

**POPULATION GROWTH, POVERTY AND ENVIRONMENTAL
SUSTAINABILITY IN TIMOR-LESTE**

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ABSTRACT

Timor-Leste has one of the poorest and fastest growing populations in the world. It faces many developmental challenges, including the rapid deterioration of natural resources, for example a deforestation rate of 1.3 percent per annum. With increasing population pressure, poverty and diminishing natural resources, peace and nation building is under enormous stress in Timor-Leste.

As a new nation, Timor-Leste lacks research in many areas including population, poverty and environment relations and their implications for peaceful development. The present thesis addresses three questions about Timor-Leste, namely the promises and challenges of the current and future population prospects for peace and sustainable development, the role of sustainable population and environment - particularly forests, in maintaining and strengthening people's livelihoods and reducing poverty; and the governance and policy measures that can be adopted to support sustainable livelihoods, national peace and environmental sustainability.

The thesis is based on analyses of primary and secondary data. The primary data were collected during field work in Timor-Leste in 2011-12, which comprise 170 household interviews, eight village surveys, four focus group discussions, and several in-depth interviews in five districts. The secondary data were obtained from censuses and available surveys for analysing the current demographic situation of Timor-Leste and projecting its population from 2010 to 2030.

At the macro level, this research showed that Timor-Leste's population will increase rapidly in the next two decades with a continuing high youth dependency ratio and it will be unlikely to have a demographic window of opportunity by 2030, precluding a timely capital accumulation and diversion of savings to productive sectors of the

economy unless there is a rapid and substantial decline in fertility. In this fragile state burdened with weak institutions, population pressure, inadequate human resources and a poorly performing domestic economy would exacerbate Timor-Leste's poverty, environmental degradation and demographic risks of civil conflict in the next two decades.

At the micro level, this thesis showed that multi-dimensional poverty has strong links with poor human and economic capital accumulation. Having more children in a household is not due to poverty, but rather due to geographical isolation, poor infrastructure development and heavy reliance on products from natural resources such as land and forests. Gathering forest products by the communities is a significant part of subsistence and traditional living. Ninety three percent of the households collected and used forest products in the year preceding the survey.

Heavy reliance on forest products is predominantly driven by people's needs for energy, construction and income generation. This is likely to increase as the population grows and would lead to further loss of forest resources. Most forest-reliant communities have six or more children and are located in places of low infrastructure development. They have high natural capital but poor human capital.

This research recommends measures to be aimed at promoting smaller families and increasing educational attainments in areas of low infrastructure development, high natural capital and large numbers of children. The thesis further recommends that policies be implemented for human resource development; provision of clean, affordable and accessible energy; strengthening of customary laws for environmental management and for investing in agro-forestry and eco-tourism to reduce deforestation and poverty, and to improve peace and sustainable livelihoods.

DECLARATION

I certify that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

Signature: _____

Date: _____

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This thesis is a product of my deepened engagement with the unique nation of Timor-Leste at both a professional and personal level. This connection will stay with me for life. It is a journey that has bettered me as an individual and, with any luck, will help make a tiny difference in the lives of the Timorese.

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LIST OF ABBREVIATIONS

ADB	Asian Development Bank
AusAID	Australian Agency for International Development
BCC	Behaviour Change Communication
CIA	Central Intelligence Agency
CIFOR	Centre for International Forest Research
CM	Contraception Method
CO ₂	Carbon dioxide
DES	Demographic and Environmental Stress
DFID	Department for International Development
DHS	Demographic Health Survey
DID	Department for International Development
EC	European Commission
ESCAP	Economic and Social Commission for Asia and the Pacific
ETH	European Union
FAO	Food and Agriculture Organisation
FP	Family Planning
GDP	Gross Domestic Product
GNI	Gross National Income
GoTL	Government of Timor-Leste
GPS	Global Positioning System
HAI	Health Alliance International
HDI	Human Development Index
HDR	Human Development Report
HLPE	High Level Panel of Experts
ICPD	International Conference on Population and Development
IDS	International Development Institute of Sussex
IFAD	International Fund for Agriculture Development
ILO	International Labour Organisation
IMF	International Monetary Fund
IMR	Infant Mortality Rate
IOM	International Organisation for Migration
IPCC	International Panel for Climate Change
IUCN	International Union for Conservation of Nature
IUDs	Intra Uterine Devices
KSI	Kdadalak Sulimutuk Institute
LUCC	Land-Use/Cover Change
LPG	Liquefied Petroleum Gas
MAFF	Ministry of Agriculture Forestry and Fisheries
MDGs	Millennium Development Goals
MEA	Millennium Ecosystem Assessment
MoH	Ministry of Health
MPI	Multidimensional Poverty Index
m ³	Cubic Meter
NAPA	National Adaptation Plan of Action
NBSAP	National Biodiversity Strategy Action Plan
NDFWR	National Directorate of Forestry and Water Resources
NFPP	National Family Planning Policy
NGOs	Non-Governmental Organisations
NRHS	National Reproductive Health Strategy

NSD	National Statistics Directorate
NTFPs	Non Timber Based Forest Products
ODI	Overseas Development Institute
OECD	Organisation for Economic Co-operation and Development
OPHI	Oxford Poverty and Human Development Initiative
PATVET	Pacific Association of Technical Vocational Education and Training
PCA	Principal Component Analysis
PoWPA	Program of Work in Protected Areas
PPE	Population, Poverty and Environment
PRB	Population Reference Bureau
PSN	Population and Sustainability Network
RH	Reproductive Health
SDP	Strategic Development Plan
SEFOPE	Secretariat of State of Professional Training and Employment
SID	Society for International Development
SISCa	Integrated Community Health Services Outreach Program
SLA	Sustainable Livelihoods Approach
SLM	Sustainable Land Management
SRES	Special Report on Emissions Scenarios
SDP	Timor-Leste-Strategic Development Plan
TFR	Total Fertility Rate
TVET	Technical and Vocational Education and Training
UK	United Kingdom
UN	United Nations
UNCCD	United Nations Conventions to Combat Desertification
UNDAF	United Nations Development Assistance Framework
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Program
UNESCO	United Nations Education Science and Culture Organisation
UNFPA	United Nations Population Fund
UNEP	United Nations Environment Program
UNICEF	United Nations International Children's Emergency Fund
UNMIT	United Nations Integrated Mission in Timor-Leste
UNTAET	United Nations for Transitional Administration in East Timor
USA	United States of America
USAID	United States Agency for International Development
VCM	Vicious Circle Model
WCED	World Commission on Environment and Development
WFP	World Food Program
WHO	World Health Organisation

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CHAPTER 1: INTRODUCTION

1.1. BACKGROUND

Timor-Leste, the newest nation in Asia, is a fragile state and has one of the poorest and fastest growing populations in the world. The country's peace-building and sustainable development efforts are hindered not only by a rapidly increasing population and prospective changes in the demographic structure, but also by rapid deterioration of the environment in the face of wide-spread poverty, weak institutions and inadequate human resources. This thesis is aimed at understanding the unique relations between population, poverty and environment (PPE) in Timor-Leste's fragile state context and making policy recommendations to maintain and strengthen peace and sustainable livelihoods in the country. This chapter starts with the origins of the PPE discourse and presents some of the dominant views that have influenced the understanding of these relationships. It continues with reasons as to why it is more of an urgent issue to study these relations in regards to fragile states. This chapter then introduces the case of Timor-Leste justifying the significance of this thesis and follows with a presentation of the research questions and objectives.

1.1.1. Origins of the Population, Poverty and Environment Debate and Dominant Paradigms

There are a number of complex and dynamic inter-linkages that connect humans with the world's natural systems. Throughout human history, these connections have inspired curiosity and global debate surrounding people and nature. Arguably, one of the most discussed aspects of these linkages has been the ever increasing size of the human population and its relation to the natural resources upon which it depends (Bremner, López-Carr, Suter, & Davis, 2010).

British cleric and economist, Thomas Malthus, was one of the leading scholars in political economy and demography in the 18th century, and was highly influential in shaping the literature on the association between population growth, resources and poverty. Malthus (1798) saw the tendency of human populations to grow infinitely faster than the capacity of the earth to produce subsistence for these increasing populations. He hypothesised that if human numbers grew without any control, food supplies would be insufficient to feed humankind leading to hunger and misery. He further added that the poor would be suffering the implications of insufficient food supply and, hence, hunger and misery disproportionately:

There is a constant effort towards an increase in population which tends to subject the lower classes of society to distress and to prevent any great permanent amelioration of their condition (Malthus, 1798, p. 18).

