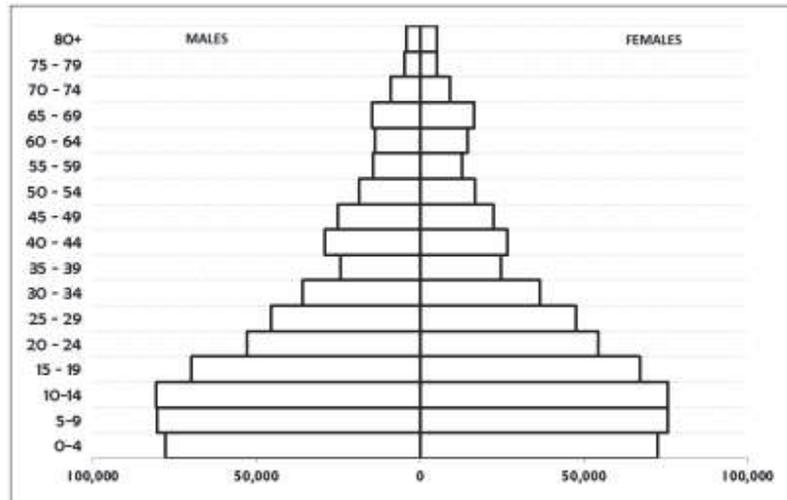
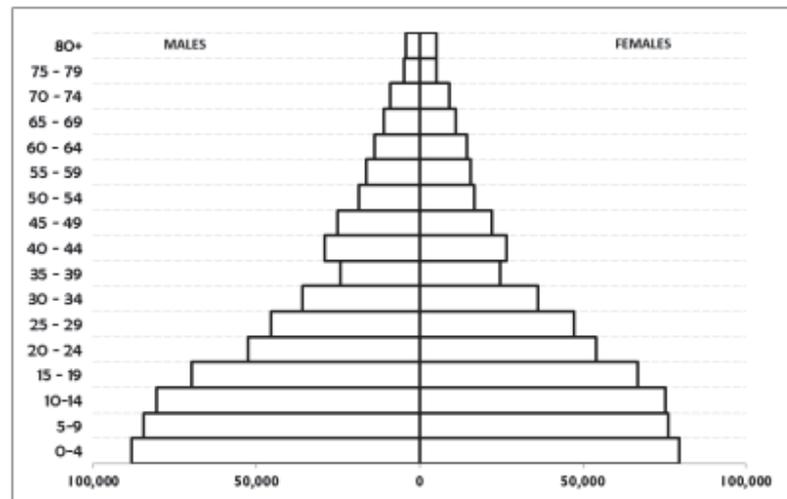


Figure 11: Adjusted 2015 Timor-Leste Census population



A comparison of Figures 10 and 11 clearly illustrates the effects of the adjustments made. The under-reporting of children under 10 years of age (and especially children under five years of age) is clearly evident in Figure 10. The utilization of the PAS spreadsheet ‘BPE’ has ensured that the pattern is more plausible for a population where the TFR is still very high (4.7 in 2013). In Figure 11 the population aged 0–4 is larger than the population aged 5–9, which in turn is larger than the population aged 10–14.

The adjustments made to age groups 55–59 and 65–69 have also ensured that the age structure is more plausible, with a linear decline into the older age groups.

An indent in age group 35–39 was not adjusted as this indent was visible in both the 2004 and 2010 Census populations, for age groups 25–29 and 30–34 respectively. This indent was retained in the 2004 and 2010 base population adjustment exercises. The indent was retained previously because there is no evidence of a problem of age misreporting. The explanation given in the 2010 population projections thematic report was that it is likely that this irregular pattern is the result of a transitory fertility decline, emigration and temporary increase in mortality caused by political and civil unrest associated with the Indonesian occupation (NDS, 2012). For this reason, no adjustments were made to age group 35–39.

The base populations utilized for the Municipality projections were adjusted to match the national base population by age and sex. A process of pro-rata adjustment was applied to ensure that the Municipality base populations summed to the national base population. This involved assuming under-enumeration errors were the same across all Municipalities since a lack of additional information meant it was not possible to apply different adjustments for each Municipality.

Chapter Five

Presentation of Results

5.1 National level projections

This chapter presents and analyses the results for the three national and the Municipality projections and also examines the impact of population momentum on future population growth in Timor-Leste and Dili.

In 2015, the total population of Timor-Leste was 1.2 million. In the high fertility scenario, where TFR will decline from 4.4 in 2015 to reach 3.0 live births per woman by 2050, the population will increase by almost 850 thousand to exceed 2 million by 2050 (Table 22). The more probable projection scenario is the medium fertility scenario, which assumes that fertility will decrease at a faster rate and reach 2.5 live births per woman by 2050. In this scenario, the population will reach 1.85 million by 2050, approximately 200 thousand less than the high scenario (Table 23). A less likely scenario is that fertility will decline even more rapidly and reach replacement level in around 15 years from now, and then proceed to decline to only 2.0 live births per woman by 2050. In this scenario, the population will reach 1.67 million by 2050, approximately 190 thousand less than the medium scenario (Table 24).

The annual exponential rate of population growth was 1.8 per cent in the high fertility scenario, and 1.7 per cent for the medium and low scenarios at the start of the projection period. By 2030, in the high fertility scenario, the rate of growth will have declined to 1.6 per cent and by 2050 it will have reached 1.4 per cent, a decline of only 0.4 per cent in 35 years. The impact of faster fertility decline will mean that in the more plausible median fertility scenario, the growth rate will decline by 0.4 per cent in only 15 years and will reach 0.9 per cent by 2050, double the decline for the high fertility scenario. In the low scenario, an even faster rate of fertility decline will mean that the growth rate will fall by 0.8 per cent by 2030 and by 1.2 per cent by 2050 to reach only 0.5 per cent.

At its 2016 growth rate, the population of Timor-Leste would double in 40 years (by 2055). The rate of growth for Timor-Leste in 2015 can be considered as high, exceeded only in Africa (2.55 per cent) and faster than the global average of 1.18 per cent in 2010–15 according to the United Nations Population Division (United Nations, 2015). Timor-Leste's growth rate is faster than lower-middle income countries (1.48 per cent) and much faster than South-East Asia, which was 1.2 per cent in 2010–15. Timor-Leste's growth rate is similar to the rate of growth in Pacific Melanesia (1.98 per cent).

The projected rate of growth for the medium fertility scenario in 2030 is closer to the United Nations Population Division projected growth rate for lower-middle income countries in 2030 (1.14 per cent) and 2050 (0.77 per cent). It will be lower than Melanesia (1.58 per cent in 2030 and 1.08 per cent in 2050), but continue to remain higher than South-East Asia (0.75 per cent in 2030 and 0.27 per cent in 2050) and the global average (0.86 per cent in 2030 and 0.57 per cent in 2050). The low fertility scenario is slightly below the world average in 2030 and 2050. The high fertility scenario would decline more slowly than the rate of decline projected for Melanesian countries (United Nations, 2015).

Table 22: Projected population and selected demographic indicators, high fertility scenario, Timor-Leste, 2015 to 2050

Year	Population	Annual growth rate	Births	Crude Birth Rate	Deaths	Crude Death Rate	Life Expectancy at Birth		
							Total	Male	Female
2015	1,200,379		36,190	30.2	9,606	8.0	65.7	64.4	67.1
2016	1,221,869	1.8	36,047	29.5	9,652	7.9	66.1	64.7	67.5
2017	1,243,144	1.7	35,844	28.8	9,690	7.8	66.4	65.1	67.9
2018	1,264,139	1.7	35,566	28.1	9,729	7.7	66.8	65.4	68.3
2019	1,284,773	1.6	35,200	27.4	9,768	7.6	67.1	65.7	68.6
2020	1,304,954	1.5	34,733	26.6	9,803	7.5	67.5	66.0	69.0
2021	1,325,207	1.6	35,438	26.7	9,863	7.4	67.8	66.3	69.4
2022	1,346,075	1.6	36,113	26.8	9,953	7.4	68.1	66.6	69.7
2023	1,367,506	1.6	36,743	26.9	10,042	7.3	68.5	66.9	70.1
2024	1,389,450	1.6	37,313	26.9	10,127	7.3	68.8	67.2	70.5
2025	1,411,840	1.6	37,800	26.8	10,206	7.2	69.1	67.5	70.8
2026	1,434,688	1.6	38,382	26.8	10,280	7.2	69.4	67.8	71.2
2027	1,458,006	1.6	38,889	26.7	10,355	7.1	69.7	68.1	71.5
2028	1,481,718	1.6	39,318	26.5	10,428	7.0	70.1	68.4	71.8
2029	1,505,744	1.6	39,662	26.3	10,500	7.0	70.4	68.6	72.2
2030	1,529,999	1.6	39,917	26.1	10,570	6.9	70.7	68.9	72.5
2031	1,554,511	1.6	40,326	25.9	10,649	6.9	70.9	69.2	72.8
2032	1,579,319	1.6	40,670	25.8	10,732	6.8	71.2	69.4	73.1
2033	1,604,359	1.6	40,954	25.5	10,813	6.7	71.5	69.7	73.4
2034	1,629,569	1.6	41,174	25.3	10,894	6.7	71.8	70.0	73.7
2035	1,654,881	1.5	41,317	25.0	10,972	6.6	72.1	70.2	74.0
2036	1,680,295	1.5	41,529	24.7	11,046	6.6	72.3	70.5	74.3
2037	1,705,834	1.5	41,719	24.5	11,125	6.5	72.6	70.7	74.6
2038	1,731,475	1.5	41,893	24.2	11,206	6.5	72.9	70.9	74.9
2039	1,757,198	1.5	42,050	23.9	11,291	6.4	73.1	71.2	75.2
2040	1,782,979	1.5	42,182	23.7	11,379	6.4	73.4	71.4	75.5
2041	1,808,814	1.4	42,347	23.4	11,480	6.4	73.7	71.6	75.8
2042	1,834,729	1.4	42,548	23.2	11,586	6.3	73.9	71.9	76.0
2043	1,860,753	1.4	42,784	23.0	11,699	6.3	74.1	72.1	76.3
2044	1,886,915	1.4	43,059	22.8	11,821	6.3	74.4	72.3	76.6
2045	1,913,247	1.4	43,377	22.7	11,951	6.3	74.6	72.5	76.8
2046	1,939,775	1.4	43,722	22.5	12,094	6.2	74.8	72.7	77.1
2047	1,966,524	1.4	44,115	22.4	12,243	6.2	75.1	72.9	77.3
2048	1,993,536	1.4	44,552	22.4	12,400	6.2	75.3	73.1	77.5
2049	2,020,850	1.4	45,038	22.3	12,564	6.2	75.5	73.3	77.8
2050	2,048,511	1.4	45,580	22.3	12,731	6.2	75.7	73.5	78.0

Continued ...

Table 22: Projected population and selected demographic indicators, high fertility scenario, Timor-Leste, 2015 to 2050

Year	Infant Mortality Rate			Total Fertility Rate	Total Dependency Ratio	Child Dependency Ratio	Old Age Dependency Ratio	Median Age		
	Total	Male	Female					Total	Male	Female
2015	57.7	59.9	55.2	4.4	82.9	73.9	9.1	19.2	18.8	19.7
2016	56.4	58.6	54.0	4.2	81.3	72.0	9.2	19.5	19.0	20.0
2017	55.1	57.3	52.7	4.0	79.5	70.2	9.3	19.8	19.3	20.3
2018	53.9	56.1	51.5	3.9	77.8	68.3	9.5	20.0	19.5	20.6
2019	52.7	54.9	50.3	3.7	76.0	66.5	9.6	20.3	19.8	20.9
2020	51.5	53.7	49.2	3.6	74.3	64.7	9.6	20.6	20.0	21.2
2021	50.2	52.4	47.9	3.5	72.8	63.1	9.7	20.9	20.3	21.5
2022	49.0	51.2	46.7	3.4	71.4	61.7	9.8	21.2	20.6	21.9
2023	47.8	49.9	45.6	3.4	70.2	60.4	9.8	21.6	20.9	22.2
2024	46.6	48.7	44.4	3.3	69.2	59.3	9.8	21.9	21.2	22.6
2025	45.5	47.6	43.3	3.2	68.2	58.3	9.8	22.2	21.5	22.9
2026	44.4	46.6	42.2	3.2	67.3	57.4	9.8	22.5	21.8	23.2
2027	43.4	45.6	41.2	3.2	66.4	56.6	9.8	22.7	22.0	23.5
2028	42.4	44.6	40.1	3.1	65.7	55.8	9.8	23.0	22.3	23.7
2029	41.5	43.7	39.1	3.1	65.0	55.2	9.9	23.2	22.5	24.0
2030	40.5	42.8	38.2	3.1	64.6	54.6	9.9	23.5	22.8	24.3
2031	39.6	41.9	37.2	3.1	64.2	54.1	10.0	23.7	23.0	24.5
2032	38.7	41.0	36.3	3.1	63.9	53.7	10.1	23.9	23.2	24.7
2033	37.9	40.1	35.4	3.0	63.7	53.4	10.3	24.2	23.5	25.0
2034	37.0	39.3	34.6	3.0	63.7	53.2	10.5	24.4	23.7	25.2
2035	36.2	38.5	33.7	3.0	63.8	53.1	10.7	24.6	23.9	25.4
2036	35.3	37.7	32.8	3.0	63.9	53.0	10.9	24.8	24.1	25.6
2037	34.5	36.9	32.0	3.0	63.9	52.8	11.1	25.0	24.3	25.8
2038	33.7	36.2	31.1	3.0	63.9	52.6	11.3	25.2	24.5	26.0
2039	32.9	35.4	30.3	3.0	63.7	52.3	11.5	25.4	24.7	26.2
2040	32.2	34.7	29.5	3.0	63.4	51.9	11.5	25.6	24.9	26.4
2041	31.4	34.0	28.8	3.0	62.9	51.4	11.5	25.8	25.1	26.6
2042	30.7	33.3	28.0	3.0	62.3	50.9	11.4	26.0	25.2	26.8
2043	30.1	32.6	27.3	3.0	61.6	50.3	11.3	26.1	25.4	26.9
2044	29.4	32.0	26.7	3.0	60.9	49.7	11.2	26.3	25.5	27.1
2045	28.7	31.3	26.0	3.0	60.4	49.2	11.2	26.5	25.7	27.3
2046	28.1	30.7	25.3	3.0	60.0	48.8	11.2	26.7	25.8	27.5
2047	27.5	30.1	24.7	3.0	59.7	48.3	11.4	26.8	25.9	27.6
2048	26.9	29.6	24.1	3.0	59.5	47.9	11.6	27.0	26.1	27.8
2049	26.3	29.0	23.5	3.0	59.3	47.6	11.8	27.1	26.2	27.9
2050	25.7	28.4	22.9	3.0	59.3	47.3	12.0	27.3	26.3	28.1

Table 23: Projected population and selected demographic indicators, medium fertility scenario, Timor-Leste, 2015 to 2050