He also believed that the propensity of the population to outpace food production could be curbed by positive and preventative checks which would eventually restore the balance between population growth and the carrying capacity of agricultural systems. The positive checks in his hypothesis included deaths due to hunger, disease and war, while the preventative checks covered postponement of marriage and celibacy, birth control and also abortion. He openly advocated for celibacy and later, marriage, but being a clergyman, he was loath to advance birth control and when he did so, he called it a 'vice'. He ultimately argued that there was a need for preventive population checks in order to maintain an optimum level of population, to save humanity from its misery, and to ensure a higher standard of living for all.

The origins of the view of an optimum population could in fact be found in the pre-Malthusian era, such as in the work of those in ancient China and Greece (Lucas & Meyer, 1994). For example, the ideas that supported that excessive population growth may reduce output per worker, depress level of living for the masses, and engender strife are those of great antiquity and appear in the works of Confucius and his school, as well as in the works of other ancient Chinese philosophers (Chen, 1914). The writers of early Greece such as Plato and Aristotle have also discussed optimum population with respect to the ideal conditions for the full development of a human's potential. They considered the problem of population size not great in economic terms, but rather from the point of view of defence, security and governance (Stangeland, 1904). Although the above-mentioned early writings as well as those from ancient Rome and India merit attention (Lucas & Meyer, 1994), it is suggested that modern population theory had its beginnings in the late eighteenth century writings of Malthus.

The assumption of a direct and causal relationship between population and food supply is a characteristic of Malthusian theory. Although he was influential in modern population theory, after his first essay, his views did not hold ground undebated. Following the industrial revolution and technological advancements of the late 19th and 20th centuries, fertility rates in the developed world declined, slowing the rate of population growth while food production largely increased. During this period, Malthus and his warnings were forgotten. However in the 1950s, his ideas resurfaced when rapid population increases in the developing countries resulting from sharp declines in mortality and continuing high fertility brought the spectre of high population growth outstripping food supplies and the availability of resources. This led to a so-called neo-Malthusian movement which was largely

shaped by Malthus's ideas and which became quite popular in the public domain. One of the most publicly known neo-Malthusian scholars in the field of demography and ecology, Paul R. Ehrlich, for example revisited his own ideas from his book *Population Bomb* (1968), and made dire warnings about population growth and limited resources in the 1990s in *The Population Explosion* (1990) co-authored by Anne Ehrlich:

Action to end the population explosion humanely and start a gradual population decline must become a top item on the human agenda: the human birth rate must be lowered to slightly below the human death rate as soon as possible. There still may be time to limit the scope of impending catastrophe, but not much time. ... More frequent droughts, more damaged crops and famines, more dying forests, more smog, more international conflicts, more epidemics, more gridlock, more crime, more sewage swimming, and other extreme unpleasantness will mark our course (Ehrlich & Ehrlich, 1990, p. 23).

In the late 20th century, scholars also focused on an inextricably linked relationship between poverty and environmental degradation and the negative downward spiral of poor communities in the face of economic and demographic changes (Durning, 1989; Grepperud, 1997; Mink, 1993; Simonis, 1992). Their major argument was that a low income forces people to increase their resource use in order to survive which diminishes the natural resource base. A lower resource base then reduces the flow of services generated, which further intensifies poverty (Angelsen et al., 1995). The consensus of such relationships was also reflected in the language used by the United

Nations (UN), such as in the quote below taken from a report following the World Commission on Environment and Development [WCED]:

Many parts of the world are caught in a vicious downwards spiral: Poor people are forced to overuse environmental resources to survive from day to day, and their impoverishment of their environment further impoverishes them, making their survival ever more difficult and uncertain (WCED, 1987, p. 27).

As theories evolved to explain the causes of environmental change and poverty, multi-layered vicious relations gained popularity in the development discourse. Influenced by Amartya Sen's entitlements approach (1981), the debate on environmental entitlement and poverty relations moved the central attention towards the role of institutions in regularising and mediating environment-society relationships (Leach, Mearns, & Scoones, 1997a). In this context of vicious relations, poverty was argued to influence environmental entitlements negatively which, in turn, affected the access and possibility of making use of the resource base, thus diminishing the potential for poverty reduction (Angelsen, et al., 1995; Lopez, 1992):

The key source of rural environmental degradation is the disruption of the traditional institutions of the poor, which until recently had permitted an efficient and sustainable use of resources. The collapse of traditional systems leads to a vicious circle of environmental degradation and further impoverishment. What causes the institutional collapse? Here

the case studies differ and tell different stories (Lopez, 1992, pp. 1138-1139).

Lopez (1992) suggests that studies in Asia, and particularly Latin America, report displacement and loss of entitlement of resources originated from factors external to the communities. These external factors were identified as large scale agriculture, export-oriented forestry operations, and major public infrastructure projects. On the other hand, studies in sub-Saharan Africa emphasize the role of internal factors where population expansion is the central issue (Lopez, 1992).

Finally, poverty was broadly debated and agreed to contribute to high fertility while high fertility was thought to cause further poverty (Birdsall, 1994; Birdsall & Sinding, 2001). The link between family size and poverty is in fact well established with the assumption that high fertility causes reduction in household savings and leads to limited investments in production activities. This is consequently conducive to decreased household and national income and hence contributes to further poverty (Merrick, 2002). Conversely, the assumptions behind poverty perpetuating high fertility are usually attributed to socio-economic factors including the lack of access to education and family planning, and a desire to produce more children to compensate for high infant and child mortality rates which are common in developing countries. The vicious cycle of these relations presented above is useful to examine the various pathways that these relations can take and impact upon one another, particularly in developing countries like Timor-Leste which are characterised by high fertility and poverty rates and face rapid environmental degradation.

Over the past three centuries, the study of PPE relations has attracted the attention of many scholars, researchers, international development agencies, policy makers as well as civil society organisations (Angelsen, et al., 1995; Birdsall & Sinding, 2001; Chen, 1914; Malthus, 1798; UN, 1987). This is even more apparent in recent decades as the understanding of these connections is crucial to dealing with the unsolved problems of sustainability particularly in the developing world. The current path of rapidly growing human population, increasing mass environmental deterioration and persistent poverty increasingly signals concerns over the prosperity of future generations and calls for urgent action on the part of our current generation:

With the target date of the millennium development goals (MDGs) rapidly approaching, the international communities are also debating the nature of a new development agenda. Whatever form the post-2015 development agenda takes, it will need to address today's complex demographic challenges, promote sustainable development and strike a balance between social economic and environmental concerns (Osotimehin, 2013).

Timor-Leste is one of the poor developing countries where the current state of PPE relations requires further investigation. The country has a total fertility rate of 5.7 (Government of Timor-Leste, 2010d) which is the 16th highest fertility rate in the world (Central Intelligence Agency [CIA], 2013a), and hosts a population where 49.9 percent is reported to live on less than 88 cents a day, which is measured to be the national poverty line (World Bank, 2009c). Timor-Leste has a heavily degraded environment with an annual deforestation rate of 1.3 percent which is again one of the highest deforestation rates in the world (World Bank, 2009d). Moreover these

situations in Timor-Leste are shaped with a continuing state of fragility and weak institutions partly due to the country's violent history.

Based on the recent developments of the PPE discourse in developing countries, this thesis aims to advance the understanding of the role of a productive and sustainable population and healthy ecosystems in maintaining and improving peace and development in Timor-Leste. It is also aimed at providing measures for effective policy making and institutional progress in this new fragile nation's efforts to fight poverty and achieve sustainability. It is explained in greater detail below how this research to study Timor-Leste has come about and the reason that its PPE relations are used as a case study.