Year	Population	Annual growth rate	Births	Crude Birth Rate	Deaths	Crude Death Rate	Life Expectancy at Birth		
							Total	Male	Female
2015	1,200,379		35,528	29.6	9,606	8.0	65.7	64.4	67.1
2016	1,221,133	1.7	35,194	28.8	9,608	7.9	66.1	64.7	67.5
2017	1,241,506	1.6	34,790	28.0	9,632	7.8	66.4	65.1	67.9
2018	1,261,407	1.6	34,300	27.2	9,657	7.7	66.8	65.4	68.3
2019	1,280,743	1.5	33,712	26.3	9,683	7.6	67.1	65.7	68.6
2020	1,299,412	1.4	33,014	25.4	9,705	7.5	67.5	66.0	69.0
2021	1,317,780	1.4	33,168	25.2	9,742	7.4	67.8	66.3	69.4
2022	1,336,222	1.4	33,260	24.9	9,801	7.3	68.1	66.6	69.7
2023	1,354,662	1.4	33,278	24.6	9,857	7.3	68.5	66.9	70.1
2024	1,373,024	1.3	33,210	24.2	9,908	7.2	68.8	67.2	70.5
2025	1,391,221	1.3	33,045	23.8	9,952	7.2	69.1	67.5	70.8
2026	1,409,452	1.3	33,369	23.7	10,002	7.1	69.4	67.8	71.2
2027	1,427,916	1.3	33,623	23.6	10,062	7.1	69.7	68.1	71.5
2028	1,446,537	1.3	33,803	23.4	10,121	7.0	70.1	68.4	71.8
2029	1,465,241	1.3	33,904	23.1	10,179	7.0	70.4	68.6	72.2
2030	1,483,947	1.3	33,922	22.9	10,236	6.9	70.7	68.9	72.5
2031	1,502,733	1.3	34,191	22.8	10,304	6.9	70.9	69.2	72.8
2032	1,521,688	1.3	34,401	22.6	10,379	6.8	71.2	69.4	73.1
2033	1,540,750	1.2	34,556	22.4	10,455	6.8	71.5	69.7	73.4
2034	1,559,861	1.2	34,651	22.2	10,529	6.8	71.8	70.0	73.7
2035	1,578,959	1.2	34,677	22.0	10,603	6.7	72.1	70.2	74.0
2036	1,598,050	1.2	34,782	21.8	10,674	6.7	72.3	70.5	74.3
2037	1,617,153	1.2	34,847	21.6	10,749	6.7	72.6	70.7	74.6
2038	1,636,227	1.2	34,875	21.3	10,826	6.6	72.9	70.9	74.9
2039	1,655,231	1.2	34,865	21.1	10,907	6.6	73.1	71.2	75.2
2040	1,674,121	1.1	34,812	20.8	10,990	6.6	73.4	71.4	75.5
2041	1,692,870	1.1	34,761	20.5	11,084	6.6	73.7	71.6	75.8
2042	1,711,470	1.1	34,705	20.3	11,183	6.5	73.9	71.9	76.0
2043	1,729,908	1.1	34,643	20.0	11,288	6.5	74.1	72.1	76.3
2044	1,748,173	1.0	34,575	19.8	11,400	6.5	74.4	72.3	76.6
2045	1,766,252	1.0	34,501	19.5	11,519	6.5	74.6	72.5	76.8
2046	1,784,162	1.0	34,487	19.3	11,649	6.5	74.8	72.7	77.1
2047	1,801,932	1.0	34,491	19.1	11,788	6.5	75.1	72.9	77.3
2048	1,819,573	1.0	34,512	19.0	11,933	6.6	75.3	73.1	77.5
2049	1,837,097	1.0	34,551	18.8	12,084	6.6	75.5	73.3	77.8
2050	1,854,520	0.9	34,618	18.7	12,238	6.6	75.7	73.5	78.0

Continued ...

Table 23: Projected population and selected demographic indicators, medium fertility scenario, Timor-Leste, 2015 to 2050

Year	Infant Mortality Rate			Total Fertility Rate	Total Dependency Ratio	Child Dependency Ratio	Old Age Dependency Ratio	Median Age		
	Total	Male	Female					Total	Male	Female
2015	57.7	59.9	55.2	4.3	82.9	73.9	9.1	19.2	18.8	19.7
2016	56.4	58.6	54.0	4.1	81.1	71.9	9.2	19.5	19.1	20.0
2017	55.1	57.3	52.7	3.9	79.3	69.9	9.3	19.7	19.3	20.4
2018	53.9	56.1	51.5	3.7	77.4	67.9	9.5	20.0	19.6	20.7
2019	52.7	54.9	50.3	3.5	75.5	65.9	9.6	20.4	19.8	21.1
2020	51.5	53.7	49.2	3.3	73.6	64.0	9.6	20.7	20.1	21.4
2021	50.2	52.4	47.9	3.2	71.8	62.1	9.7	21.1	20.5	21.8
2022	49.0	51.2	46.7	3.1	70.2	60.4	9.8	21.5	20.8	22.1
2023	47.8	49.9	45.6	3.0	68.6	58.8	9.8	21.8	21.2	22.5
2024	46.6	48.7	44.4	2.9	67.2	57.3	9.8	22.2	21.5	22.8
2025	45.5	47.6	43.3	2.8	65.7	55.9	9.8	22.5	21.9	23.2
2026	44.4	46.6	42.2	2.8	64.3	54.5	9.8	22.9	22.2	23.6
2027	43.4	45.6	41.2	2.8	63.0	53.2	9.8	23.2	22.6	23.9
2028	42.4	44.6	40.1	2.7	61.7	51.9	9.8	23.6	22.9	24.3
2029	41.5	43.7	39.1	2.7	60.6	50.7	9.9	23.9	23.3	24.6
2030	40.5	42.8	38.2	2.6	59.6	49.7	9.9	24.3	23.6	25.0
2031	39.6	41.9	37.2	2.6	58.8	48.8	10.0	24.6	23.9	25.3
2032	38.7	41.0	36.3	2.6	58.2	48.0	10.2	25.0	24.2	25.7
2033	37.9	40.1	35.4	2.6	57.7	47.3	10.3	25.3	24.6	26.0
2034	37.0	39.3	34.6	2.6	57.3	46.8	10.5	25.6	24.9	26.4
2035	36.2	38.5	33.7	2.6	57.1	46.4	10.7	25.9	25.2	26.7
2036	35.3	37.7	32.8	2.5	57.0	46.0	11.0	26.3	25.5	27.0
2037	34.5	36.9	32.0	2.5	56.9	45.6	11.2	26.6	25.8	27.3
2038	33.7	36.2	31.1	2.5	56.7	45.3	11.5	26.9	26.2	27.7
2039	32.9	35.4	30.3	2.5	56.6	44.9	11.6	27.2	26.5	28.0
2040	32.2	34.7	29.5	2.5	56.3	44.5	11.7	27.5	26.8	28.3
2041	31.4	34.0	28.8	2.5	55.9	44.1	11.8	27.8	27.1	28.6
2042	30.7	33.3	28.0	2.5	55.4	43.7	11.7	28.1	27.4	28.9
2043	30.1	32.6	27.3	2.5	54.8	43.2	11.6	28.4	27.6	29.2
2044	29.4	32.0	26.7	2.5	54.3	42.7	11.6	28.7	27.9	29.5
2045	28.7	31.3	26.0	2.5	53.9	42.3	11.6	29.0	28.2	29.8
2046	28.1	30.7	25.3	2.5	53.6	41.8	11.7	29.3	28.4	30.1
2047	27.5	30.1	24.7	2.5	53.3	41.4	11.9	29.6	28.7	30.4
2048	26.9	29.6	24.1	2.5	53.2	41.0	12.2	29.8	28.9	30.6
2049	26.3	29.0	23.5	2.5	53.1	40.7	12.4	30.1	29.2	30.9
2050	25.7	28.4	22.9	2.5	53.0	40.3	12.7	30.3	29.4	31.2

Table 24: Projected population and selected demographic indicators, low fertility scenario, Timor-Leste, 2015 to 2050

Year	Population	Annual growth rate	Births	Crude Birth Rate	Deaths	Crude Death Rate	Life Expectancy at Birth		
							Total	Male	Female
2015	1,200,379		35,528	29.6	9,606	8.0	65.7	64.4	67.1
2016	1,220,931	1.7	34,779	28.5	9,597	7.9	66.1	64.7	67.5
2017	1,240,690	1.6	33,929	27.3	9,594	7.7	66.4	65.1	67.9
2018	1,259,544	1.5	32,965	26.2	9,593	7.6	66.8	65.4	68.3
2019	1,277,370	1.4	31,871	25.0	9,590	7.5	67.1	65.7	68.6
2020	1,294,039	1.3	30,637	23.7	9,581	7.4	67.5	66.0	69.0
2021	1,309,971	1.2	30,398	23.2	9,591	7.3	67.8	66.3	69.4
2022	1,325,600	1.2	30,077	22.7	9,626	7.3	68.1	66.6	69.7
2023	1,340,829	1.1	29,665	22.1	9,657	7.2	68.5	66.9	70.1
2024	1,355,568	1.1	29,152	21.5	9,683	7.1	68.8	67.2	70.5
2025	1,369,717	1.0	28,531	20.8	9,703	7.1	69.1	67.5	70.8
2026	1,383,552	1.0	28,572	20.7	9,731	7.0	69.4	67.8	71.2
2027	1,397,357	1.0	28,542	20.4	9,774	7.0	69.7	68.1	71.5
2028	1,411,052	1.0	28,441	20.2	9,818	7.0	70.1	68.4	71.8
2029	1,424,564	1.0	28,262	19.8	9,862	6.9	70.4	68.6	72.2
2030	1,437,815	0.9	28,007	19.5	9,905	6.9	70.7	68.9	72.5
2031	1,450,940	0.9	28,109	19.4	9,962	6.9	70.9	69.2	72.8
2032	1,464,077	0.9	28,156	19.2	10,029	6.9	71.2	69.4	73.1
2033	1,477,167	0.9	28,151	19.1	10,097	6.8	71.5	69.7	73.4
2034	1,490,157	0.9	28,092	18.9	10,165	6.8	71.8	70.0	73.7
2035	1,502,988	0.9	27,970	18.6	10,234	6.8	72.1	70.2	74.0
2036	1,515,695	0.8	27,979	18.5	10,301	6.8	72.3	70.5	74.3
2037	1,528,318	0.8	27,938	18.3	10,372	6.8	72.6	70.7	74.6
2038	1,540,801	0.8	27,846	18.1	10,446	6.8	72.9	70.9	74.9
2039	1,553,091	0.8	27,702	17.8	10,522	6.8	73.1	71.2	75.2
2040	1,565,128	0.8	27,498	17.6	10,602	6.8	73.4	71.4	75.5
2041	1,576,896	0.7	27,332	17.3	10,692	6.8	73.7	71.6	75.8
2042	1,588,392	0.7	27,138	17.1	10,786	6.8	73.9	71.9	76.0
2043	1,599,582	0.7	26,913	16.8	10,887	6.8	74.1	72.1	76.3
2044	1,610,426	0.7	26,656	16.6	10,994	6.8	74.4	72.3	76.6
2045	1,620,887	0.6	26,367	16.3	11,107	6.9	74.6	72.5	76.8
2046	1,630,933	0.6	26,061	16.0	11,229	6.9	74.8	72.7	77.1
2047	1,640,549	0.6	25,758	15.7	11,359	6.9	75.1	72.9	77.3
2048	1,649,729	0.6	25,457	15.4	11,496	7.0	75.3	73.1	77.5
2049	1,658,471	0.5	25,160	15.2	11,637	7.0	75.5	73.3	77.8
2050	1,666,779	0.5	24,875	14.9	11,782	7.1	75.7	73.5	78.0

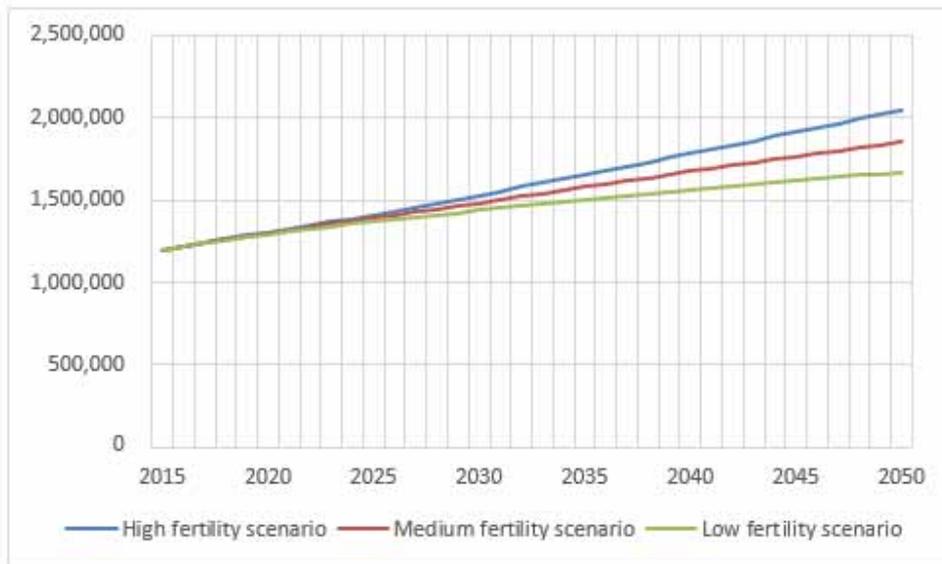
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Table 24: Projected population and selected demographic indicators, low fertility scenario, Timor-Leste, 2015 to 2050

Year	Infant Mortality Rate			Total Fertility Rate	Total Dependency Ratio	Child Dependency Ratio	Old Age Dependency Ratio	Median Age		
	Total	Male	Female					Total	Male	Female
2015	57.7	59.9	55.2	4.3	82.9	73.9	9.1	19.2	18.8	19.7
2016	56.4	58.6	54.0	4.1	81.1	71.9	9.2	19.5	19.1	20.1
2017	55.1	57.3	52.7	3.8	79.2	69.8	9.3	19.8	19.4	20.4
2018	53.9	56.1	51.5	3.6	77.1	67.7	9.5	20.2	19.6	20.8
2019	52.7	54.9	50.3	3.3	75.0	65.5	9.6	20.5	19.9	21.1
2020	51.5	53.7	49.2	3.1	72.9	63.2	9.6	20.8	20.2	21.5
2021	50.2	52.4	47.9	3.0	70.8	61.1	9.7	21.2	20.6	21.9
2022	49.0	51.2	46.7	2.8	68.8	59.1	9.8	21.6	21.0	22.3
2023	47.8	49.9	45.6	2.7	66.9	57.1	9.8	22.1	21.5	22.8
2024	46.6	48.7	44.4	2.6	65.0	55.2	9.8	22.5	21.9	23.2
2025	45.5	47.6	43.3	2.5	63.2	53.3	9.8	22.9	22.3	23.6
2026	44.4	46.6	42.2	2.4	61.3	51.5	9.8	23.3	22.7	24.0
2027	43.4	45.6	41.2	2.3	59.5	49.7	9.8	23.8	23.1	24.5
2028	42.4	44.6	40.1	2.3	57.8	47.9	9.8	24.2	23.6	24.9
2029	41.5	43.7	39.1	2.2	56.1	46.3	9.9	24.7	24.0	25.4
2030	40.5	42.8	38.2	2.2	54.6	44.7	9.9	25.1	24.4	25.8
2031	39.6	41.9	37.2	2.2	53.4	43.3	10.0	25.5	24.8	26.3
2032	38.7	41.0	36.3	2.1	52.3	42.1	10.2	26.0	25.2	26.7
2033	37.9	40.1	35.4	2.1	51.4	41.1	10.3	26.4	25.7	27.2
2034	37.0	39.3	34.6	2.1	50.8	40.2	10.6	26.9	26.1	27.6
2035	36.2	38.5	33.7	2.1	50.3	39.5	10.8	27.3	26.5	28.1
2036	35.3	37.7	32.8	2.1	50.0	38.9	11.1	27.7	26.9	28.5
2037	34.5	36.9	32.0	2.0	49.7	38.4	11.3	28.1	27.4	28.9
2038	33.7	36.2	31.1	2.0	49.5	37.9	11.6	28.6	27.8	29.4
2039	32.9	35.4	30.3	2.0	49.3	37.5	11.8	29.0	28.3	29.8
2040	32.2	34.7	29.5	2.0	49.0	37.0	12.0	29.4	28.7	30.2
2041	31.4	34.0	28.8	2.0	48.7	36.6	12.0	29.8	29.1	30.6
2042	30.7	33.3	28.0	2.0	48.2	36.2	12.0	30.3	29.6	31.1
2043	30.1	32.6	27.3	2.0	47.7	35.7	12.0	30.7	30.0	31.5
2044	29.4	32.0	26.7	2.0	47.3	35.3	12.0	31.2	30.5	32.0
2045	28.7	31.3	26.0	2.0	47.0	34.9	12.1	31.6	30.9	32.4
2046	28.1	30.7	25.3	2.0	46.8	34.5	12.3	32.0	31.3	32.8
2047	27.5	30.1	24.7	2.0	46.6	34.1	12.5	32.5	31.7	33.3
2048	26.9	29.6	24.1	2.0	46.6	33.7	12.8	32.9	32.1	33.7
2049	26.3	29.0	23.5	2.0	46.5	33.3	13.2	33.4	32.5	34.2
2050	25.7	28.4	22.9	2.0	46.5	33.0	13.6	33.8	32.9	34.6

Figure 12 illustrates that the differences between the three scenarios during the first 15 years of the projection period are not very large. After 2030, the differences in population size widen until the end of the projection. The determinant of the divergence is the difference in the fertility rates assumed in each scenario.

Figure 12: Projected population for high, medium, and low fertility scenarios, Timor-Leste, 2015 to 2050



It is important to note that in spite of fertility decline in the medium fertility scenario, population growth will be substantial during the projection period and the number of live births per year will decrease by only 910 (or 2.6 per cent) by 2050. The main determinant of the sustained number of births is population momentum. This is the tendency for a population to continue growing even if fertility experiences a significant fall. Past high fertility results in a population with a high proportion in the youngest ages, and births continue to outnumber deaths as these young people move through their childbearing years (Rowland, 2003; Weeks, 2002).

An important concept to understand population momentum is replacement-level fertility (a TFR of 2.1 live births per woman). Once replacement level fertility has been reached, birth will gradually reach equilibrium with deaths (as the population ages) and, in the absence of immigration and emigration, a population ultimately will stop growing and become stationary. It is notable in the medium fertility scenario that the ratio of deaths to births increases from 27 deaths per 100 live births in 2015 to 35 by 2050. The low fertility scenario assumes TFR will be below replacement level by 2032, but even so, the ratio of deaths to births will only be 47 deaths per 100 live births by 2050.

The population momentum implicit in a population projection can be computed. The initial or base population (2015) is projected with replacement-level fertility (a TFR of 2.14), constant life expectancy at 2015 levels (64.4 years for males and 67.1 years for females), and zero net international migration. In this projection, the population grows only through intrinsic potential in its age composition. Table 25 shows the results of this projection. Even with constant replacement-level fertility and constant mortality rates, the population will continue growing during the 35 years of the projection period. From 2015 to 2050, the population would expand by 35.5 per cent, which is the value of the population growth rate in 2050. Thus, the potential for growth contained solely within the age composition of the population is 35.5 per cent. The

difference between births and deaths corresponds to the natural increase of the population. The ratio of deaths to births increased from 54 deaths per 100 live births in 2015 to reach 73 by 2050. Momentum will continue, albeit with diminishing effect until the point of parity between births and deaths (a ratio of 100 equaling the point at which momentum would cease). This means that momentum will have an effect across the projection period.

Table 25: Population momentum projection, Timor-Leste, 2015 to 2050

Year	Population	Growth	Births	Deaths	Difference
2015	1,200,379		17,637	9,606	8,031
2016	1,209,162	0.7	18,312	8,776	9,536
2017	1,218,967	1.5	19,005	8,930	10,075
2018	1,229,286	2.4	19,711	9,147	10,564
2019	1,240,084	3.3	20,423	9,391	11,032
2020	1,251,345	4.2	21,136	9,647	11,489
2021	1,263,078	5.2	21,848	9,872	11,976
2022	1,275,292	6.2	22,554	10,100	12,454
2023	1,287,979	7.3	23,249	10,329	12,920
2024	1,301,122	8.4	23,925	10,558	13,367
2025	1,314,701	9.5	24,577	10,786	13,791
2026	1,328,674	10.7	25,205	11,051	14,154
2027	1,342,996	11.9	25,806	11,316	14,490
2028	1,357,640	13.1	26,376	11,578	14,798
2029	1,372,572	14.3	26,909	11,842	15,067
2030	1,387,752	15.6	27,399	12,105	15,294
2031	1,403,053	16.9	27,659	12,353	15,306
2032	1,418,356	18.2	27,898	12,596	15,302
2033	1,433,641	19.4	28,110	12,841	15,269
2034	1,448,880	20.7	28,295	13,086	15,209
2035	1,464,043	22.0	28,449	13,331	15,118
2036	1,478,897	23.2	28,143	13,553	14,590
2037	1,493,232	24.4	27,846	13,766	14,080
2038	1,507,056	25.5	27,548	13,980	13,568
2039	1,520,369	26.7	27,255	14,197	13,058
2040	1,533,171	27.7	26,966	14,420	12,546
2041	1,545,367	28.7	26,484	14,639	11,845
2042	1,556,871	29.7	26,022	14,858	11,164
2043	1,567,699	30.6	25,575	15,084	10,491
2044	1,577,859	31.4	25,147	15,317	9,830
2045	1,587,364	32.2	24,739	15,559	9,180
2046	1,596,262	33.0	24,423	15,807	8,616
2047	1,604,595	33.7	24,115	16,066	8,049
2048	1,612,362	34.3	23,818	16,334	7,484
2049	1,619,567	34.9	23,535	16,609	6,926
2050	1,626,220	35.5	23,268	16,889	6,379

In the medium fertility scenario, the population will increase from 1.2 million to 1.8 million by 2050. Table 26 illustrates that almost two-thirds (65 per cent) of this growth will be caused by momentum and just over one third (35 per cent) is accounted for by excess fertility (above replacement level) and increasing life expectancy, offset by the overseas migration of 5,000 persons each year. Also, the influence of a slower rate of fertility decline is notable. In the high fertility scenario, 422 thousand additional people will be added to the population by 2050 purely because of fertility exceeding replacement level. By contrast, in the low fertility scenario, which reaches below replacement level fertility by 2032, only 40,559 additional people are added to the population by 2050 as a result of demographic components and not momentum. It is worthy of note that any increase in the population in the low scenario between 2033 and 2050 can be attributed to increasing life expectancy.

Table 26: Calculation of growth due to momentum and the demographic components for high, medium, and low fertility projection scenarios, Timor-Leste, 2050

	Projection scenario					
	High		Medium		Low	
	Population	%	Population	%	Population	%
	2050					
Total Population Growth	848,132	100.0	654,141	100.0	466,400	100.0
Growth from Momentum	425,841	50.2	425,841	65.1	425,841	91.3
Growth from Demographic components	422,291	49.8	228,300	34.9	40,559	8.7

The main point to be noted from this exercise is that population momentum will have a substantial effect across the projection period. However, the effect of a decline in fertility to reach a TFR of 2.5 live births per woman in the medium scenario, as opposed to a slower pace of decline to reach a TFR of 3.0 (high scenario) will mean that almost 200 thousand fewer additional people are added to the population by 2050. Reducing the fertility rate even further provides an even more profound constraining effect on population growth.

Changes in the distribution of the population by age and sex are as important as population numbers and growth rates. Age and sex data are needed for planning of economic and social needs. For example, age is an important variable in measuring the potential school population, the potential voting population, and potential labour force (Smith, et. all, 2001). It is for this reason that population projections do not just project the total population, but also the population by age groups and sex.

Tables 27, 28 and 29 present the population by age groups and sex for the years 2015, 2030 and 2050 for the three projection scenarios, and Figures 13, 14 and 15 illustrate the changing structures using population pyramids. The base axis of each pyramid is set at 150,000 males (left side) and 150,000 females (right side) to facilitate direct comparison of the population structures between the three scenarios. The 2015 data is presented in blue bars, the 2030 data in red bars, and the 205 data in black bars.

Table 27: Projected population and selected demographic indicators, Timor-Leste, 2015, 2030, and 2050

Age	2015			2030			2050		
	Population			Population			Population		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
0-4	167,726	88,212	79,514	184,785	94,493	90,292	214,190	109,432	104,758
5-9	160,799	84,547	76,252	166,186	85,005	81,181	201,302	102,803	98,499
10-14	156,057	80,611	75,446	157,005	81,260	75,745	192,390	98,196	94,194
15-19	136,689	69,746	66,943	153,710	80,640	73,070	182,462	92,786	89,676
20-24	106,859	52,688	54,171	147,120	76,194	70,926	168,199	84,590	83,609
25-29	92,825	45,425	47,400	141,079	70,572	70,507	149,345	73,865	75,480
30-34	72,299	35,886	36,413	121,114	58,942	62,172	139,248	68,803	70,445
35-39	48,824	24,212	24,612	92,860	43,161	49,699	135,423	67,678	67,745
40-44	55,801	29,058	26,743	80,604	37,622	42,982	129,729	64,350	65,379
45-49	47,254	25,010	22,244	62,552	30,034	32,518	125,161	60,536	64,625
50-54	35,390	18,637	16,753	41,947	20,276	21,671	107,153	50,740	56,413
55-59	31,854	16,292	15,562	48,624	24,888	23,736	80,977	36,605	44,372
60-64	28,342	13,845	14,497	40,139	20,790	19,349	68,519	31,046	37,473
65-69	22,180	11,097	11,083	28,291	14,464	13,827	50,301	23,257	27,044
70-74	18,128	8,937	9,191	22,998	11,306	11,692	30,432	13,979	16,453
75-79	9,948	4,855	5,093	17,577	8,170	9,407	29,761	14,339	15,422
80+	9,404	4,328	5,076	23,408	10,958	12,450	43,919	20,649	23,270
Total	1,200,379	613,386	586,993	1,529,999	768,775	761,224	2,048,511	1,013,654	1,034,857

Table 28: Projected population and selected demographic indicators, Timor-Leste, 2015, 2030, and 2050

Age	2015			2030			2050		
	Population			Population			Population		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
0-4	167,726	88,212	79,514	159,069	81,344	77,725	166,271	84,951	81,320
5-9	160,799	84,547	76,252	151,236	77,359	73,877	162,680	83,089	79,591
10-14	156,057	80,611	75,446	151,617	78,481	73,136	159,304	81,319	77,985
15-19	136,689	69,746	66,943	153,713	80,642	73,071	152,752	77,642	75,110
20-24	106,859	52,688	54,171	147,119	76,194	70,925	143,282	71,900	71,382
25-29	92,825	45,425	47,400	141,081	70,573	70,508	134,827	66,480	68,347
30-34	72,299	35,886	36,413	121,113	58,941	62,172	134,027	66,121	67,906
35-39	48,824	24,212	24,612	92,858	43,160	49,698	135,426	67,681	67,745
40-44	55,801	29,058	26,743	80,604	37,622	42,982	129,729	64,350	65,379
45-49	47,254	25,010	22,244	62,554	30,036	32,518	125,162	60,536	64,626
50-54	35,390	18,637	16,753	41,947	20,273	21,674	107,153	50,742	56,411
55-59	31,854	16,292	15,562	48,623	24,889	23,734	80,979	36,607	44,372
60-64	28,342	13,845	14,497	40,140	20,792	19,348	68,516	31,041	37,475
65-69	22,180	11,097	11,083	28,291	14,462	13,829	50,301	23,259	27,042
70-74	18,128	8,937	9,191	22,998	11,306	11,692	30,432	13,976	16,456
75-79	9,948	4,855	5,093	17,577	8,171	9,406	29,762	14,341	15,421
80+	9,404	4,328	5,076	23,407	10,958	12,449	43,917	20,649	23,268
Total	1,200,379	613,386	586,993	1,483,947	745,203	738,744	1,854,520	914,684	939,836

Table 29: Projected population and selected demographic indicators, low fertility scenario, Timor-Leste, 2015, 2030, and 2050

Age	2015			2030			2050		
	Population			Population			Population		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
0-4	167,726	88,212	79,514	134,147	68,601	65,546	122,986	62,839	60,147
5-9	160,799	84,547	76,252	135,240	69,183	66,057	125,807	64,264	61,543
10-14	156,057	80,611	75,446	146,402	75,794	70,608	126,134	64,402	61,732
15-19	136,689	69,746	66,943	153,715	80,643	73,072	123,075	62,515	60,560
20-24	106,859	52,688	54,171	147,120	76,194	70,926	119,140	59,607	59,533
25-29	92,825	45,425	47,400	141,080	70,573	70,507	119,294	58,579	60,715
30-34	72,299	35,886	36,413	121,111	58,940	62,171	128,965	63,527	65,438
35-39	48,824	24,212	24,612	92,858	43,160	49,698	135,426	67,680	67,746
40-44	55,801	29,058	26,743	80,606	37,623	42,983	129,734	64,353	65,381
45-49	47,254	25,010	22,244	62,554	30,036	32,518	125,156	60,534	64,622
50-54	35,390	18,637	16,753	41,947	20,274	21,673	107,155	50,741	56,414
55-59	31,854	16,292	15,562	48,626	24,890	23,736	80,976	36,604	44,372
60-64	28,342	13,845	14,497	40,139	20,791	19,348	68,519	31,045	37,474
65-69	22,180	11,097	11,083	28,284	14,460	13,824	50,299	23,258	27,041
70-74	18,128	8,937	9,191	23,003	11,306	11,697	30,435	13,978	16,457
75-79	9,948	4,855	5,093	17,578	8,172	9,406	29,764	14,341	15,423
80+	9,404	4,328	5,076	23,405	10,958	12,447	43,914	20,648	23,266
Total	1,200,379	613,386	586,993	1,437,815	721,598	716,217	1,666,779	818,915	847,864

Figure 13: Superimposed population pyramids, high fertility scenario, Timor-Leste, 2015, 2030, and 2050