1.1.2. The State of Urgency to Advance Knowledge on PPE in Countries Left Behind

Humankind has been experiencing somewhat continuous growth in its population size since the 14th century. The highest annual growth rates were recorded in the late 1960s with a rate of 2.12 percent (UN, 2011b). Although this growth rate has been steadily declining partly as a result of advancements in family planning, the world population has been expanding at an increasing rate since the 20th century. It reached six billion in 1999 and added the next billion in 2011, three years ahead of the UN projected period of 2014 (Population Reference Bureau [PRB], 2011). Today the world's population is double the size of what it was in 1967 and is growing by about 83 million annually (PRB, 2011). It reached just above 7 billion people with an annual growth rate of 1.1 percent in 2011 (PRB, 2011). According to the medium variant of the UN projections, the global population is expected to increase to 9.3 billion in 2050, and stabilise at 10.1 billion by 2100 (United Nations Department of Economic and Social Affairs [UNDESA], 2011). With the ever increasing size of the

human population, problems such as food insecurity, poverty, environmental degradation and climate change are expected to be exacerbated even further. The ecosystems that support people's livelihoods and well-being are continuously being degraded and more rapidly so in the last century partly due to the adverse effects on the environment in producing economic growth and global development models coupled with poor governance. The Millennium Ecosystem Assessment (MEA) released in 2005 is a synthesis of international studies which analyse the state of the earth's ecosystems. The assessment of 24 critical ecosystems shows that 60 percent of the natural 'life support' system is already degraded (MEA, 2005). The health and well-being of all human beings depend on clean air and water, fertile soils and other services provided by natural systems. The quality of environmental assets and their services are especially important for people living in poverty (Department for International Development [DID], European Commission, United Nations Development Program [UNDP], & World Bank, 2002). The findings of various studies emphasise that the burden of environmental decline falls more heavily on poor people pushing them into greater poverty and uncertainty (World Resources Institute, 2005). This is mainly due to the fact that poor people's livelihoods are generally more dependent upon the natural resource base (Hope, 2002; Sen, 1981), and the declines in ecosystem services make them more vulnerable to external shocks (MEA, 2005). Therefore, current trends in population growth and ecosystem health suggest an even more challenging future for the world's poorest. It is also becoming clearer for the international community that future population dynamics and state of ecosystems are central to the goals of eradicating poverty and achieving sustainable development.

The emergence of the concept of sustainable development goes back to only 1987 when the Brundtland Report of the UN introduced it as a development model “that meets the needs of the present without compromising the ability of future generations to meet their own needs” (UN, 1987). The emphasis was put on a system that is economically, socially and environmentally sustainable. In the year 2000, the concept of sustainable development achieved broad international recognition and commitment was officially secured at the Millennium Summit of the United Nations to achieve concrete targets. A total of 193 United Nations member states and more than 23 international organisations agreed on eight international development goals named “Millennium Development Goals” to be achieved by 2015 (UNDP, 2010). These goals included eradicating extreme poverty and ensuring environmental sustainability along with achieving universal primary education, promoting gender equality and empowering women, reducing child mortality, improving maternal health, combating HIV/AIDS, malaria and other diseases, and developing a partnership for development (UNDP, 2010).

While many countries are making progress towards achieving the Millennium Development Goals, there is a wide variation of progress across regions and countries. Most countries are achieving progress in some goals but facing a unique set of challenges in achieving others. Yet there is a group of 35 to 50 countries which is strikingly lagging behind (UNDP, 2010).

Today one of the biggest challenges of many developing countries is the fragile state of governance. Fragile regions or states lack the ability to develop mutually constructive relations with society and have a weak capacity to carry out basic governance functions which include ensuring safety, maintaining justice and rule of law, providing basic services and managing public resources (Organisation for

Economic Co-operation and Development [OECD], 2013; Population and Sustainability Network [PSN], 2012). Fragile states are also unable to keep societal expectations and state capacity in equilibrium and fail to establish reciprocal state-society relations or create binding social contracts (Steward & Brown, 2009). Fragile states are often low income countries with low human development. Their citizens are mostly vulnerable to a whole range of internal and external shocks including residue of past conflict (World Bank, 2009b) which in turn make these countries particularly more susceptible to further instability, with potential consequences beyond their borders (OECD, 2013). The state of fragility threatens economic and social stability and challenges sustainable development efforts in general (PSN, 2012).

Today among the world's seven billion inhabitants, 20 percent are currently living in countries with fragile states and this is actually where MDG progress is the lowest (UN, 2009). In fact, the populations living in fragile states are farthest away from benefiting from progress in the MDGs than any others on the planet, meaning that in terms of development progress they are the ones who are left behind (Carment & Yiagadeesen, 2011). Today, two-thirds of the world's low-income countries are fragile (Chandy, 2011). These fragile countries are those which currently host one third of all people surviving on less than USD \$1.25 per day, where half of the world's children die before the age of five, and where one third of all maternal deaths occur (World Bank, 2009a). Another striking factor is the fact that many of them have the world's highest fertility rates (see Table 1.1 for a list of indices for some of the selected fragile states). While the share of the world's poor living in fragile states has doubled from 20 to 40 percent since 2005 (Chandy, 2011), the OECD (2013) predicts that by 2015, half of the world's population living on less than USD \$1.25 a

day will be in fragile states. This means that world poverty (more or less measured on the basis of income) will be increasingly concentrated in fragile states or regions.

It is important to recognise the “human development” extension of poverty where health, education and nutritional components are included and the emphasis is shifted from man-made to human, political and natural capital as the foundations for welfare improvements (Angelsen & Wunder, 2003). A multi-dimensional approach to measuring poverty may mean that more and more people will be exposed to poverty given the extremely high population growth rates in fragile states, and it will become harder for national governments and the international community to overcome the associated problems of fragility and poverty.

Table 1.1

List of Fragile Countries, Their Human Development and Fertility Rates

List of Fragile Countries	HDI Ranking (2013 estimates)	Level of Human Development	Fertility Rates (2013 estimates)
Guinea	178	Low	4.99
Guinea-Bissau	176	Low	4.37
Afghanistan	175	Low	5.54
Liberia	174	Low	4.92
Sudan	171	Low	5.54
Comoros	169	Low	3.93
Togo	159	Low	4.58
Nepal	157	Low	2.36
Myanmar	149	Low	2.21
Angola	148	Low	5.49
Timor-Leste	134	Medium	5.22
Iraq	131	Medium	3.50
Kiribati	121	Medium	2.63
Micronesia	117	Medium	2.68
Syria	116	Medium	2.77
West Bank and Gaza	110	Medium	2.91
Bosnia and Herzegovina	81	High	1.25
Libya	64	High	2.09
Tuvalu	N/A	N/A	3.06
Marshall Islands	N/A	N/A	3.29
World (Average)	102	Medium	2.45

Source: CIA, 2013a; World Bank, 2013d; UNDP, 2013a

The interaction of factors that contribute to the fragility of states is complex and context specific. However, the underlying political, socio-economic and environmental factors can be closely related to population dynamics, environmental degradation, resource scarcity and inequalities (PSN, 2012). The causes and manifestations of fragility have also been continuously influenced by powerful forces such as democratic aspirations, new technologies and climate change (OECD 2013). Empirical research has shown that high risk of conflict is strongly correlated with low or stagnating income, high reliance on natural resources and other demographic factors such as high population density (Bordean & Elbadawi, 2007). While high

population growth and the resulting pressures on natural and public resources can intensify social, economic and environmental concerns in all countries (PSN, 2010), these pressures may cause extreme challenges in fragile state contexts.

The threats that call for and justify international engagement in these fragile countries clearly go beyond traditional concerns of interstate conflict, war and violence within states; the spread and possible use of nuclear, radiological, chemical and biological weapons; terrorism; and transnational organised crime, but certainly include socio-economic and environmental threats, including poverty and environmental change at a global scale (UN, 2004). Today, fragility remains one of the biggest obstacles to global peace and sustainable development and is likely to remain as such in the future.

Since the 1990s fragile states have been a central concern of international development and security (OECD 2013). The declaration adopted at the United Nations Conference on Environment and Development held at Rio de Janeiro in 1992 (The Rio Declaration) brought global attention to the need for the co-existence of peace, development and a healthy environment for a sustainable society. This is encapsulated in its Principle 25 which states that “peace, development and environmental protection are interdependent and indivisible” (UN, 1992). The understanding of the complex nature of PPE links in fragile states is becoming more of an urgent issue in the fight against poverty and instability (Bass, Bigg, Bishop, & Tunstall, 2006). This is partly because the increasing engagement with fragile states, whose populations are growing rapidly, has led to an accumulation of evidence highlighting the importance of healthy ecosystems for peace and sustainable development (Angelsen, Larsen, Lund, Smith-Hall, & Wunder, 2011; Dalal-Clayton & Bass, 2009; Department for International Development et al., 2002; United

Nations Environment Program [UNEP], 2007; UNEP, ESCAP, & Asian Development Bank [ADB], 2012). While meeting the MDG targets requires concrete action on the part of our current generation, there is a clear need to strengthen our efforts to understand unique challenges that fragile countries face that arise from their complex and context specific population, poverty and environment relations. Scientific research plays an important role in providing evidence-based policy guidance and development support for country-owned solutions. This research has therefore chosen to focus on the small island country of Timor-Leste where the understanding of population trends, poverty, and environment relations are instrumental in the nation's journey to build a peaceful and sustainable state.