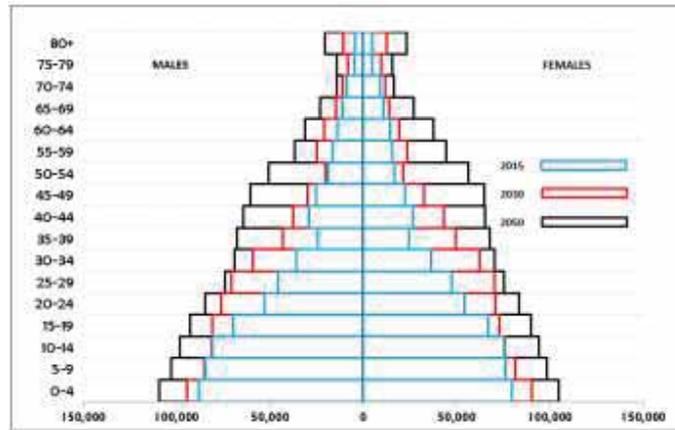


Figure 14: Superimposed population pyramids, medium fertility scenario, Timor-Leste, 2015, 2030, and 2050

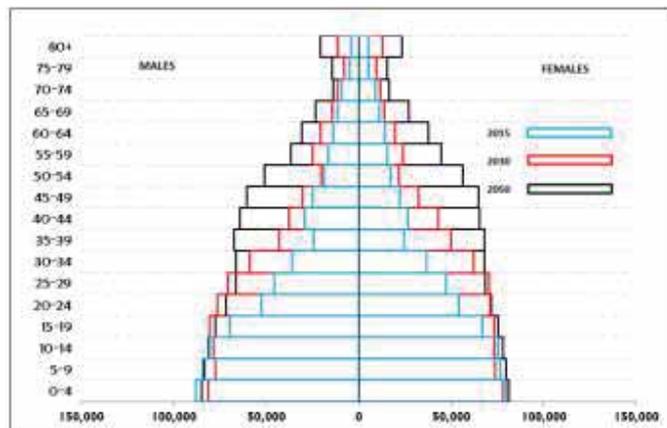
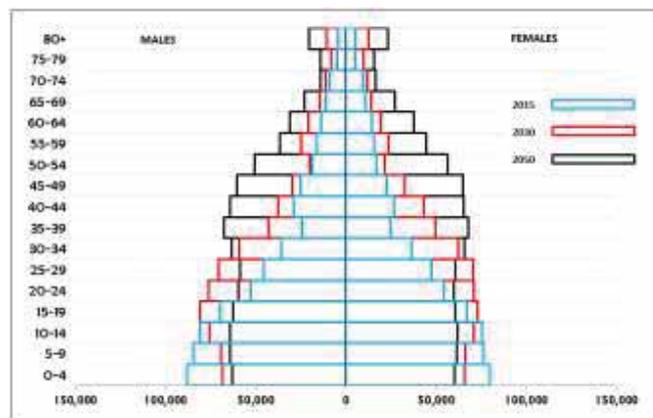


Figure 15: Superimposed population pyramids, low fertility scenario, Timor-Leste, 2015, 2030, and 2050



In Figures 13, 14 and 15, the 2015 age structure (blue bars) has the classic shape of a country with a high fertility rate and low life expectancy: the base is wide due to the high numbers of live births per woman and as age increases, each cohort is smaller than the preceding cohort due to high rates of mortality across the life course, producing a pyramidal shape. However, by 2050 (black bars) the three pyramids clearly illustrate the impact of different rates of fertility decline on the population structure. The structures in 2030 (red bars) illustrate the transition between the 2015 and 2050 structures in the three scenarios.

In Figure 13, the high fertility scenario, the transition from the blue to black bars (2015 to 2050) is characteristic of a population experiencing rapid growth. Of the three pyramids, this one has least evidence of population structural change. The most notable change is that the bars have become wider because the population has grown from the base upwards (through high fertility), and because increasing life expectancy has meant that mortality has declined for all age groups across the population. There is some evidence of greater expansion of the adult population.

In Figure 14 for the medium fertility scenario, which is the most plausible future scenario, the structural changes are quite dissimilar for the child and adolescent population: there is virtually no notable increase in the size of the black bars (2050) relative to the blue bars (2015), due to fertility decline to a rate of only 2.5 live births per woman. The shape between age group 0–4 and age 45–49 is no longer pyramidal in 2050, as the size of the bars barely decreases with increasing age. Consequently, the size of the child population relative to the adult population has decreased markedly in the medium projection scenario, exhibiting the structure of a population in the middle of a demographic transition. This represents a marked contrast to Figure 13 for the high fertility scenario, where the pyramidal shape of a high fertility population is still very noticeable in 2050.

In Figure 15 for the low fertility scenario, the differences described between the high and medium scenario pyramids are even more starkly apparent. Due to fertility reaching replacement level by 2032, and sub-replacement level by 2050 (2.0 live births per woman), the red bars (2030) are smaller than the blue bars (2015) for age groups between 0 and 14 years, and the black bars (2050) are even smaller than the red bars (2030) for age groups between 0 and 29 years. The undercutting, or narrowing of the population at its base is symptomatic of a population fully transitioning to a more mature age structure. A child deficit (from here-on referred to by the more commonly used term of a ‘youth bulge’) is starting to appear in the red bars, and is fully evident in the black bars (2050), which gives the appearance of a substantial bulge within the working age population (between ages 30 and 55).

All three pyramids exhibit the same population structure for ages 35 and above because the assumptions for life expectancy and migration were the same in all three projections and as the span of the projection period is 35 years, a differential rate of fertility decline has no bearing on the population structure for older age groups. Consequently, the impact of population momentum has no differential impact for age 35 and above. The changes evident in all three projections are of population ageing due to increases in life expectancy across the life course and especially for older age groups.

A key to understanding the relationship between population dynamics and socio-economic development is the concept of the demographic dividend. As fertility declines, a large proportion of the population moves into and through working age while the proportion of children experiences a sustained decrease. This forms the afore-mentioned ‘youth bulge’ that is especially apparent in the low fertility scenario (Figure 15), and to some extent emerging in the medium fertility scenario (Figure 14), but not at all evident in the high fertility scenario because the fertility rate is still too high for ‘undercutting’ within the child population to create the youth bulge (Figure 13).

The demographic dividend represents a so-called ‘window of opportunity’ for economic growth, firstly, because an expanding workforce can generate and accumulate more capital, and the shrinking size of the dependent population means that the burden of support is potentially lower. Secondly, the Government and the productive population can focus their expanding pots of wealth on the education and health of the proportionally smaller and declining cohorts of adolescents and children, who can then be even more productive when they reach working age. This is because less population pressure on the educational and health system may facilitate qualitative and quantitative improvements and, therefore, an important accumulation of human capital (Leete and Schoch, 2003; Mason, 2003). These improvements can potentially stimulate and maintain economic development (if diverse and decent employment is available to match the skills and scale of the growing working age population). Thus, approximately one-third of the economic growth experienced by several East Asian countries during the last quarter of the past century can be attributed to an adequate utilization of the demographic dividend (Williamson and Higgins, 1997).

The ‘opening’ of the demographic ‘window of opportunity’ has been quantified as the moment when the percentage of the population under 15 years falls below 30 per cent of the total population (whilst at the same time, the percentage of the population aged 65 years or over remains below 15 per cent). The window ‘closes’ when the population aged 65 years or over rises above 15 per cent due to population ageing (United Nations, 2004). For Timor-Leste, in the low fertility scenario, the window of opportunity will open in 2029 and will remain open for the duration of the projection period. In the low fertility scenario, the window of opportunity will open in 2034 and will remain open for the duration of the projection period. In the high fertility scenario, the window will not open until 2049.

Should the medium fertility scenario occur, or were fertility to drop and stabilise below 2.5 live births per woman, the window will open in the early to mid-2030s. In the meantime, a major challenge for the Government will be to make sure that the increasingly larger cohorts of young people who will enter the workforce in the 2030s are healthy, adequately educated, and suitably skilled to be productive workers. Critically, decent job opportunities must be made available for the growing workforce to be productively employed. Conversely, if the economy cannot absorb the expanding working age population, improve human resources and capitalize on the ‘window of opportunity’, the more numerous young adult population, or the so called ‘youth bulge’, may become a heavy burden economically, politically and socially. A demographic dividend appears probable and represents both a huge opportunity but also a major socio-demographic challenge for the Government of Timor-Leste.

We as a Government should not wait to act. The time to prepare for opening of the ‘window of opportunity’ for the demographic dividend commencing is now, because we need to start to invest in the cohorts who are currently children or have yet to be born and who will enter the working age population when the window of opportunity is opening. We as a Government should ensure that all children have their births registered and receive a birth certificate. This strategy will facilitate development of a population register for local planning purposes around health, education and other services.

The Sustainable Development Goals (SDG) framework offers a mechanism within which to make these preparations. The Government should focus on:

- SDG 3 (good health and wellbeing) to ensure that all women have their reproductive health needs met and all children and young people are healthy;
- SDG 4 (quality education) to ensure that all children and young people are well educated;

- SDG 5 (gender equality) to ensure that all women and girls are empowered and reach their full potential;
- SDG 8 (decent work and economic growth), and SDG 9 (industry, innovation and infrastructure) to make progress in creating employment for the expanding working age population.

The time to prepare for the opening of the ‘window of opportunity’ for the demographic dividend chimes perfectly with SDG 2030 agenda.

Table 30 contains a set of demographic indicators on sex and age structure of the future population of Timor-Leste for the three scenarios. The examination of these indicators helps shed light on the potential for a demographic dividend in Timor-Leste.

Table 30: Selected demographic indicators, high, medium, and low fertility projection scenarios, Timor-Leste, 2015 to 2050

Projection Scenario											
High											
Year	Sex ratio ¹	Median age	% < 15	% 15-64	% > 65	% Women 15-49	Total Dependency Ratio	Child Dependency Ratio	Old Age Dependency Ratio	Ageing Ratio ²	Elderly Support Ratio ³
2015	104.5	19.2	40.4	54.7	5.0	47.5	82.9	73.9	9.1	12.3	57.0
2020	103.3	20.6	37.1	57.4	5.5	50.1	74.3	64.7	9.6	14.3	66.1
2025	102.1	22.2	34.7	59.5	5.9	51.6	68.2	58.3	9.8	16.3	69.3
2030	101.0	23.5	32.2	60.0	6.0	52.0	64.0	54.0	9.9	18.2	69.0
2035	100.1	24.6	32.4	61.1	6.5	52.6	63.8	53.1	10.7	20.1	56.8
2040	99.3	25.6	31.8	61.2	7.1	51.8	63.4	51.9	11.5	22.2	57.4
2045	98.6	26.5	30.7	62.3	7.0	51.2	60.4	49.2	11.2	22.7	50.3
2050	98.0	27.3	29.7	62.9	7.5	50.0	59.3	47.3	12.0	25.4	55.8

Medium											
Year	Sex ratio ¹	Median age	% < 15	% 15-64	% > 65	% Women 15-49	Total Dependency Ratio	Child Dependency Ratio	Old Age Dependency Ratio	Ageing Ratio ²	Elderly Support Ratio ³
2015	104.5	19.2	40.4	54.7	5.0	47.5	82.9	73.9	9.1	12.3	57.0
2020	103.3	20.7	36.3	57.6	5.6	50.3	71.6	64.0	9.6	15.1	65.1
2025	102.0	22.5	33.7	60.3	5.9	52.3	65.7	55.9	9.8	17.6	69.3
2030	100.9	24.3	31.1	62.7	6.2	54.4	59.6	49.7	9.9	20.0	69.8
2035	99.9	25.9	29.8	63.7	6.8	54.7	57.1	48.4	10.7	23.2	58.8
2040	99.3	27.5	28.5	64.0	7.5	53.9	54.3	44.5	11.7	26.3	57.4
2045	98.1	29.0	27.5	65.0	7.6	52.8	53.9	42.3	11.6	27.5	58.3
2050	97.3	30.3	26.3	65.4	8.3	51.1	53.0	40.3	12.7	31.6	55.8

Low											
Year	Sex ratio ¹	Median age	% < 15	% 15-64	% > 65	% Women 15-49	Total Dependency Ratio	Child Dependency Ratio	Old Age Dependency Ratio	Ageing Ratio ²	Elderly Support Ratio ³
2015	104.5	19.2	40.4	54.7	5.0	47.5	82.9	73.9	9.1	12.3	57.0
2020	103.3	20.8	36.6	57.9	5.6	50.5	72.9	63.2	9.6	15.2	66.1
2025	102.0	22.9	32.7	61.3	6.0	53.1	63.2	53.3	9.8	18.5	69.3
2030	100.0	25.1	29.3	64.7	6.4	55.1	54.6	44.7	9.9	22.2	69.0
2035	99.6	27.3	26.3	66.5	7.2	53.3	50.3	39.5	10.8	27.3	56.8
2040	98.8	29.4	24.9	67.1	8.0	56.2	49.0	37.0	12.0	32.3	57.4
2045	97.8	31.6	23.7	68.0	8.2	56.7	47.0	34.8	12.1	34.7	58.3
2050	96.0	33.0	22.5	69.2	9.3	52.4	46.5	33.0	13.6	41.2	55.0

¹ Males per 100 Females

² Elderly (65+) per 100 Children (0-14)

³ The ratio of those aged over 70 to Women aged 40-54

The first indicator presented in Table 30 is the sex ratio which is the number of males per 100 females. This variable does not substantially vary between the three scenarios. In all scenarios, the sex ratio falls below 100, which means a shift from a predominance of males to a slight predominance of females. The main reason for this trend is the greater increase in life expectancy for women than for men: from 2.7 years in 2015 to 4.5 years in 2050.

Median age is the age at which half of the population is younger and half of the population is older. In 2015, the median age was 19.2 years, which indicates that Timor-Leste has a very young population structure. For example, globally the median age was 30 years in 2015 and in the least developed countries it was 20 years in 2015 (United Nations, 2015). The median age increases across the projection period to reach 27.3 years in the high fertility scenario, 30.3 years in the medium fertility scenario and 33.8 years in the low fertility scenario. By 2050, the median age will be higher than that for the least-developed countries (27.1 years) and the low-income countries (24.6 years) in all three scenarios, but will also be well below the median age in the lower-middle income countries (33.4 years) in the high and medium fertility scenarios.

As the median age increases, so the percentage of the population under age 15 years declines: from 40.4 per cent in 2015 to 26.3 per cent for the medium scenario by 2050. The decline is smaller for the high fertility scenario (to 29.7 per cent by 2050) and larger for the low fertility scenario (to 22.5 per cent by 2050).

Table 30 illustrates the quinquennium for the opening of the ‘demographic window of opportunity’ (when the population aged less than 15 years drops below 30 per cent of the total population):

High fertility scenario (2046–50);

Medium fertility scenario (2031–35);

Low fertility scenario (2026–2030).

One of the most important functional age groups is the working age population, which is the population aged between 15 and 64 years. By convention, this age group is considered the productive portion of the population, although not all the people in this age group are economically active and some people (adolescents and people aged 65 and over) are economically active. The population aged between 15 and 64 years was 54.7 per cent in 2015 and increases by almost 11 per cent to reach 65.4 per cent in 2050 for the medium fertility scenario. The increase is less for the high fertility scenario (by 8.1 per cent to 62.8 per cent in 2050) and the increase is greater for the low fertility scenario (by 13.5 per cent to reach 68.2 per cent in 2050). The greater increase for the medium and especially the low fertility scenarios is consistent with the pattern of change for the population aged less than 15 years of age and confirms the age structure changes that are observed in Figures 14 and 15.