1.1.3. Introducing Timor-Leste as a Case Study

Timor-Leste, located in the eastern part of the Timor Island in the Indonesian archipelago, lies between the South China Sea and the Indian Ocean (see Figure 1.1). It is one of the newest nations in the world and has been identified as a state along with 19 other countries in 2011 (World Bank, 2011). Timor-Leste became an independent country on 20 May 2002, after 450 years of Portuguese rule followed by 24 years under Indonesian occupation (Borgerhoff, 2006). The context of fragility and the nature of development that are experienced by Timor-Leste today trace back to its long colonial history followed by a brutal Indonesian occupation and a civil war that took place only four years after the country's independence (Hood, 2006).



Figure 1.1. Map of Timor-Leste

Source: Australia Timor-Leste Friendship Network, 2009

Timor-Leste’s complex history under Portuguese and Indonesian rule has left the newest nation of Asia with various development challenges including weak institutions, inadequate human resources, wide-spread poverty and extremely poor infrastructure. Today Timor-Leste stands out as the poorest nation in the region and among the poorest in the world with 49.9 percent of its population stated as living below the national poverty line which is 88 cents a day (World Bank, 2009c). The latest Human Development Report ranked Timor-Leste 134 out of 186 countries with a Human Development Index (HDI) of 0.576 in 2013 putting Timor-Leste in the medium human development scale (UNDP, 2013a). Timor-Leste’s HDI has been steadily improving since 2002. The improvement was an increase from 0.375 in 2002 to 0.576 in 2013, with an average annual growth rate of 2.71 percent in HDI during this period. Timor-Leste’s inequality adjusted HDI however is reported to be 0.386, implying a loss of 33 percent in its HDI due to inequalities in education, income and life expectancies across the nation. These HDIs indicate that Timor-Leste performs very poorly and way below the world average. Among the group of fragile states, its

ranking fits somewhere in the middle among the group of fragile states (see Table 1.1). In fact, its latest rank and HDI show a significant improvement from the 2008 indices when its rank of 162 was significantly worse than other impoverished non-African countries such as Papua New Guinea (148) and Haiti (149). However according to the recent ranking, 19 African countries and Afghanistan perform much poorer than Timor-Leste (UNDP, 2013a).

Table 1.2

Timor-Leste's MDG Progress

	2009 Indices	MDG Progress	Target by 2015
Proportion of population living under the national poverty line	49.9%	Off-Track	14%
Proportion of children 0-59 months old who are underweight	44.7%	Off-Track	31%
Proportion of Children who reach Grade 5	65.9%	Off-Track	100%
Maternal Mortality ratio (per 100,000 live births)	557	Off-Track	252
Proportion of people using improved sanitation facilities	43%	Off-Target	60%
Net enrolment ratio in primary education	82.7%	On Track	100%
Proportion of people using improved drinking water source	64%	On Track	78%
Infant Mortality (per 1,000 live births)	45	Achieved	
Under-5 Mortality rate (per 1,000 live births)	64	Achieved	

Source: Government of Timor-Leste, 2010c; Government of Timor-Leste, 2010d; World Bank, 2009c

Despite some of the improvements in achieving the Millennium Development Goals (MDGs) that have taken place in recent years (see Table 1.2), the nation building process of Timor-Leste still faces significant challenges. One of these challenges is the country's unprecedented rapid population growth that is due to an extremely high total fertility rate (TFR) of 5.7 children over a woman's lifetime (National Statistics Directorate & Ministry of Finance Democratic Republic of Timor-Leste Dili, 2010). The previous estimate of TFR for Timor-Leste was 7.8 children per woman in 2003

(Ministry of Health and National Statistics Office Timor-Leste, Dibley Pty Ltd, University of Newcastle, & The Australian National University Australia, 2004). This implies that, on average a woman is now having approximately two fewer children than she did about seven years ago. However, a TFR of 5.7 is still indicates high fertility, which has contributed to an average population growth rate of 3.5 percent in the 2005 and 2010 period, thus ranking Timor-Leste as the fifth fastest growing nation in the world (UN, 2011a). While the reasons behind this high fertility seem to be culturally and economically driven, a highly patriarchal and strictly Catholic social structure makes family planning issues very sensitive and challenging. Although the demand for maternal health and family planning services is increasing, access to such services is very limited due to various reasons including poor infrastructure, costs of transportation, lack of sufficient number of skilled health personnel and deliverables. Amid the worrying signs of fragile socio-economic, environmental and institutional conditions, it is concerning that if the current fertility rate and its implied population growth continue; the population of Timor-Leste will double in 29 years (National Statistics Directorate & Ministry of Finance Democratic Republic of Timor-Leste Dili, 2010). The population dynamics associated with this high fertility and high rate of population growth, if unaltered towards a lower population growth rate, are likely to have adverse implications for Timor-Leste's efforts to achieve sustainable development and may also hinder the stability of the country.

Timor-Leste's domestic economy is predominantly based on subsistence agriculture¹. About 73.5 percent of the population lives in rural areas and agriculture remains as

¹ This thesis uses the definition of subsistence agriculture where all or nearly all food produced by farmers is used to feed their families.

the main source of income in most villages (World Bank, 2006b). Ninety percent of the rural poor and over half of the urban poor depend on the agricultural sector for their livelihoods (World Bank, 2009d). Despite being the dominant sector employing the bulk of the population, agriculture only generates 2.3 percent of GDP for the country (CIA, 2013b). Timor-Leste has had a poor and stagnant domestic economy ever since it became independent, yet as an oil producing country, it has managed to enjoy large amounts of oil revenue since the pumping of hydrocarbon began in the Timor Sea in 2004 (United Nations Integrated Mission in Timor-Leste [UNMIT], 2008). The extraction and sale of Timor-Leste's hydrocarbons are generating significant revenue, amounting to around US\$ 100 million per month (United States Agency for International Development [USAID], 2008), and ensuring a 'sustainable' budget for the expenditure of US\$ 300 million per year (International Monetary Fund [IMF], 2007).

Timor-Leste is currently one of the most oil-dependent countries in the world (IMF, 2012). This is because the economy is undiversified and the government of Timor-Leste continues to rely heavily on its vast off-shore oil and gas fields in the Timor Sea to fund domestic expenditure. For example, income from petroleum accounted for 95 percent of the total government revenue and 80 percent of the Gross National Income in 2010 (Harmadi & Gomes, 2013). The total assets of the Petroleum Fund exceeded US\$11.5 billion by the end of 2012 since the promulgation of the 2005 Petroleum Fund Law (Government of Timor-Leste, 2013b). The private sector on the other hand remains weak with a meagre contribution to GDP.

Such oil revenues are critical for Timor-Leste's economic future and although there is a general optimism that they can provide an opportunity to pursue development-oriented policies for the nation (Lundahl & Sjöholm, 2008), poor but resource rich

countries like Timor-Leste with weak institutions are sadly the ones that are most likely to fall into what is known as the “resource curse trap” (Bulte, Erwin, Damania, Richard, Deacon, & Robert, 2005). This trap relates to overspending, corruption and inefficient institutions eventually constraining future development. In Timor-Leste there is almost 90 percent dependency on petroleum fund revenues (Anderson, 2010). Increasing inequality and disparities between rural and urban populations, particularly among the so-called political elites and the rest, are becoming more and more apparent (UNDP, 2011d). A poor performing non-oil economy with a rapidly growing population largely dependent on subsistence agriculture in the Timor-Leste context gives explicit warnings for continuing poverty and fragility. This is partly due to a neglect of sectors such as agriculture, health, education and environment which are closely linked to the livelihoods of the poor. Further stresses arise also with the restricted nature of the petroleum sector in terms of creating jobs for the country’s expanding youth. This technology-intensive industry has so far done little to create jobs for the unemployed and reduce wide-spread poverty (International Labour Organisation [ILO], 2008). Thus, the biggest challenge for managing such a large natural resource revenue in the face of underdeveloped human resources and weak institutional capacity is how to best use of the oil-wealth to lift the country’s non-oil economy, reduce poverty and achieve sustainable and inclusive development for all. The labour force, growing at a rate of 4 to 5 percent annually, indicates that 15,000 to 21,000 people are entering the labour market each year while only 400 formal jobs are being created annually (United Nations Population Fund [UNFPA] & The Government of Democratic Republic of Timor-Leste, 2009). The shortage of jobs for young people results in extremely high waste of human potential and costs in lost production as well as unmet aspirations. While low productivity in agriculture and underemployment of the people are some of the contributing factors to poverty

and food insecurity in the country, a large young population with lack of opportunities and hence, frustrations, would indeed contribute to the continuing state of underdevelopment, poverty and fragility which may create civil unrest within the society.

Another stumbling block in Timor-Leste's nation building process is the severe environmental degradation that has been taking place in the country since colonial times. While unsustainable extraction of sandalwood was common during the Portuguese colonial period, under Indonesian rule timber was unsustainably harvested as an export commodity (Government of Timor-Leste, 2012). Moreover, mass environmental destruction took place during the occupation where forests were often burnt to fight against resisting Timorese groups hiding in these areas. Forests were also cleared to create concentrated villages to relocate people into these areas to impose greater control (Government of Timor-Leste, 2012). Based on available data on forest cover from 1992 to 1999, it is estimated that 114,000 ha of dense forest were lost, and 78,000 ha of sparse forest were destroyed during that period (Food and Agriculture Organisation [FAO], 2010).

Along with the historical environmental disruptions, the combination of geological and climate conditions, shifting cultivation practices, overgrazing, and rapid deforestation have all contributed to the partial/severe degradation of one-third of the land area of Timor-Leste (World Bank, 2005). It is suggested that catchment-wide erosion is now upto 20 times higher than it has been over the few thousand years (Alongi et al., 2009). Today Timor-Leste has one of the highest deforestation rates in the world with 1.1 percent annually; that is four times the global average (World Bank, 2009d). Clearing of land for agriculture and use of firewood for energy are identified as major forces behind deforestation since independence (World Bank,

2009d). The pressures to produce food for a rapidly increasing population are translated into continued growth in land areas for both arable agriculture and shifting cultivation practices. Rural people heavily rely on fire wood for their needs and it is estimated that 93 percent of the energy consumed by households comes from wood (FAO, 2010). The huge demand, estimated at 977,776 m³, exceeds the potential source and poses a treat for forest sustainability (FAO, 2010). Furthermore, forest inventories are practically non-existent which inhibits formulating appropriate management plans and strategies.

Records on environmental issues are very limited partly due the fact that most of the nation's data and valuable files, including land and property titles, were burnt or destroyed during the 1999 conflict (World Bank, 2013b). Limited information on the state of the environment and its services for the livelihoods of the Timorese people and the national economy also contributes to poor understanding of the complex PPE linkages by decision makers. Such lack of understanding has been reflected in government strategic development plans as well as funding and investment allocated in certain areas. Disturbingly, neither the rapid population growth nor the severe environmental degradation that are causing major concerns for sustainable development in Timor-Leste today are prioritised or handled with caution by the government. For example, key environmental laws and regulations are lacking, or in the process of being integrated into the judicial system. Where government rules and policies exist, there are major problems with their implementation and enforcement (McWilliam, 2003). The reasons behind weak enforcement are many, but they include lack of funding, limited human resources and weak institutions which are common challenges for fragile states (FAO, 2008).

The understanding of the nature of the PPE relationship is particularly important in the case of Timor-Leste since ill-suited economic agendas and poor development strategies may lead to further fragility, poverty and destruction of the nation's natural and cultural wealth.

1.1.4. Significance of this research

Timor-Leste is a new nation which lacks scientific research in many areas, one of which is the PPE relationship and its importance for the country's peaceful development process. Reliable data is particularly lacking in the field of the environment because most data sources were destroyed following the Indonesian occupation and were never recovered (USAID, 2008). Forest resource inventories are incomplete (Marques, Fonseca, Ferreira, & Laranjeira, 2010), and there is a lack of up-to-date research which explores people's dependence on forest resources. There are available reports that base their poverty analysis on people's income (World Bank, 2009c), expenditure (National Statistics Directorate, 2007), or a mixture of human development indicators (UNDP, 2011c). However, there is a shortage of scientific research which applies a framework to analyse the relations between poverty, demographics and forest reliance at the household level, and to link these with the country's macro level population, poverty and environmental dynamics.

As discussed previously, Timor-Leste is one of the poorest nations in Asia and has one of the fastest growing populations in the world. This makes environmental degradation a critical issue, particularly given that Timor-Leste already has one of the highest rates of deforestation globally. During its twelve years as an independent country, Timor-Leste has rightly prioritised areas such as public sector development, provision of health care, education and infrastructure development in its nation-building process (Government of Timor-Leste, 2010c). The concerns related to a

sustainable population and environment however did not receive the attention they required in poverty reduction and peace building strategies.

This thesis argues that the role of a sustainable population and forests need to be explored and communicated with decision makers because integrating population trends and environmental sustainability are important milestones for poverty reduction and the improvement of people's livelihoods in Timor-Leste. Therefore, in the following chapters, this thesis will highlight where a productive sustainable population and a healthy forestry sector fit in the nation building process of Timor-Leste.

The recommendations of this research intend to contribute to the nation and peace building process of Timor-Leste by influencing the design of population, poverty alleviation, forest conservation and development policies as well as programs that tackle these issues. As Australia is a neighbouring nation, this research is also expected to contribute to formulating more effective strategies for Australia's development aid to Timor-Leste and also for an in-depth understanding of post-conflict development in other countries in the Asia-Pacific region.

1.2. RESEARCH OVERVIEW, QUESTIONS AND OBJECTIVES

1.2.1. Research Overview – Research Aim

This research aims to examine the population, poverty and environment linkages in Timor-Leste in the context of rapid population growth, low levels of human development and continuing state of fragility of the nation state. Using an adapted version of the sustainable livelihoods framework (Angelsen et al., 2011; DFID, 1999), the research seeks to measure multi-dimensional poverty and forest reliance at the household level and examine relations among these with links to population

dynamics. The research seeks to advance our understanding of the role of a productive and sustainable population and healthy ecosystems in maintaining and improving livelihoods and fostering sustainable development in the context of Timor-Leste. This research further provides recommendations for effective policy making and better governance in this new fragile nation's efforts to fight against poverty and achieve sustainability.

1.2.2. Research Questions

This research addresses the following questions:

1. What promises and challenges do the current and future population prospects hold for peace and sustainable development in Timor-Leste's fragile state context?
2. What role can sustainable population and environment, particularly forests, play in maintaining and strengthening people's livelihoods, reducing poverty and contributing to the nation building process in Timor-Leste?
3. What governance² and policy measures need to be adopted to support sustainable livelihoods, national peace and environmental sustainability in Timor-Leste's future development path?

1.2.3. Research Objectives

This research has the following specific objectives to address its aims:

² Governance is defined as a system of values, policies and institutions by which a society manages its economic political and social affairs through interactions within and among the state, civil society and private sector (UNDP 2002).

- 1) To analyse the current demographic characteristics and population growth trends and project them into the future in order to identify the major challenges and opportunities for sustainability in Timor-Leste's fragile state context.
- 2) To estimate the extent of multi-dimensional poverty and forest reliance at the household level through a sustainable livelihoods framework, and to explore the various uses and types of forest resources in supporting livelihood outcomes.
- 3) To identify the trends and relations between population dynamics, multi-dimensional poverty and forest reliance at the household level.
- 4) To recommend appropriate governance mechanisms and policies for improved sustainable livelihood outcomes based on stakeholder consultations and empirical government and household level data.

1.3. THESIS OUTLINE

This dissertation is organised into nine chapters. Chapter 1 contains the background information of this research and its significance, the research problems, questions and objectives. Chapter 2 provides a review of the literature relevant to Timor-Leste and introduces the conceptual framework on which this research is based. Chapter 3 presents the methodology with a detailed description of the study area and survey methods used. Chapter 4 analyses the current demographic characteristics of Timor-Leste and gives a detailed picture of the country's population trends through contextualising it in comparison with trends in other Southeast Asian and fragile countries. Chapter 5 projects the future population of Timor-Leste to 2030, and provides a situational analysis of current and prospective challenges for sustainable development, particularly from three perspectives. These perspectives include the

impact of population growth on the economy, environmental sustainability, and on peace and security at the national level. Chapter 4 and 5 particularly address research objective 1. Chapter 6 introduces the need for a multi-dimensional poverty analysis and explains how and why a sustainable livelihoods framework is used in this thesis to measure poverty at the household level. The poverty analysis is based on livelihood assets which include economic capital, social capital, human, physical and natural capital. Chapter 7 initially sheds light on the role of various uses and types of forest resources in supporting livelihoods. The chapter continues with measuring forest reliance at the household level and analysing the relationship between household demographic dynamics, household poverty and forest reliance. Chapter 6 and 7 address research objective 2 and 3. Chapter 8 identifies pathways to cope with demographic change and highlights areas for sound policy making to achieve a resourceful and healthy population as drivers for the country's peace and sustainable development. It identifies the challenges and opportunities that lie in the policy framework and programming of reproductive health and family planning and makes recommendations for future directions. Chapter 9 provides a review of historic trends that shaped the current institutional and policy framework for forest governance in Timor-Leste. On the basis of empirical findings, stakeholder consultations and in-depth interviews, it explores the opportunities and challenges that lie in forestry sector at the policy, governance and implementation level. Then it suggests a typology of adaptive responses to conserve Timor-Leste's land and forests, and to develop a strong forestry sector for improved livelihoods and poverty reduction. Finally, Chapter 10 draws together the main findings of this research and focuses on the discussion of the research outcomes and their theoretical implications. It offers recommendations for policy and concludes with suggestions for future research and

final remarks. Chapter 8, 9 and 10 address the final research objective of this research.