The percentage of the population aged over 65 years will increase in all three scenarios, but remain below 15 per cent, which is the point at which the ‘demographic window of opportunity’ will close.

The percentage of women of reproductive age increases from 47.5 per cent in 2015 (in line with the increase in the working age population). The increase is slightly higher for the low fertility scenario (by almost 5 per cent to 52.4 per cent in 2050) than the increase for the medium fertility scenario (3.6 per cent by 2050) and the high fertility scenario (2.5 per cent by 2050).

The total dependency ratio is the population aged less than fifteen years and 65 years and above per 100 working age people. Because the percentage of the population aged less than 15 years declines markedly for the medium and especially the low fertility scenario, the percentage of the population aged 65 years and over increases only modestly, and at the same time the percentage of the population of working age increases substantially for the medium and especially the low fertility scenario, the total dependency ratio decreases more in the low scenario, than in the medium scenario and especially in the high scenario. These structural changes can be observed in Table 30.

The child dependency ratio is the population aged less than 15 years per 100 working age people. As explained in the previous paragraph, the changing proportional age structure also leads to declines in the child dependency ratio (which are of greater magnitude in the medium scenario than the high scenario and of greatest magnitude in the low fertility scenario) because of declining fertility.

The old age dependency ratio is the population aged 65 years and above per 100 working age people. The population ageing that is apparent in Figures 13, 14 and 15 is a result of increasing life expectancy leading to lower mortality at all ages, but especially for those aged 65 years and over. This is the reason for an increase in the old age dependency ratio for all three projection scenarios.

The ageing index is the ratio of the elderly to children. Since the percentage of the population that are children is decreasing faster than the percentage of the population aged 65 years and above, especially for the medium and particularly for the low fertility scenario, the ageing ratio increases by a greater magnitude in the low scenario than the medium scenario and especially the high scenario by 2050.

One impact of the population ageing that is projected to take place in Timor-Leste by 2050 is a shift in the elderly support ratio which is calculated as the increase in the population aged over 70 years to the female population of ages 40 to 54 years. The shift is however not linear, because the percentage of women aged 40 to 54 will increase due to increases in life expectancy.

Table 31: Population by broad age groups, high, medium and low fertility projection scenarios, Timor-Leste, 2015, 2030 and 2050

Year	Age group			Total
	0-14	15-64	65+	
High fertility scenario				
2015	484,582	656,137	59,660	1,200,379
2030	507,976	929,749	92,274	1,529,999
2050	607,882	1,286,216	154,413	2,048,511
Medium fertility scenario				
2015	484,582	656,137	59,660	1,200,379
2030	461,922	929,752	92,273	1,483,947
2050	488,255	1,211,853	154,412	1,854,520
Low fertility scenario				
2015	484,582	656,137	59,660	1,200,379
2030	415,789	929,756	92,270	1,437,815
2050	374,927	1,137,440	154,412	1,666,779

Table 31 displays the population according to three functional age groups: 0–14, 15–64 and 65 years and over. The 0–14 years age group is considered as dependent on those in the working ages (15–64 years). The population 65 years and over, usually called the elderly, are also considered as dependent on those in the working ages (15–64 years).

In 2015, the population under 15 years of age was approximately 480 thousand. In the median scenario, the size of the child population will decrease by over 20 thousand by 2030, after which the child population will increase to reach approximately the same population size in 2050 as exists currently. The reason for this reversal is the increase in the number of women in the reproductive ages i.e. a population momentum effect giving rise to a slight rebound in the number of children born, despite the reduction in fertility rates. Indeed, the number of women aged 15–49 will increase from approximately 280 thousand in 2015 to 360 thousand in 2030 and to 470 thousand in 2050 under the medium fertility scenario.

Due to a higher rate of fertility across the period of the projection in the high scenario, the child population is projected to increase by over 120 thousand by 2050. Conversely, due to rapid fertility decline in the low scenario, the child population is projected to decrease by 110 thousand by 2050.

The medium and particularly the low fertility scenarios can be achieved through universal access to reproductive health services including modern contraceptive methods. In tandem with this strategy, the Government should begin to plan for the imminent reduction in the size of the child population. The Government should ensure that all children have their births registered and receive a birth certificate. This strategy will facilitate development of a population register for local planning purposes around health, education and other services. As fewer children will be entering school ages, the Government can reprioritize the use of existing resources to raise the quality of education made available, and ensure that all children (and especially girls) attend school and receive a high-quality education. The Government should

also raise the proportion of those receiving further education and vocational training. This will help prepare the child population for the labour force. The next 15 years are critical, since these child cohorts are the ones who will reach working age when the demographic dividend commences in around 15 years' time.

The percentage of persons aged 65 years and older was just under 60 thousand in 2015. The increase is identical for all three scenarios due to the same life expectancy assumptions being applied in all three cases: the population will reach 92 thousand by 2030 and over 150 thousand by 2050. The Government needs to expand the scale, as well as the scope of social protection and health care services available to provide for this growing older age population in future.

In 2015, the working age population numbered around 650 thousand people. In the medium fertility scenario, the working age population will increase by around 270 thousand people to reach 930 thousand by 2030 and by a further 280 thousand to reach over 1.2 million by 2050. In the high fertility scenario, the working age population will reach almost 1.3 million, and in the low fertility scenario the working age population will reach just over 1.1 million by 2050.

In the next thirty-five years, the working age population will inevitably grow, predominately through population momentum. The difference between the high and low fertility scenarios is either not having the potential to achieve a demographic dividend during the next 35 years in the high fertility scenario, or having the opportunity under the medium and especially the low fertility scenarios. In the high fertility scenario, Timor-Leste's economic growth will be constrained by a larger child dependency ratio. Under the medium and the low scenarios, a lower child dependency ratio will mean that greater emphasis can be placed on high quality investment in human capital and women will have more time to contribute to the economy (because they will have fewer children to take care of).

Nevertheless, the inevitable absolute increase of the working age population during the next three decades constitutes substantial growth in the number of potential workers (the supply-side of the labour market). Unless there is a concerted effort to invest in and to expand and diversify the economy, including development of decent employment opportunities (the demand-side of the labour market), Timor-Leste could face serious problems. This is because the number of people unemployed and under-employed will increase considerably. If the expanding working age population is not economically absorbed, the demographic dividend will not materialize and indeed, become a demographic burden. The economic benefits of the demographic dividend are contingent on a propitious economic condition, adequate policies, as well as social and political stability (Cincotta, Engelman and Anastation, 2003; Leete and Schoch, 2003). Policy-makers and planners should focus on designing a strategy to cope with the expansion of the working age population to reap the economic benefits and negate serious social and political consequences.

5.2 Municipality level projections

The Municipality projections were derived from only one scenario, and adjusted to align, or sum to, the medium fertility scenario, since this is the most probable future scenario. The projections run from 2015 to 2030, a shorter period than that adopted for the national projections. This is because there is more uncertainty involved in sub-national projections than national projections.

The projected pace of growth and size of the populations of the Municipalities depends mainly on the assumptions set on fertility and net migration. Table 32 presents the projected populations and annual exponential growth rates for the Municipalities. The most notable change by 2030, is that Dili's population is projected to increase by around 170 thousand people, which constitutes adding an additional 60 per cent onto Dili's 2015 population in only 15 years. Between 2015 and 2020, the population is projected to grow at almost 4 per cent per annum. Thereafter, the rate of growth is projected to decline, reaching 3.0 per cent by 2024 and 2.3 per cent by 2030. Dili's growth is, in part, the result of in-migration from the other Municipalities, but is also attributable to population momentum and above replacement level fertility. The reason for the decline in the rate of growth is attributable to two factors: a weakening of the momentum effect, and a declining fertility rate, which is projected to fall from 3.6 live births per woman in 2015 to reach replacement level (2.1 live births per woman) in 2030.

Declines in fertility vary widely across the other Municipalities (see Table 5). Ainaro is projected to experience the highest decline (2.5 live births per woman between 2015 and 2030, or 2.4 using the adjusted value – see Table 35) and Oecusse is projected to experience the lowest decline (1.0 live birth per woman between 2015 and 2030). Aileu will have the highest fertility by 2030 (3.1 live births per woman), and outside of Dili, Oecusse is projected to have the lowest fertility in 2030 (2.3 live births per woman), despite also experiencing the lowest absolute decline in fertility.

Let us examine migration in more detail. Table 33 displays net migration rates for the municipalities of 2015 and 2030. Dili is the only Municipality with a positive net migration rate, of almost 12 persons per thousand population in 2015 dropping to 7.4 persons per thousand population in 2030. Even so, these rates obscure the fact that Dili is estimated to lose almost 2,300 persons per annum through international migration. All other Municipalities are projected to experience negative net migration rates. Of 8,358 net migrants leaving these Municipalities annually, the majority (68 per cent) move to Dili and the remainder (an estimated 2,710 per annum or 32 per cent) leave Timor-Leste for overseas destinations. Across the Municipalities, migration rates vary widely. Aileu will have the lowest rate (-3.7 per thousand in 2015 and -2.8 per thousand in 2030) and Liquica will have the second lowest rate across the projection period. At the opposite end of the spectrum, Lautem will have the highest rate (-15.3 per thousand in 2015 and -14.8 per thousand in 2030) and Viqueque will have the second highest rate across the projection period. It is important to note that across the projection period, combined international and internal migration rates are projected to be higher from Municipalities furthest from, or less well connected with Dili and projected to be lowest for Municipalities adjacent to Dili. Oecusse is an exception to this pattern.

Table 32: Population projections and exponential rates of growth, Municipalities, 2015 to 2030

Year	Timor-Leste		Aileu		Ainaro		Baucau		Bobonaro		Covallina		Dili	
	Population	Growth rate	Population	Growth rate	Population	Growth rate	Population	Growth rate	Population	Growth rate	Population	Growth rate	Population	Growth rate
2015	1,200,379		49,640		63,814		124,759		98,731		66,073		281,808	
2016	1,221,133	1.71	50,773	2.26	64,245	0.67	125,328	0.45	99,205	0.48	66,792	1.08	293,231	3.97
2017	1,241,506	1.65	51,896	2.19	64,616	0.58	125,823	0.39	99,573	0.37	67,495	1.05	304,889	3.90
2018	1,261,407	1.59	53,009	2.12	64,922	0.47	126,236	0.33	99,823	0.25	68,185	1.02	316,728	3.81
2019	1,280,743	1.52	54,106	2.05	65,165	0.37	126,562	0.26	99,956	0.13	68,863	0.99	328,666	3.70
2020	1,299,412	1.45	55,179	1.96	65,347	0.28	126,796	0.18	99,974	0.02	69,529	0.96	340,621	3.57
2021	1,317,780	1.40	56,242	1.91	65,509	0.25	126,996	0.16	99,932	-0.04	70,194	0.95	352,553	3.44
2022	1,336,222	1.39	57,308	1.88	65,693	0.28	127,220	0.18	99,885	-0.05	70,870	0.96	364,424	3.31
2023	1,354,662	1.37	58,373	1.84	65,903	0.32	127,466	0.19	99,840	-0.04	71,556	0.96	376,149	3.17
2024	1,373,024	1.35	59,429	1.79	66,142	0.36	127,731	0.21	99,806	-0.03	72,255	0.97	387,659	3.01
2025	1,391,221	1.32	60,471	1.74	66,410	0.41	128,011	0.22	99,786	-0.02	72,962	0.97	398,892	2.86
2026	1,409,452	1.30	61,515	1.71	66,725	0.47	128,330	0.25	99,808	0.02	73,657	0.95	409,895	2.72
2027	1,427,916	1.30	62,580	1.72	67,102	0.56	128,713	0.30	99,893	0.08	74,317	0.89	420,720	2.61
2028	1,446,537	1.30	63,663	1.72	67,537	0.65	129,156	0.34	100,044	0.15	74,933	0.83	431,338	2.49
2029	1,465,241	1.28	64,756	1.70	68,026	0.72	129,654	0.39	100,260	0.22	75,495	0.75	441,735	2.38
2030	1,483,947	1.27	65,850	1.68	68,554	0.77	130,186	0.41	100,525	0.26	75,987	0.65	451,853	2.26

Continued ...

Table 32: Population projections and exponential rates of growth, Municipalities, 2015 to 2030

Year	Timor-Leste		Ermera		Lautem		Liquica		Manatuto		Manufahi		Oecusse		Viqueque	
	Population	Growth rate	Population	Growth rate	Population	Growth rate	Population	Growth rate	Population	Growth rate	Population	Growth rate	Population	Growth rate	Population	Growth rate
2015	1,200,379		127,831		66,307		72,973		47,374		54,498		69,676		76,893	
2016	1,221,133	1.71	129,972	1.66	66,550	0.37	74,454	2.01	47,806	0.91	55,130	1.15	70,224	0.78	77,422	0.69
2017	1,241,506	1.65	132,054	1.59	66,728	0.27	75,909	1.93	48,202	0.83	55,734	1.09	70,712	0.69	77,876	0.58
2018	1,261,407	1.59	134,069	1.51	66,845	0.18	77,328	1.85	48,559	0.74	56,306	1.02	71,132	0.59	78,265	0.50
2019	1,280,743	1.52	136,010	1.44	66,909	0.10	78,700	1.76	48,876	0.65	56,844	0.95	71,486	0.50	78,599	0.43
2020	1,299,412	1.45	137,867	1.36	66,930	0.03	80,016	1.66	49,154	0.57	57,342	0.87	71,776	0.40	78,881	0.36
2021	1,317,780	1.40	139,692	1.32	66,938	0.01	81,293	1.58	49,417	0.53	57,831	0.85	72,042	0.37	79,141	0.33
2022	1,336,222	1.39	141,538	1.31	66,966	0.04	82,552	1.54	49,689	0.55	58,336	0.87	72,328	0.40	79,413	0.34
2023	1,354,662	1.37	143,400	1.31	67,021	0.08	83,786	1.48	49,975	0.57	58,856	0.89	72,637	0.43	79,698	0.36
2024	1,373,024	1.35	145,269	1.29	67,104	0.12	84,991	1.43	50,273	0.60	59,389	0.90	72,974	0.46	80,002	0.38
2025	1,391,221	1.32	147,136	1.28	67,212	0.16	86,162	1.37	50,585	0.62	59,931	0.91	73,345	0.51	80,320	0.40
2026	1,409,452	1.30	149,035	1.28	67,357	0.22	87,321	1.34	50,921	0.66	60,492	0.93	73,762	0.57	80,635	0.39
2027	1,427,916	1.30	151,002	1.31	67,555	0.29	88,492	1.33	51,300	0.74	61,083	0.97	74,236	0.64	80,924	0.36
2028	1,446,537	1.30	153,029	1.33	67,796	0.36	89,674	1.33	51,719	0.81	61,702	1.01	74,770	0.72	81,177	0.31
2029	1,465,241	1.28	155,109	1.35	68,077	0.41	90,864	1.32	52,178	0.88	62,343	1.03	75,363	0.79	81,382	0.25
2030	1,483,947	1.27	157,215	1.35	68,377	0.44	92,054	1.30	52,666	0.93	63,158	1.30	76,006	0.85	81,516	0.17

Table 33: Migration rates, Municipalities, 2015 and 2030

	Annual net migration												
	Aileu	Ainaro	Baucau	Bobonaro	Covalima	Dili	Ermera	Lautem	Liquica	Manatuto	Manufahi	Oecussi	Viqueque
	2015												
Net Migrants Population	-185	-731	-1418	-1153	-513	3358	-948	-1013	-302	-347	-303	-491	-955
Migration rate¹	49,640	63,814	124,759	98,731	66,073	281,808	127,831	66,307	72,973	47,374	54,498	69,676	76,893
	-3.7	-11.4	-11.4	-11.7	-7.8	11.9	-7.4	-15.3	-4.1	-7.3	-5.6	-7.1	-12.4
	2030												
Net Migrants Population	-185	-731	-1418	-1153	-513	3358	-948	-1013	-302	-347	-303	-491	-955
Migration rate¹	65,850	68,554	130,186	100,525	75,987	451,853	157,215	68,377	92,054	52,666	63,158	76,006	81,516
	-2.8	-10.7	-10.9	-11.5	-6.7	7.4	-6.0	-14.8	-3.3	-6.6	-4.8	-6.5	-11.7

¹ Net migrants per 1,000 population

Table 34: Municipalities ranked by population size, 2015 and 2030

Rank Order	2015	2030
	Largest Population	
1	Dili	Dili
2	Ermera	Ermera
3	Baucau	Baucau
4	Bobonaro	Bobonaro
5	Viqueque	Liquica
6	Liquica	Viqueque
7	Oecusse	Oecusse
8	Lautem	Covalima
9	Covalima	Ainaro
10	Ainaro	Lautem
11	Manufahi	Aileu
12	Aileu	Manufahi
13	Manatuto	Manatuto
	Smallest Population	

As noted, the combined effect of projected changes in fertility and rates of migration are the main cause of changes in growth rates and population size for the Municipalities. Table 34 uses ranking of Municipalities by population size to assess the impact of these changes. The main points to be noted are that Municipalities with a faster pace of fertility decline or a higher net migration rate (or both) are projected to grow in population size more slowly and this can reduce their ranking relative to other Municipalities. Consequently, Viqueque and especially Lautem are expected to drop in rank order by one and two positions respectively. Conversely, Aileu, which has the lowest net migration rate and the highest fertility rate in 2015 and 2030 will increase in rank order for population size.

What are the implications of the changing size of Municipality populations due to changes in fertility and through differential migration rates? It is critically important that we, as the Government of Timor-Leste, develop Municipality-specific strategies that can address differential rates of growth and the combinations of fertility and life expectancy changes that underpin the growth rate. For example, in Aileu, Ainaro and Ermera, more emphasis could be placed upon universal access to reproductive health services including modern contraceptive methods to reduce fertility rates than in other municipalities where fertility rates are currently lower and/or are projected to decline to lower levels. By contrast, in remoter Municipalities such as Lautem and Viqueque, more emphasis could be given to developing local infrastructure, services, sustainable agricultural systems and a diversified economy so that lower proportions of the population need to migrate to Dili for education and work opportunities. Through such a strategic regional development approach, the growth rate of Dili can also be reduced to more manageable levels than estimated in the Dili projection.

Figures 16 to 28 present superimposed population pyramids for each Municipality corresponding to the beginning and end of the projection period. The pyramids facilitate understanding of the changing structure of each Municipality population over time and the differences between the structures in 2050. The base axis of each pyramid is set at 10,000 males (left side) and 10,000 females (right side) to facilitate direct comparison of the population structures between the Municipalities. The only exceptions are Dili, which has a base axis set at 30,000 males (left side) and 30,000 females (right side) and Ermera, which has a base axis set at 15,000 males (left side) and 15,000 females (right side). These differences need to be borne in mind when comparing the structures of Dili and Ermera with each other or with the other Municipalities. As for the national projections, 2015 data is presented in blue bars and 2030 data in red bars.

The shape of the pyramids resemble, to varying degrees, the shape of the national medium fertility scenario population pyramids for 2015 (blue bars) and 2030 (red bars) as presented in Figure 14. This is because the Municipality projections were reconciled against the medium fertility projection scenario. Thus, the 2015 pyramidal shape has the tendency to narrow at the base by 2030 (due to declining fertility), the main exceptions are Dili and Aileu. In all pyramids, there is evidence of an increase in the population aged between 15 and 29. All pyramids exhibit expansion for ages 75 and above and many show improvements for ages 55 and above, due to an increase in life expectancy. Differential rates of fertility decline do not appear to be associated with the degree of the narrowing at the base of the pyramids. For example, Aileu is projected to experience a decline of 2.0 live births per woman and yet the 2030 population under 15 years is larger than the 2015 population aged less than 15. Conversely, Oecusse is projected to experience a decline of only 1.0 live birth per woman, but there is significant narrowing of the pyramid.

The main difference between the pyramids is due to net migration, which varies widely across the Municipalities by age and sex (Tables 18 and 19). The impact of annual net migration also directly influences fertility year on year, through migration of women of reproductive age. Additionally, growth at

the base of the pyramids is differentially influenced by year-on-year changes in population momentum effects resulting from migration-caused alterations to age and sex structures. Overall, in comparison to the national projections, the population dynamics taking place at the Municipality level are very much more complex and their transition is non-linear because of people of different age and sex moving between the Municipalities and to overseas locations.

The overall message for the use of the Municipality projections for planning is that attention needs to be paid to shorter and medium-term transitions to ensure that longer term developmental aims can be achieved.

The pyramids for Dili are significantly different from all other Municipalities. In 2015, the beginning of a bulge in the young working age population is already apparent (due to past migration patterns). Across the projection period, the bulge is projected to mature and be augmented by additional migrants. By 2030, it is projected that there be substantial growth in the working age population at ages 30 to 44 for both males and females. By 2030, Dili will most likely be the main location in the country where the demographic dividend can be capitalized upon. In fact, due to migration mainly of young people to Dili, the process may even be advanced in time. Dili is also projected to experience expansion in the child and old age population over the projection period and therefore, the Government must prepare for substantial increases to provision of services for these dependent groups.