CHAPTER 2: POPULATION POVERTY AND ENVIRONMENT LINKAGES: A REVIEW OF THE LITERATURE

2.1. INTRODUCTION

This chapter provides a detailed review of the literature on population poverty and environment (PPE) linkages and highlights some of the important schools of thought, theoretical models and empirical evidence available in the study area. The literature selected and reviewed for this chapter specifically draws on the themes related to population growth, high fertility rates, poverty and environmental degradation and, ultimately, states of fragility and risk of violent conflict. These subjects of inquiry are particularly important to analyse PPE relations in Timor-Leste as the country context is largely shaped by extremely high fertility rates, wide spread poverty, rapid deforestation, and a post-conflict fragile state with weak institutions.

With the above-mentioned subject areas at the core of inquiry of this thesis, this chapter initially reviews relevant literature on the themes of population and poverty, followed by population and environment, and poverty and environment. Having explored the literature focusing on the relevance of PPE relations for peace and sustainable development in fragile state contexts, this chapter then identifies the micro and macro level interconnections of these three subjects of inquiry and lessons learnt from two century old debates (Dasgupta, Bongaarts, & Cleland, 2011; Malthus, 1798; Stangeland, 1904; Wolfgram, 2005) This chapter concludes with the presentation of a conceptual framework that is developed for this research to explore PPE connections for peace and sustainable development in Timor-Leste.

2.2. POPULATION AND POVERTY

From the 18th century until the 1990s, there have been two major contrasting views about the relationship between population growth and poverty. One of these views is the belief that high fertility and rapid population growth hinder poverty reduction and reduce fertility, and that lower population growth rates facilitate the reduction of poverty (Dasgupta, 1995; Mason, 2003; UNFPA, 2012). The second view on the other hand, suggested that population concerns are of secondary importance and it is the economic growth that is the key to reducing poverty (National Research Council, 1986; Simon, 1981).

The first school of thought mentioned above goes back to the end of the 18th century when Thomas Malthus and his followers argued that high fertility and poverty went hand in hand. Malthus, in his essay on ‘The Principles of Population’ in the midst of Victorian England’s Industrial Revolution, argued that the population expands geometrically while subsistence increases only at an arithmetic progression and hence man’s ability to increase his food supply is constrained through land scarcity, the limited production capacity of cultivated land, and the law of diminishing returns (Malthus, 1798). His argument was riveting in the way he predicted that population growth would outstrip subsistence, be it food, jobs or any of the various components that define ‘subsistence’, and lead to hunger and human misery. He also argued that the lower class of society and its conditions would be subject to more distress due to the increases in population (Malthus, 1798, p. 18).

A century and a half later when population growth rates were accelerating as a result of high fertility and declining mortality, the successive Malthusians, called neo-Malthusians, argued that the large numbers of children relative to the number of working adults as a result of high fertility rates, meant that savings that might

otherwise have been invested in the country's infrastructure and development instead had to be diverted to meet the immediate needs, in areas such as food, health care, housing and education, of growing numbers of children and adolescents (Coale & Hoover, 1958; Merrick, 2001). Coale and Hoover (1958) for instance, introduced a model exploring the relationship between population growth and economic development particularly in the context of low GDP growth, low industrialization and heavy reliance on subsistence agriculture. The authors argued that the combined effect of an increasing population size and high and rising child dependency ratios diverted national resources away from investment in expanding production and in increasing capital/labour ratio to meet the growing needs for schools, health, housing and other infrastructure needed to avoid compromising the future population's well-being and productivity. Similarly, the authors suggest that household level resources are diverted away from saving for productive investment to meet current consumption needs. This translated into the argument that population growth and high child dependency prevents countries and families from making long term investments to help lift them out of poverty.

In the 1960s and '70s, the neo-Malthusians played a key role in shaping efforts to mobilise wealthy developed countries to provide financial aid to support government-administered family planning programs in developing countries (Merrick, 2002). Hence governments and non-governmental organisations in developing countries with high population growth rates were assisted to enable them to develop or expand access to family planning services (Kelley, 2001). Some economists were, however, quick to respond to the implied relation of population growth impacting on poverty by arguing that if high fertility and high proportions of a population living in poverty were correlated, this correlation would not imply

causality and, in fact, the relationship could run in the opposite direction (Merrick, 2002). Poverty can well be the cause of high fertility because children represent wealth, provide household labour for the poor, and are the only form of social security available to parents in old age (Aassve et al., 2005). Moreover, the poor may want more children because parental expectations about the benefits of an additional child might be high and the costs of raising another child may not be realised by the parents (Merrick, 2001). High fertility among the poor may also be linked to the high percentages of infant and child mortality ratios due to factors like poor access to health services, inadequate reproductive health and maternal care.

There is strong evidence, for example, supporting the hypothesis that short birth intervals, birth order and mother's age at birth have strong effects on infant and early child mortality (Hobcraft, McDonald, & Rutstein, 1983; Palloni & Millman, 1986; Palloni & Tienda, 1986). The causal relation is also argued to go in the opposite direction such that infant and early childhood mortality could affect fertility levels and patterns (Palloni & Rafalimanana, 1997).

One of the views that attempt to describe the impact of infant mortality on fertility levels and patterns refers to the physiological effect. This effect arises when the death of an infant leads to sudden termination of breast-feeding and this, in turn, triggers resumption of menses and ovulation, thus, increasing the period of exposure to new conception (Palloni & Rafalimanana, 1997). The magnitude of this purely physiological effect is found to be relatively large and remarkably consistent in different demographic contexts (Jones & Palloni, 1990). Less strong but equally consistent is the effect attributed to pure cessation of lactation (Bongaarts & Delgado, 1977; Delgado, Martorell, & Klein, 1982; Jones & Palloni, 1990).

Another alternative view refers to the replacement effect when couples deliberately attempt to 'replace' any child who dies at an early age in order to attain a desired number of surviving off-spring at the end of their reproductive life (Palloni & Rafalimanana, 1997). A third alternative view refers to the so-called insurance (hoarding) effect. This view tries to explain why couples practice bearing more children than the desired family size even if none of the children born ever die. This approach suggests that more children than the desired family size protects the couple's kinship against any future child death and, therefore, insures that it attains the desired family size at the end of the reproductive period (Palloni & Rafalimanana, 1997). This form of anticipatory behaviour can result in increases in fertility when uncertainties in the prevailing mortality environment increase. An individual couple's insurance strategy largely depends on the perceived child mortality experience within the society.

The studies mentioned above have played a pivotal role in theories of fertility decline, particularly those associated with the demographic transition framework (Freedman, 1961/62; National Academy of Sciences, 1971; Notestein, 1945). They are important in understanding the relevance of high fertility, and high infant and child mortality going hand in hand in poor developing countries such as Timor-Leste.

Returning to the claims related to the reduced savings and investments due to high fertility and population growth, it is important to highlight that some scholars are opposed to such claims. Simon (1981) for instance suggested that the doubling of the population in developing regions between 1950 and 1985 did not necessarily prevent all countries within that region from raising their living standards. Kuznet (1967) challenged the hypothesis of the Coale-Hoover by suggesting that the role of population is of secondary importance while the basic obstacles to economic growth

are linked to delays in adjusting social and political institutions (Easterlin, 1975). Schultz (1993), who tested the investment-diversion effect in low income countries over the 1969-1980 period, suggested that the school enrolment rates could rise without diverting resources from other forms of investment despite growth in the school-age population. In the mid-1980s, the National Research Council (1986) concluded that while demographic factors might play some important role in determining a country's prospects for economic progress, they are of limited importance compared with considerations such as poor economic policies, bad governance, corruption and the lack of natural resources. By 1990, only a few economists believed that the population factor mattered and the rationale for supporting family planning programs to reduce poverty was largely undermined. The predominant approach at the time supported the idea that decisions about family size and reproduction were a private matter and that contraceptives were private goods whose supply was better left to market forces.