Figure 16: Superimposed population pyramids, Aileu, 2015 and 2030

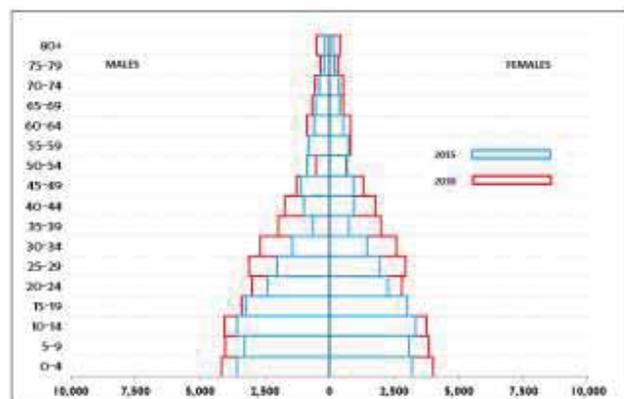


Figure 17: Superimposed population pyramids Ainaro, 2015 and 2030

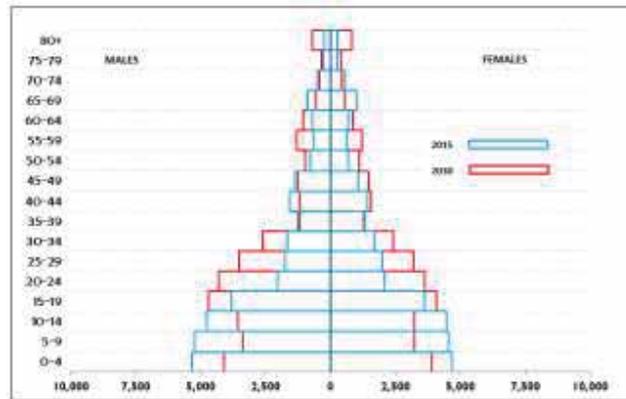


Figure 18: Superimposed population pyramids, Baucau, 2015 and 2030

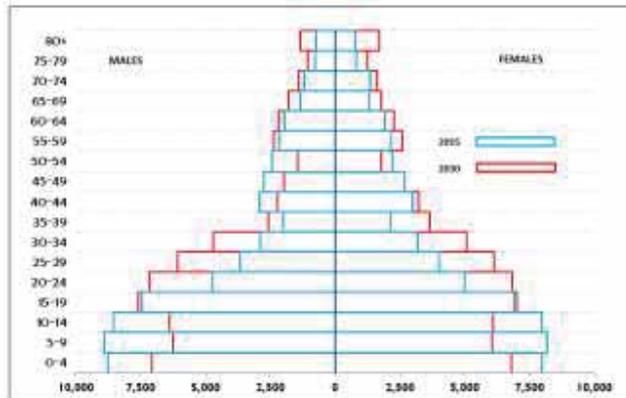


Figure 19: Superimposed population pyramids, Bobonaro, 2015 and 2030

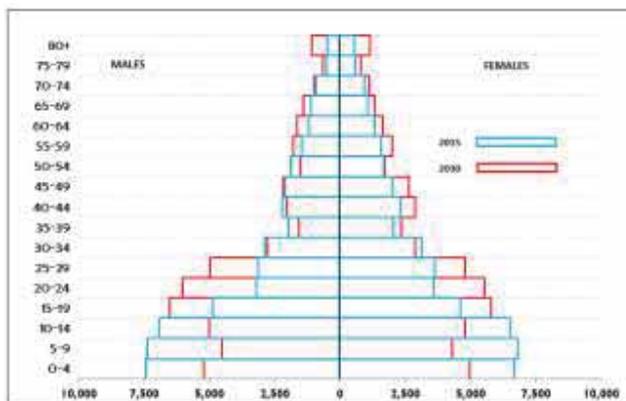


Figure 20: Superimposed population pyramids, Covalima, 2015 and 2030

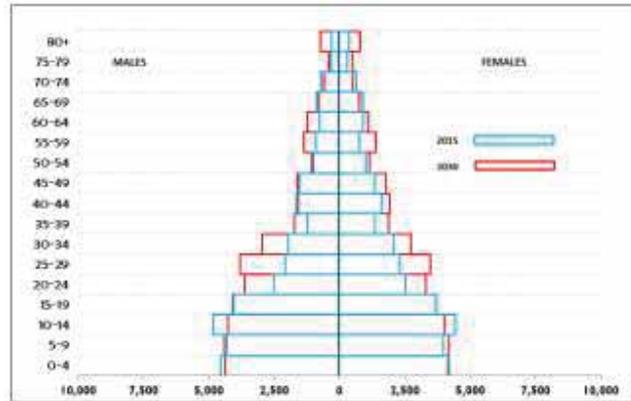


Figure 21: Superimposed population pyramids, Dili, 2015 and 2030

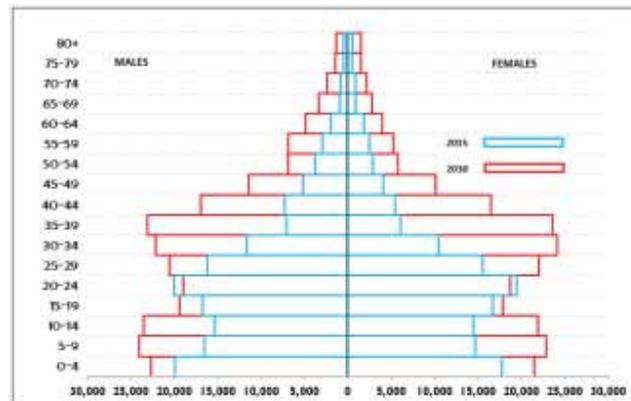


Figure 22: Superimposed population pyramids, Ermera, 2015 and 2030

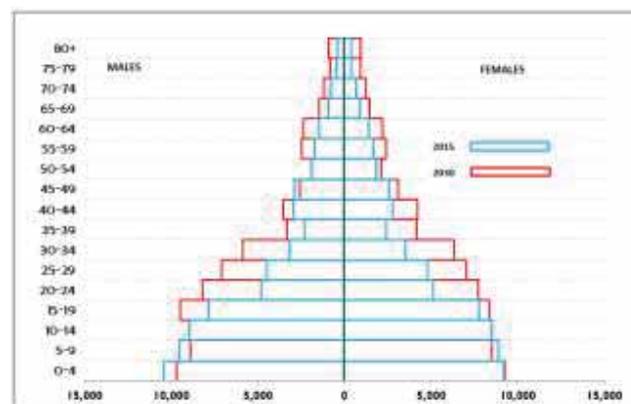


Figure 23: Superimposed population pyramids, Lautem, 2015 and 2030

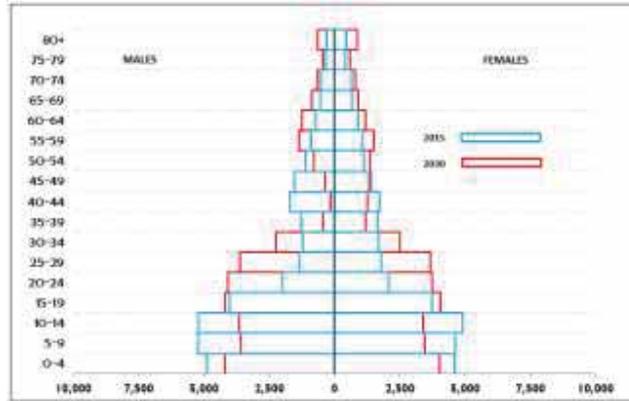


Figure 24: Superimposed population pyramids, Liquica, 2015 and 2030

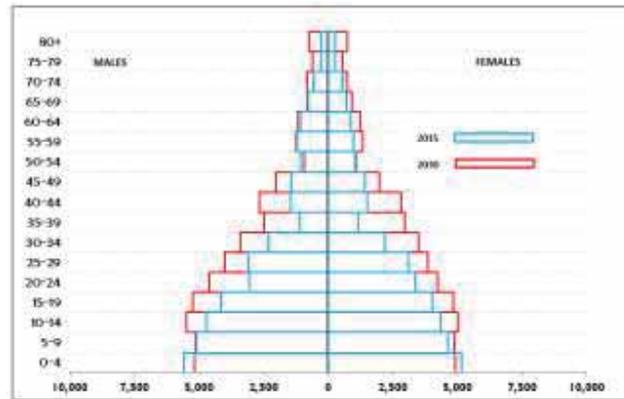


Figure 25: Superimposed population pyramids, Manatuto, 2015 and 2030

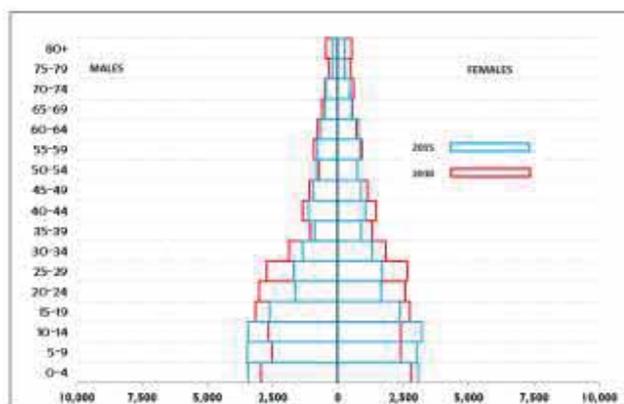


Figure 26: Superimposed population pyramids, Manufahi, 2015 and 2030

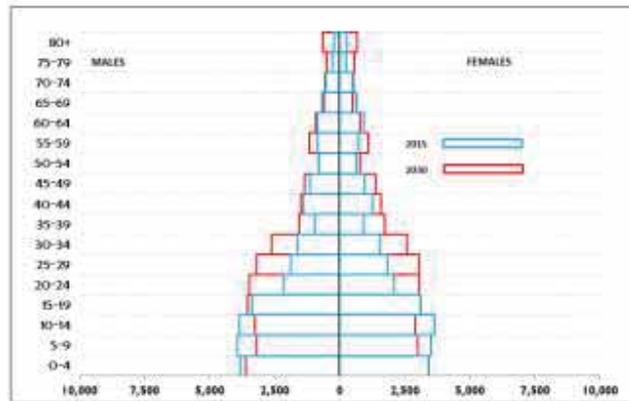


Figure 27: Superimposed population pyramids, Oecusse, 2015 and 2030

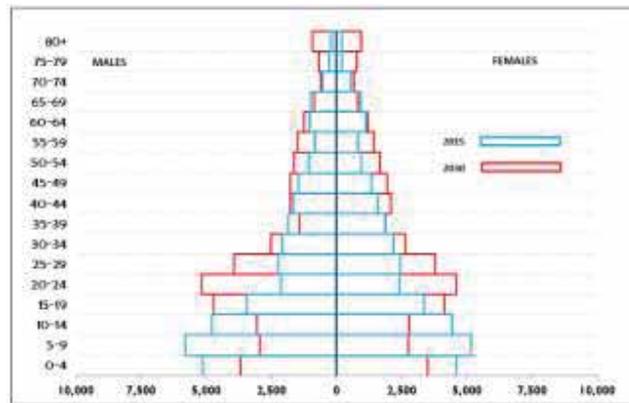


Figure 28: Superimposed population pyramids, Viqueque, 2015 and 2030

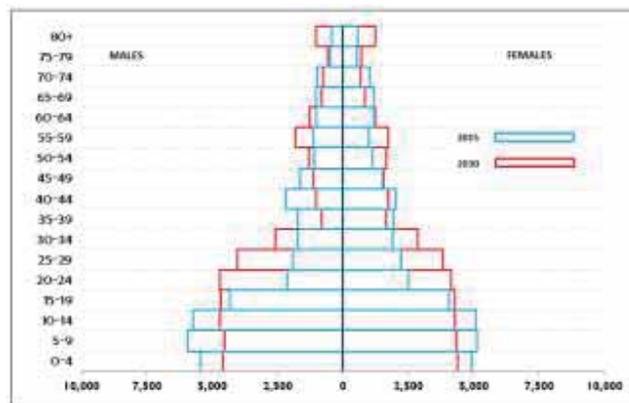


Table 35 displays selected indicators on the age and sex composition of the Municipality populations. The sex ratio is highest in Dili, at 108.6 males per 100 females in 2015, but not in 2030 when the sex ratio will have declined to 103.1. By 2030, higher sex ratios will be found in Manufahi (105.9), Ainaro (105.0) and Aileu (104.7). Lautem had the lowest sex ratio in 2015 (97.9) and this is projected to decline even further to only 90.3 males per 100 females by 2030 as a result of predominately male out-migration. Three other municipalities are projected to transition towards a deficit of males in their population by 2030 as a result of predominately male out-migration: Viqueque (97.6 males per 100 females); Bobonaro (98.0 males per 100 females); and Baucau (95.2 males per 100 females). Such transitions will have implications for family formation and co-habitation and may lead to a slightly faster pace of fertility decline than is projected. All other Municipalities are projected to have a declining sex ratio from male pre-dominance towards parity.

Median ages are on the increase in all Municipalities. Dili has the highest median age in 2015 (21.1 years) and maintains this position in 2030 (26.7 years). Ainaro has the lowest median age in 2015 (17.0 years), but by 2030, the lowest median age is in Ermera (22.2 years), which also has one of the highest (adjusted) TFRs of 3.1 live births per woman.

Across the Municipalities, changes in the age structure are consistent: the percentage aged less than 15 years is projected to decrease, the percentage aged 65 and above is projected to increase, and the working age population is also projected to increase. Oecusse is projected to have the greatest decline in the child population (18 per cent) and the greatest increase in the working age population (16 per cent). Aleiu is projected to have the smallest decline in the child population (4 per cent) and the smallest increase in the working age population (3 per cent). In line with an increase in the working age population, all Municipalities are projected to experience a rise in the percentage of women aged between 15–49. This is projected to be highest in Oecusse (1.5 per cent) and despite the large numerical increase in the population in Dili, the percentage of women of reproductive age is projected to increase by only 2.2 per cent by 2030. The largest percentage increase in the population aged 65 years and older is projected to occur in Lautem (2.7 per cent) and there is practically no increase in Covalima.

As for the national projections, shifts in total and child dependency are consistent: total and child dependency are projected to decrease in all Municipalities. The most extreme change in child dependency is projected for Oecusse, where child dependency will decrease by 47 children per 100 working age people, and the least change is projected for Dili, where child dependency will decline by only 10 children per 100 working age population. The changes in the old age dependency ratio are small and not consistent across the municipalities, but the elderly support ratio is projected to increase in all Municipalities by the end of the projection period (despite the change not being linear by quinquennium). The largest projected increase for the elderly support ratio by 2030 is projected to occur in Lautem (39 persons aged over 70 per women aged 40–54), followed by Baucau (37) and the smallest change is projected to occur in Dili (2.8). Thus, there is an expectation that familial support for elderly family members will increase in rural areas (particularly where there are higher rates of outmigration, which is predominately of adult males). In the case of Lautem, not only is there projected to be a deficit of working age men, but women may also need to bear an increased burden of care for elderly relatives and in-laws.

Table 35: Selected demographic indicators, Municipality projections, 2015 to 2030

Ailleu												
Year	Sex ratio ¹	Median age	% < 15	% 15-64	% > 65	% Women 15-49	Total Dependency Ratio	Child Dependency Ratio	Old Age Dependency Ratio	Ageing Ratio ²	Elderly Support Ratio ³	Total Fertility Rate ⁴
2015	107.7	18.9	40.3	54.9	4.8	47.2	82.0	73.3	8.7	11.9	56.9	5.5
2020	106.8	19.9	38.0	56.9	5.2	49.0	75.8	66.7	9.1	13.6	74.2	3.8
2025	105.6	21.3	37.1	57.1	5.8	49.8	75.1	65.0	10.1	15.5	75.7	3.3
2030	104.7	22.3	36.3	57.8	5.9	51.1	72.9	62.7	10.2	16.3	71.4	3.2
Ainara												
Year	Sex ratio ¹	Median age	% < 15	% 15-64	% > 65	% Women 15-49	Total Dependency Ratio	Child Dependency Ratio	Old Age Dependency Ratio	Ageing Ratio ²	Elderly Support Ratio ³	Total Fertility Rate ⁴
2015	105.8	17.0	45.4	48.4	6.2	42.7	106.7	93.9	12.8	13.7	65.0	5.5
2020	105.9	18.6	40.4	53.1	6.5	46.9	88.4	76.1	12.3	16.1	84.9	3.2
2025	105.4	20.7	35.0	58.6	6.4	50.1	70.6	59.7	10.9	18.3	80.3	3.0
2030	105.0	22.6	31.2	62.6	6.2	52.7	59.7	49.8	9.9	19.7	75.5	3.1
Baucau												
Year	Sex ratio ¹	Median age	% < 15	% 15-64	% > 65	% Women 15-49	Total Dependency Ratio	Child Dependency Ratio	Old Age Dependency Ratio	Ageing Ratio ²	Elderly Support Ratio ³	Total Fertility Rate ⁴
2015	102.1	19.2	40.3	53.0	6.6	43.7	88.6	76.1	12.5	16.5	71.6	4.7
2020	99.8	20.7	36.4	56.0	7.7	46.4	78.7	65.0	13.8	21.2	85.7	2.9
2025	97.4	22.5	32.3	59.2	8.6	49.1	69.1	54.6	14.5	26.6	100.4	2.6
2030	95.2	24.2	29.7	61.1	9.2	52.0	63.7	48.6	14.9	30.9	108.8	2.6

Continued

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¹ Males per 100 Females

² Elderly (65+) per 100 Children (0-14)

³ The ratio of those aged over 70 to Women aged 40-54

⁴ TFRs for 2020 to 2030 were revised following Municipality projection adjustment

Table 35: Selected demographic indicators, Municipality projections, 2015 to 2030

Bobonaro												
Year	Sex ratio ¹	Median age	% < 15	% 15-64	% > 65	% Women 15-49	Total Dependency	Child Dependency	Old Age Dependency	Ageing Ratio ²	Elderly Support Ratio ³	Total Fertility Rate ⁴
2015	101.2	19.0	42.2	51.4	6.3	43.5	94.5	82.2	12.3	15.0	67.6	4.7
2020	100.1	19.8	37.8	55.2	6.9	46.6	81.0	68.5	12.6	18.3	78.9	2.9
2025	99.0	22.0	32.5	59.8	7.7	50.1	67.1	54.3	12.8	23.6	77.5	2.6
2030	98.0	24.0	28.6	63.0	8.4	53.0	58.8	45.4	13.2	29.3	78.8	2.7
Covalima												
Year	Sex ratio ¹	Median age	% < 15	% 15-64	% > 65	% Women 15-49	Total Dependency	Child Dependency	Old Age Dependency	Ageing Ratio ²	Elderly Support Ratio ³	Total Fertility Rate ⁴
2015	103.5	19.4	39.8	53.6	6.7	46.1	86.7	74.2	12.4	16.7	65.9	4.7
2020	103.2	20.5	36.3	56.9	6.9	48.6	75.8	63.8	12.1	18.9	80.3	3.6
2025	102.8	22.0	35.0	58.4	6.7	48.8	71.3	59.9	11.4	19.1	77.5	3.1
2030	102.4	23.5	33.4	59.8	6.8	50.2	67.1	55.8	11.2	20.2	73.0	2.7
Dili												
Year	Sex ratio ¹	Median age	% < 15	% 15-64	% > 65	% Women 15-49	Total Dependency	Child Dependency	Old Age Dependency	Ageing Ratio ²	Elderly Support Ratio ³	Total Fertility Rate ⁴
2015	108.6	21.1	35.0	63.0	1.9	57.6	58.7	55.6	3.1	5.5	29.0	3.8
2020	106.5	23.1	33.6	64.0	2.4	58.6	56.3	52.4	3.8	7.3	30.5	2.8
2025	104.6	25.0	32.6	64.4	3.0	58.4	55.4	50.6	4.7	9.3	33.2	2.4
2030	103.1	26.7	30.2	66.2	3.6	59.8	51.1	45.7	5.3	12.0	31.7	2.1

Continued ...

Table 35: Selected demographic indicators, Municipality projections, 2015 to 2030

Ermera												
Year	Sex ratio ¹	Median age	% < 15	% 15-64	% > 65	% Women 15-49	Total Dependency	Child Dependency	Old Age Dependency	Ageing Ratio ²	Elderly Support Ratio ³	Total Fertility Rate ⁴
2015	103.3	17.7	43.4	52.8	3.8	46.2	89.5	82.2	7.3	8.8	43.0	5.4
2020	102.2	19.1	40.1	55.2	4.6	48.1	81.0	72.6	8.4	11.5	51.0	3.5
2025	101.1	20.7	36.9	57.8	5.3	50.0	72.9	63.8	9.1	14.3	62.0	3.1
2030	100.1	22.2	34.2	60.1	5.7	52.1	66.3	56.8	9.4	16.7	64.0	3.1
Lautem												
Year	Sex ratio ¹	Median age	% < 15	% 15-64	% > 65	% Women 15-49	Total Dependency	Child Dependency	Old Age Dependency	Ageing Ratio ²	Elderly Support Ratio ³	Total Fertility Rate ⁴
2015	97.9	17.4	44.3	49.8	5.8	42.1	100.7	89.0	11.7	13.2	62.9	5.2
2020	95.5	18.8	39.2	54.1	6.7	45.9	84.8	72.4	12.4	17.2	67.3	3.3
2025	92.7	20.8	34.8	57.5	7.7	48.0	74.0	60.6	13.4	22.1	79.2	2.9
2030	90.3	22.3	32.6	58.9	8.5	49.5	69.7	55.3	14.1	26.1	101.7	2.9
Liquica												
Year	Sex ratio ¹	Median age	% < 15	% 15-64	% > 65	% Women 15-49	Total Dependency	Child Dependency	Old Age Dependency	Ageing Ratio ²	Elderly Support Ratio ³	Total Fertility Rate ⁴
2015	103.9	19.2	40.5	54.3	5.1	47.0	84.0	74.6	9.4	12.6	55.7	5.1
2020	103.5	20.2	38.7	55.5	5.8	48.1	80.2	69.7	10.5	15.0	73.7	3.5
2025	102.6	21.6	36.2	57.5	6.3	49.8	73.8	62.9	10.9	17.3	79.4	3.0
2030	101.8	23.0	33.3	60.3	6.4	53.1	65.7	55.1	10.7	19.3	71.2	2.8

Continued ...

Table 35: Selected demographic indicators, Municipality projections, 2015 to 2030

Manatuto												
Year	Sex ratio ¹	Median age	% < 15	% 15-64	% > 65	% Women 15-49	Total Dependency	Child Dependency	Old Age Dependency	Ageing Ratio ²	Elderly Support Ratio ³	Total Fertility Rate ⁴
2015	105.2	19.0	41.6	52.3	6.1	42.6	91.2	79.5	11.7	14.7	69.5	4.6
2020	105.0	20.2	36.7	56.2	7.1	47.2	77.9	65.3	12.7	19.4	82.4	3.0
2025	104.3	22.4	32.4	59.7	7.8	50.3	67.4	54.3	13.1	24.1	90.7	2.7
2030	101.8	24.2	29.8	62.3	7.9	53.1	60.6	47.9	12.7	26.4	89.5	2.9
Manufahi												
Year	Sex ratio ¹	Median age	% < 15	% 15-64	% > 65	% Women 15-49	Total Dependency	Child Dependency	Old Age Dependency	Ageing Ratio ²	Elderly Support Ratio ³	Total Fertility Rate ⁴
2015	108.4	18.9	40.7	53.2	6.2	44.7	88.0	76.4	11.6	15.2	73.6	4.9
2020	108.0	20.6	36.2	56.5	7.3	49.0	77.1	64.1	12.9	20.2	88.0	3.0
2025	106.9	22.6	32.6	59.8	7.6	51.3	67.2	54.5	12.7	23.2	95.4	2.7
2030	105.9	24.3	30.7	62.1	7.2	53.6	60.9	49.4	11.7	23.4	92.5	2.7
Oecusse												
Year	Sex ratio ¹	Median age	% < 15	% 15-64	% > 65	% Women 15-49	Total Dependency	Child Dependency	Old Age Dependency	Ageing Ratio ²	Elderly Support Ratio ³	Total Fertility Rate ⁴
2015	102.9	18.6	43.0	51.4	5.6	44.4	94.5	83.6	10.9	13.1	50.8	4.2
2020	102.5	20.5	36.8	56.0	7.3	48.6	78.7	65.7	13.0	19.8	69.8	2.3
2025	102.0	23.1	28.8	63.4	7.8	54.0	57.7	45.4	12.3	27.0	81.9	2.2
2030	101.5	25.4	24.6	67.1	8.2	55.9	49.0	36.7	12.2	33.4	80.2	2.3
Viqueque												
Year	Sex ratio ¹	Median age	% < 15	% 15-64	% > 65	% Women 15-49	Total Dependency	Child Dependency	Old Age Dependency	Ageing Ratio ²	Elderly Support Ratio ³	Total Fertility Rate ⁴
2015	102.3	18.7	42.0	49.9	8.1	42.6	100.4	84.1	16.3	19.3	86.4	4.6
2020	101.0	19.5	38.5	53.0	8.5	45.7	88.6	72.5	16.1	22.1	91.9	3.7
2025	99.3	21.1	35.1	56.6	8.4	47.4	76.7	61.9	14.8	23.9	96.3	3.3
2030	97.6	22.8	33.0	58.9	8.1	48.7	69.7	56.0	13.9	24.6	99.7	2.5

The demographic situation in Dili deserves more attention because of its disproportionately high socio-economic impact across the country's demographics and economy. Apart from the median age, the age structure indicators in Table 35 indicated only minor changes in the age composition for Dili compared to other Municipalities. However, the superimposed population pyramids presented in Figure 21 indicate significant age structural change and major population expansion across the entire age range of the population for both sexes. Dili's population is projected to increase by 170 thousand people, which constitutes adding an additional 60 per cent onto Dili's 2015 population in only 15 years (Table 36). The working age population will increase from approximately 180 thousand to approximately 300 thousand - an annual rate of growth of 3.5 per cent. The population less than 15 years of age will grow from approximately 100 thousand to over 135 thousand - an annual rate of growth of 2.2 per cent, and the elderly population will increase from 5,500 people to over 16 thousand people, which corresponds to an annual increase of 7.3 per cent.

Table 36: Population by broad age groups, annual rate of growth and dependency ratios, Dili, 2015 and 2030

Age	Population	%	Total Dependency Ratio	Child Dependency Ratio	Old Age Dependency Ratio	Average annual growth rate
2015						
0-14	98,754	35.0				-
15-64	177,610	63.0				-
65+	5,445	1.9				-
Total	281,808		58.7	55.6	3.1	-
2030						
0-14	136,507	30.2				2.2
15-64	298,961	66.2				3.5
65+	16,385	3.6				7.3
Total	451,853		51.1	45.7	5.3	3.1

Due to these rates of population increase, the Government will face significant challenges in planning for inclusive and sustainable economic growth and in providing the infrastructure and services necessary to ensure the welfare of the population. Productively absorbing the strongly expanding working-age population will be challenging, the expansion of the child population will place substantial pressure on the health and education system, and on family expenses. The increase in the elderly population will also provide challenges for provision of health services and social protection.

It is important to assess the contribution of migration to the projected dramatic expansion of the population and the functional age groups. To examine this, the population of Dili has been projected as a closed population (a population without migration). Growth of the total population and the functional age groups without migration is presented in Table 37. The total population is projected to increase from approximately 280 thousand to almost 390 thousand - an annual rate of growth of 2.1 per cent (as compared to 3.1 per cent for the projection including migration). Migration to Dili will directly contribute almost 65 thousand additional people (on average, 1.0 per cent of annual growth and 38 per cent of total growth) to the population of Dili between 2015 and 2030. This means that fertility and increased life expectancy will contribute an additional 105 thousand (62 per cent of total growth) to Dili's population between 2015 and 2030. This confirms that fertility constitutes the main determinant of population growth in Dili between

2015 and 2030.

Table 37: Simulated projection assuming zero net migration: population by broad age groups, annual rate of growth and dependency ratios, Dili, 2015 and 2030

Age	Population	%	Total Dependency Ratio	Child Dependency Ratio	Old Age Dependency Ratio	Average annual growth rate
2015						
0-14	98,754	35.0				-
15-64	177,610	63.0				-
65+	5,445	1.9				-
Total	281,808		58.7	55.6	3.1	-
2030						
0-14	120,476	31.1				1.3
15-64	253,704	65.5				2.4
65+	12,966	3.3				5.8
Total	387,146		52.6	47.5	5.1	2.1

A projection was run for Dili with constant life expectancy at the 2015 level and a constant TFR of 2.14 (replacement level) to determine the proportion of Dili's growth through fertility that can be attributed to population momentum. The results are presented in Table 38. This exercise calculated that through momentum alone, Dili's population is projected to increase by approximately 73,300 between 2015 and 2030. This is 43 per cent of all growth. Demographic components contribute the remaining 57 per cent of growth. Since it has been determined through the closed population simulation that 38 per cent of growth is attributable to migration, this means that the remaining 19 per cent of total growth in Dili across the projection period can be attributed to above replacement level fertility and increased life expectancy.

Reducing migration rates will have the largest constraining impact on Dili's growth. However, providing universal access to reproductive health services including modern contraceptive methods can also have a major impact on the growth rate. In a practical sense, it may be less of a challenge to provide universal access to reproductive health services in a city, than it may be to stem the flow of migrants to Dili through rural development strategies.

Table 38: Growth from momentum and demographic components, Dili, 2030

Dili	Population	%
	2015-2030	
Total Population Growth	170,045	100.0
Growth from Momentum	73,283	43.1
Growth through migration	64,707	38.1
Growth through above replacement level fertility and increased life expectancy	32,055	18.9

Chapter six

Conclusions

The implications of these projections are:

The population is going to increase rapidly

Despite declining fertility, the population of Timor-Leste is likely to continue to experience a rapid and substantial growth during the 35 years of the projection period (2015–2050). The annual growth rate is currently 1.7 per cent. According to the medium fertility projection (the most probable scenario, where fertility will decline from 4.3 live births per woman in 2015 to 2.5 in 2050), the annual growth rate will be 1.3 per cent by 2030 and 0.9 per cent by 2050. The population will increase by over 650 thousand to 1.85 million by 2050, an increase of almost 55 per cent on the 2015 population. In the high fertility scenario, where fertility is projected to decline to 3.0 live births per woman, the population will be over 2 million in 2050 and in the low fertility scenario, where fertility is projected to decline to 2.0 live births per woman, the population will be 1.67 million in 2050.

Population momentum is the main driver of population growth

Despite fertility decline, population momentum will sustain population growth across the projection period. The absolute increase in population due to momentum alone will be 425 thousand, an increase of 36 per cent on the 2015 population by 2050. In the medium fertility scenario, momentum will contribute almost two-thirds (65 per cent) of all population growth that will take place between 2015 and 2050. The contribution of momentum is less for the high fertility scenario (50 per cent) because of the greater contribution to growth of a higher fertility rate. In the low fertility scenario, momentum accounts for 91 per cent of all growth because fertility will drop below replacement level from 2032 onwards. Growth through population momentum is inevitable, even with a lower fertility rate. The GDS recommends that we as a Government plan accordingly. Also, by investing in strategies to reduce fertility not related to momentum (above replacement level fertility), such as through universal access to reproductive health services including modern contraceptive methods, population growth levels can be constrained to more manageable levels and sustainable development can be more easily planned for and implemented.

A ‘demographic dividend’ is within sight

In the medium and especially the low fertility scenarios, demographic shifts in the age structure will occur. This will lead to the opening of a ‘window of opportunity’ by 2029 in the low fertility scenario and 2034 in the medium fertility scenario. The window of opportunity will open when the percentage of the population aged less than 15 years will decline below 30 per cent due to a sustained period of fertility decline to 2.5 or fewer live births per woman. As a direct consequence, the percentage of the population in the productive ‘working age’ will increase. This window of opportunity will remain open for the duration of the projection period. The opportunity lies in harnessing a demographic dividend, where a larger productive population is responsible for supporting a smaller dependent child population, and there is an opportunity to improve the wealth of society and the country as a whole. According to the high fertility scenario, Timor-Leste will not have this opportunity for many decades to come, as the window of opportunity will not open until 2049.

Achieving a demographic dividend is not automatic. The Government of Timor-Leste needs to raise access for Timor-Leste’s children and young people as soon to improved levels of healthcare, and higher-quality education opportunities. This will prepare cohorts of highly skilled young people for entry to the workforce by the early 2030s. Substantial investment in infrastructure and standards is required, so that diverse, high quality work opportunities can be generated for the expanding young workforce.

Through population momentum, the working age population will increase dramatically and demand for jobs will rise considerably, such that demand is likely to surpass the job creation rate. If we as a Government fail to create a conducive environment for a demographic dividend, the expansion of the working age population will inevitably become a demographic deficit, with potential serious political and social implications.

A more substantial fertility decline (as in the medium or especially the low fertility scenario) will reduce the absolute number of people entering the working age population, constraining demand for jobs to more manageable levels. The bonus is that a demographic dividend and greater economic growth is also possible if lower fertility is achieved.

Municipality-specific planning is required

Between 2015 and 2030, there will be substantial differences in growth rates across the Municipalities due to a combination of different rates of fertility decline and net migration rates, with divergent effects on the age and sex structures of the Municipality populations.

According to the 2010 and 2015 Census analyses, for at least the past decade, every Municipality in Timor-Leste has experienced net out-migration to Dili. The same annual trend from the period 2011–2015 was assumed for the 2015 to 2030 period. The other Municipalities are projected to lose over 5,600 migrants to Dili annually. An international migration assumption has been developed for these projections. 5,000 people will leave Timor-Leste annually and of these, 2,300 are from Dili, with 2,700 leaving from other Municipalities. It is important to note that across the projection period, combined international and internal migration rates are projected to be higher from Municipalities furthest from, or less well connected with Dili and projected to be lowest for Municipalities adjacent to Dili. Oecusse is an exception to this pattern.

Dili

By 2030, Dili's population is projected to increase by 170 thousand people, adding an additional 60 per cent onto Dili's 2015 population in only 15 years. Between 2015 and 2020, the population is projected to grow at almost 4 per cent per annum. Thereafter, the rate of growth is projected to decline, reaching 3.0 per cent by 2024 and 2.3 per cent by 2030. However, the growth rate in 2030 will still be the highest of all Timor-Leste's Municipalities. Fertility is a more significant determinant of population growth in Dili than migration. However, most growth through fertility is a result of population momentum and migration is the main reason why the population growth rate in Dili is well above the national average of 1.7 per cent in 2015. The substantial growth of the working age population will present a particular planning challenge for the Government. The growth of the child dependent population will pose financial challenges for families and developmental challenges for the Government, and the expansion of the elderly dependent population will also increase social protection needs. The Government should aim to provide universal access to reproductive services including modern contraceptive methods in Dili and in tandem, develop strategies that reduce the push factors that underpin the sustained flows of migration from the other Municipalities to Dili.

Other Municipalities

It is critically important that the Government of Timor-Leste develops Municipality-specific strategies that can address differential rates of growth and the combinations of fertility and mortality change that underpin the growth rate. For example, in Municipalities where fertility rates are higher and/or the projected decline is lower, such as Aileu, Ainaro and Ermera, an emphasis on increasing access to reproductive health services including modern contraceptive methods to reduce fertility rates is necessary. In remoter Municipalities such as Lautem and Viqueque, the emphasis of development should be geared towards developing local infrastructure, services, sustainable agricultural systems and a diversified economy so that lower proportions

of the population need to migrate to Dili for education and work opportunities. Through such regional development, the growth rate of Dili can also be reduced to more manageable levels than developed in the Dili projection.

Conclusion

We as a Government should not wait to act. The time to prepare for opening of the ‘window of opportunity’ for the demographic dividend commencing is now, because we need to start to invest in the cohorts who are currently children or have yet to be born and who will enter the working age population when the window of opportunity is opening. We as a Government should ensure that all children have their births registered and receive a birth certificate. This strategy will facilitate development of a population register for local planning purposes around health, education and other services. The whole of Government should utilize the subnational population projections for their local planning strategies.

The Sustainable Development Goals (SDG) framework offers a mechanism within which to make these preparations. The Government should focus on:

- SDG 3 (good health and wellbeing) to ensure that all women have their reproductive health needs met and all children and young people are healthy;
- SDG 4 (quality education) to ensure that all children and young people are well educated;
- SDG 5 (gender equality) to ensure that all women and girls are empowered and reach their full potential;
- SDG 8 (decent work and economic growth), and SDG 9 (industry, innovation and infrastructure) to make progress in creating employment for the expanding working age population.

The time to prepare for the opening of the ‘window of opportunity’ for the demographic dividend chimes perfectly with SDG 2030 agenda.

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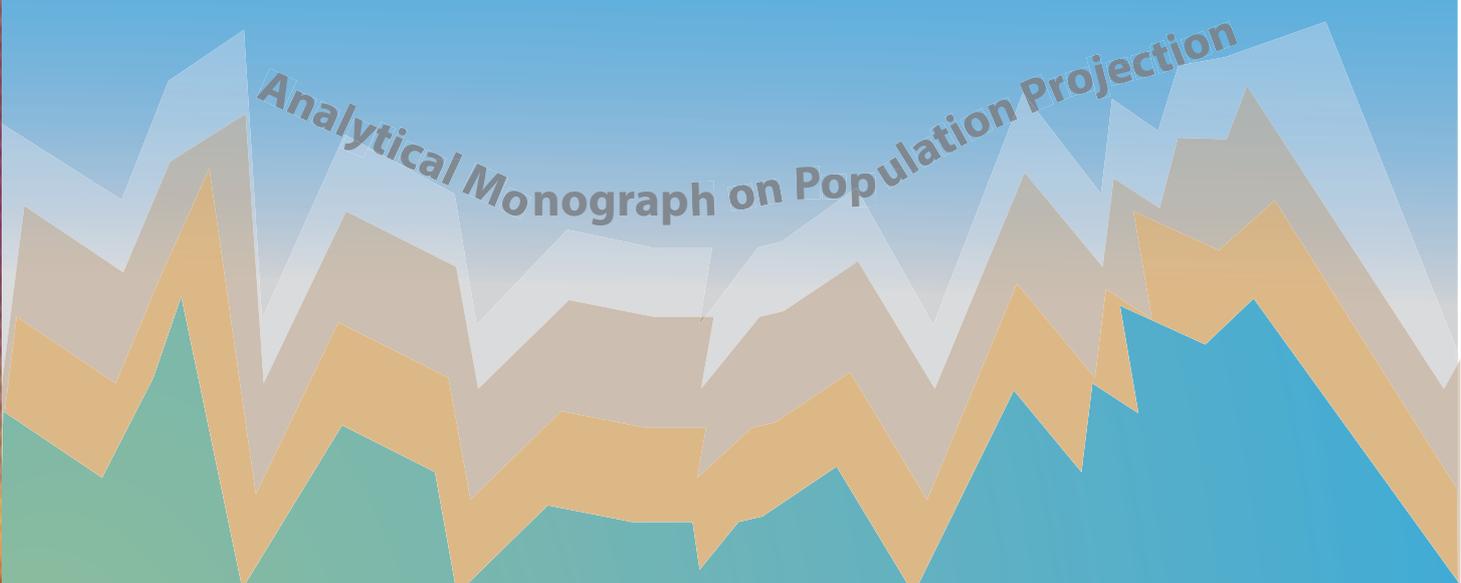
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