In the late 1990s, some researchers diverted their attention to looking at the relations between population and economic growth at different stages of the demographic transition from high to lower fertility (Birdsall & Sinding, 2001). One of the main findings of such recent work is that when fertility begins to decline, the process creates a demographic window of opportunity for only a limited period of time, during which increased personal savings and investment become possible. As fertility drops, the ratio of potential workers (aged 15-64) to non-workers (people aged below 15 and aged above 64) rises, meaning that more workers are responsible for taking care of fewer children. This situation is argued to enable countries to increase the stocks of their physical and human capital which can then lead to an increase in schools and well-trained teachers, health care facilities and well equipped

health care providers, modern communication networks and a highly skilled labour force to support further economic development (Bloom, David, & Sevilla, 2004).

Several studies supported the view about the demographic window of opportunity. Higgins and Williamson (1997) for instance found that much of the impressive rise in Asian savings rates since the 1960s can be explained by the equally impressive decline in youth dependency burdens allowing Asian countries to relinquish their reliance on foreign capital. Likewise, Bloom and Williamson (1998) argued that rapid fertility decline in East Asia facilitated the swift economic growth in this region by reducing the dependency ratio, thereby expanding the per capita productive capacity of East Asian economies. However it is important to acknowledge that the rapid economic growth was not automatic. It had to be accompanied by judicious government policies to create investment in developing infrastructure in education, health and other activities that helped economic development of the country. The enabling conditions for benefiting from such demographic positions are further discussed below.

In their empirical research, Kelley and Schmidt (2005) found that worldwide, the combined impacts of demographic change have accounted for approximately 20 percent of per capita output growth impacts, with larger shares in Asia and Europe. This builds on their earlier work where the authors examine 65 less developed countries and 23 developed countries over time cross-sectionally since 1960, and found that dependency ratios impacted on savings (Kelley & Schmidt, 1996).

As mentioned briefly earlier, several studies support the view that the opening of a demographic window of opportunity does not guarantee delivering economic growth. Firstly, it is because the opening of this opportunity is a one-time temporary occasion

and the length of existence (approximately two decades) depends on the speed of demographic transition from high to lower fertility (Williamson, 2001). Secondly, it also depends on whether a country is pursuing appropriate economic and social policies through solid institutions, to increase human capital and enable the large wave of workers to acquire skills and find productive employment. When these conditions were met, such as the case in South Korea and Taiwan, the surge in the accumulation of physical and human capital contributes to a rapid rise in living standards (Williamson, 2001). On the contrary, even with the successful achievements of lowering population growth and thus opening the window of opportunity, this may fail to reduce poverty because of the accompanying misguided or lately institutionalised economic policies.

Some of the studies mentioned above are more focused on the impact of population dynamics on economic growth rather than explicitly on poverty reduction or human well-being. These studies rather assume that increased economic growth whether it is derived from the agricultural, manufacturing or service sectors, raises living standards among substantial sections of the population with ripple effects for others. A very distinct exception to this however may be the economic growth driven by exploitation of mineral resources (such as oil), where only small elites can potentially benefit from the proceeds (Das Gupta et al., 2011).

Recent findings on the population and poverty debate tend to support the Neo-Malthusian arguments in their belief that high fertility inhibits the efforts of poor countries to reduce poverty. In a study comparing the countries that experienced a rapid fertility decline with those that did not, Birdsall and Sinding (2001) found that high fertility increased the absolute levels of poverty by retarding economic growth and worsening the distribution of generated income per capita.

The underlying finding of the combination of the studies in the recent past suggests that the effects of fertility on poverty reduction differ at various stages of the transition from high to low fertility, with high fertility inhibiting poverty reduction before the transition and declining fertility contributing to it during the transition. This, of course, is provided that the ensuing reductions in dependency ratios are accompanied by sound policies for developing infrastructure for education, health and welfare (Eastwood & Lipton, 2001).

Another relevant discussion on population poverty dynamics is linked to the aspects concerning food scarcity and malnutrition (Simon, 1981). Economists point out that global food production has exceeded population growth for several decades thanks to dramatic improvements in technology and agricultural techniques. Food scarcity and malnutrition depend more on agricultural and trade policies and on poor people's inability to access food supplies than on rates of population growth. However, a recent report on the global food outlook, agreeing on the points mentioned above, notes that malnutrition in poor countries would be substantially lower if population growth in these countries was lower than what the UN projects as the medium variant (Rosegrant, Paisner, Meijer, & Witcover, 2001). This statement suggests that, rapid population growth, if associated with misguided policies on agriculture and trade, would exacerbate the effects of such policies and cause hunger while a slower population growth might buy time for better policies to be adapted and have an effect on reducing malnutrition.

Moving from macro scale population dynamics to micro level household analysis, several studies have found that having a small-sized family allows the conditions for poverty reduction and particularly increases the well-being of women and children in a household. For example, Merrick (2002) suggested that children in large families

tend to have poorer health and lower survival probabilities and infants born less than 24 months after a sibling are less likely to survive than those born after a long interval. The author argued that large family size also tends to inhibit the physical development of children, possibly through lower quality maternity care and poorer nutrition (Merrick, 2002). A study on the effects of Thailand's rapid fertility decline found that reduced fertility rate enabled families to invest more per child and thereby educate each child better (Knodel, Napaporn, & Werasit, 1990). Similarly, Rosenzweig and Wolpin (1980) found that in India, increases in fertility decreased child quality, and a decrease in family size by improvements in birth control technology, increased schooling levels of Indian children. Joshi and Schultz (2007) on the other hand found that fertility decline in Matlab, Bangladesh, is associated with improvements in women's health, household earnings and assets, use of preventive health inputs, and children's health and schooling. In Colombia, the family planning program was found to bring substantial socio-economic gains to women, especially if they had access to the program when young (Miller, 2010). Such women were found to have obtained more schooling, and were more likely to have worked in the formal sector. Miller (2010) concluded that family planning may be placed as the most effective (and cost efficient) intervention among others to foster human capital accumulation. These studies are particularly important as they shed light on the potential for increased well-being and poverty reduction that can be gained through reduced family size allowing human capital formation and women's empowerment.

Some suggest that because of their exclusion from power and from access to safe reproductive technology, many women have more children than they otherwise would wish (Sen, Germain, & Chen, 1994). The importance of gender equality and

inclusion of women in decision-making are hence advocated for the stabilisation of the population by not only the feminist contributors but this view is also largely endorsed by the participants of the Cairo Conference of 1994 (United Nations, 1995).

The 1994 International Conference on Population and Development (ICPD) was an important milestone in comprehending that population and development are inextricably linked, and empowering women and meeting people's needs for education and health, including reproductive health, are necessary for both individual advancement and balanced development (United Nations, 1995). Through this conference, the mainstream approach to population issues was also changed from a focus on numbers and demographic targets to a shift to human rights and dignity. The new approach had references to the human capability approach by Amartya Sen (1981) where the intention was put towards providing people with freedom, choice and dignity to live the life that they had a reason to value.

The very recent UNFPA report (2012), which gathers micro and macro level findings of population and poverty studies under a holistic understanding of both concepts, underlines four strong associations. These are listed as follows:

- 1- Countries with higher birth rates have lower economic growth rates.
- 2- Age-Structural Transformations are responsible for a substantial portion of the recent poverty reduction in some countries due to demographic dividend accompanied by sound socio-economic policies.
- 3- The elimination of unwanted fertility may reduce poverty in some countries as much as their current anti-poverty programs.
- 4- Small families are more likely to rise out of poverty.

In the light of these four guiding findings, it can be concluded that low dependency ratios (resulting from fertility declines) create an opportunity to increase productivity, savings and investment in future growth. Conversely, lower fertility is associated with better child health and schooling, and better health and greater labour-force participation for women. Rapid population growth can constrain economic growth, especially in low-income countries with poor policy environments. Finally, while policy and institutional settings are central in shaping the prospects of economic growth and poverty reduction, the rate of population growth and structure also matters in facilitating or hindering economic development (Das Gupta et al., 2011).

2.3. POPULATION AND ENVIRONMENT

An understanding of the relationship between population dynamics and the environment has been long sought by humans (Cohen, 1995; Petersen, 1972). At different times, the discussions may have been centred in somewhat different contexts, such as the relationship of population growth to governance (Stangeland, 1904), to food production (Malthus, 1798), to agricultural growth (Boserup, 1965), to resource availability by neoclassical economists (Simon, 1981), to pollution (Meadows et al., 1972), and to land degradation (Blaikie, 1985). Nevertheless, available literature suggests that there is still large disagreement about the magnitude and the direction of this relationship and some even dispute whether such a relationship exists at all (Panayotou, 2000).

From a historical point of view, it is safe to suggest that it was again Thomas Malthus' essay on 'The Principle of Population' (1798) that initiated the launch of population and natural resources as scientific topics of inquiry. Malthus's main argument was that population numbers tend to grow exponentially while food

production grows linearly, never quite keeping pace with population and thus resulting in ‘natural checks’ (such as famine) to further growth (Malthus, 1798). He then added ‘preventative checks’ such as celibacy and birth control in his argument as discussed previously in this chapter.

Although Malthus’ ideas were influential in the subsequent decades, the concerns raised by him and his followers receded quickly following the industrial and agricultural revolution contributing to increased productivity through technological advancement (Panayotou, 2000). After the 1960s however, scientific research regained interest in the matter related to population growth and limits to natural resources. The concerns over growing population were reflected in the report named ‘The Growth of World Population’ (National Academy Science, 1963) published by the U.S. National Academy of Sciences in 1963. This was then followed by *The population bomb* published in 1968 by Paul Ehrlich (1968) both of which invited public attention to the issue of population growth, food production, and the environment. Garret Hardin (1968) in his book *The tragedy of the commons* argued that the users of common resources such as water, land and air will inevitably destroy the very resource which they depend on in the face of growing population. He argued that as long as incentives exist for each household to privatize open access resources, there will be a tendency at the societal level to overexploit available resources to the detriment of all users (Hardin, 1968). On the other hand, the Club of Rome released the books *The limits to growth* and *World model* (Meadows, Meadows, Randers, & Behrens, 1972) which represented the first computer-based population environment modelling effort predicting an “overshoot” of global carrying capacity within 100 years.

As illustrated in the literature above, Neo-Malthusians (adherents to Malthus) held a limited resources perspective with the belief that human population, because of their tendency to increase exponentially if fertility is unchecked, would ultimately outstrip the earth's resources, leading to ecological catastrophe. The temptation to assume a direct and causal relation in the Neo-Malthusian thinking however has been heavily criticised also because of overlooking cultural adaptation, technological developments, trade, and institutional arrangements that have allowed human populations to grow beyond their local subsistence base. For example, in response to the argument of Hardin in *The tragedy of the commons*, Ostrom et al. (1999) contended that although tragedies have undoubtedly occurred, it is also undeniable that people have self-organised to manage common-pool resources for thousands of years and often have devised long-term, sustainable institutions for governing these resources.

A clear example of the Neo-Malthusian framework, which was also largely criticised, was reflected in I=PAT formulation developed by Ehrlich and Holdren (1971). The formulation was one of the attempts to describe the role of multiple factors in determining environmental change where environmental impacts (I), in other words, resource depletion or waste accumulation, are the product of population (P) which can be referred to the size of the human population; affluence (A) which can be understood as the level of consumption by that population; and technology (T) which can be translated as the processes used to obtain resources and transform them into useful goods and wastes. According to this formula, a doubling of population size, other factors being treated equal, will lead to a doubling of the environmental impact. Some reckoned the equation was thought to provide a useful framework to assist in thinking of ways of reducing environmental impacts by reducing various

types of throughput. Others thought the equation was too simplistic and deterministic as it did not account for interactions among the terms (for example, increasing affluence can lead to more efficient technologies); it omitted explicit reference to important variables such as culture and institutions (such as social organisation) (De Souza, Williams, & Meyerson, 2003); impact was not linearly related to the right side variables (there can be important thresholds); and it could simply lead to wrong conclusions (Hayes, 1995).

On the opposite spectrum of the Neo-Malthusian view, pro-natalist scholars suggested that population growth is in fact good for the environment as larger and denser populations create more efficient environmental management and economies of scale leading to smaller environmental impact. Cornucopian theories espoused by some neoclassical economists such as Simon (1981) and Boserup (1965, 1981) for instance, claimed that population growth does not cause resource scarcities and environmental problems but helps resolve them through human ingenuity which help trigger technological innovation and economies of scale. The so-called Boserupian hypothesis, in fact suggested that agricultural production increases with population growth owing to the intensification of production (greater labour and capital inputs). Boserup's theory of intensification was found to hold true in the historical experience of many developed countries and was also justified by many localized case studies in the developing world (Stone, 2001). Simon (1981) on the other hand did not discount the occurrence of desertification for instance but believed that most claims were unfounded and exaggerated, and the problems were more linked with poor land management practices, particularly on government-owned public lands (Wolfgram, 2005).

Under this perspective of people as problem solvers, the advocates believe that more people mean more problem solvers, since human creativity has the potential to overcome limits of nature. Moreover, some believe that market mechanisms can help establish a dynamic equilibrium between population and resources. In this line of thinking, market failures and inappropriate technologies are more responsible for environmental degradation than population size or growth, and natural resources can be substituted by man-made ones (de Sherbinin, Carr, Cassels, & Jiang, 2007).

More recently however, the argument suggesting population growth can be accommodated by technological change has been criticised by scholars who thought that this approach discounts the deprivation faced by generations before the benefits of change can manifest themselves (Das Gupta et al., 2011). Panayotou (2000) argues that there are two major concepts about which little information is available. These are resilience (rebound) and recovery (reversal) of ecological systems following a change. In relation to these, Das Gupta (2008) argues that depreciation of the environment is frequently irreversible (or at best, the systems take a long time to recover), except in a very limited sense where it is not possible to replace a depleted or degraded ecosystem with a new one. Finally, ecosystems can collapse abruptly, without much prior warning. According to Das Gupta et al. (2011), the limited knowledge on resilience and recovery of the environment and increasing pressure on the common resources raise major concerns in regards to their sustainability.

In addition to the responses related to the limited knowledge of systems of environmental change and debates on whether population growth and resource scarcities can be accommodated through technological advancement, Homer Dixon (1995) introduced a concept called ingenuity. The author defined ingenuity as the ideas applied to solve practical social and technical problems. Fundamentally he

raised the question of whether humans can be smart enough to generate enough ingenuity to keep resource scarcity from negatively affecting their well-being. By identifying two types of ingenuity, social and technical ingenuity, the author provided a framework to understand that ideas about social organisation, especially about reforming and building institutions, are just as important as technological ideas. His theory suggested that the generation and dissemination of productive ideas is endogenous not just to the economic system but also the broader social system that includes a society's politics and culture.

In the face of environmental changes in the current millennia, there is no doubt that there will be greater need for ingenuity to deal with the complexity of the human-environment relations. Homer-Dixon (1995) argued that given the pace of resource depletion, it is important to realise that multiple scarcities within a system can produce synergic outcomes. Using forests as an example, Homer-Dixon suggested that forests not only provide wood for fuel construction and paper but they also reduce any variance in the hydrological cycle by slowing the runoff of rainwater, and by absorbing and releasing some of it through transportation. They stabilise soils and reduce erosion, absorb and fix atmospheric carbon dioxide that otherwise might contribute to global warming, and they provide a habitat for diverse organisms (Homer-Dixon, 1995). Each of these renewable services helps sustain goods and services in the ecological system. Thus, the loss of forests can generate much more than scarcity of wood. The total impact of these scarcities can hence be much greater than the sum of their separate impacts (Chen & Fiering, 1989). Moreover as also suggested by Das Gupta et al. (2011) ecological systems often exhibit sharp and unanticipated threshold effects. They may respond slowly and incrementally to

human intervention for a long time and suddenly change their character (Ludwig, Hilborn, & Walters, 1993).

Homer-Dixon (1995) argues that in some contexts scarcity can simultaneously increase the requirement for and restrict the supply of ingenuity, producing an ingenuity gap that may have consequences for adaptation and, in turn, social inability. He identifies factors that can restrict the supply of ingenuity as market failure, social friction, and shortages of capital and constraints on science. The underpinnings of each of these are provided in Figure 1. He argues that some countries experience a chronic ingenuity gap between their requirement for and their supply of ingenuity. This means that resource scarce countries may always be short of ingenuity to deal with the pressures particularly under conditions where fragility and resource depletion prevail. Homer-Dixon's theory is important to consider social, institutional and organisational factors in dealing with complexities and the systems of ingenuity generation. The particular theory is significant to consider for the context of fragile states in their post-conflict development phase. The relevance of the increasing demand for social and technological ingenuity and the case for its limited supply is very much the situation identified in Timor-Leste.

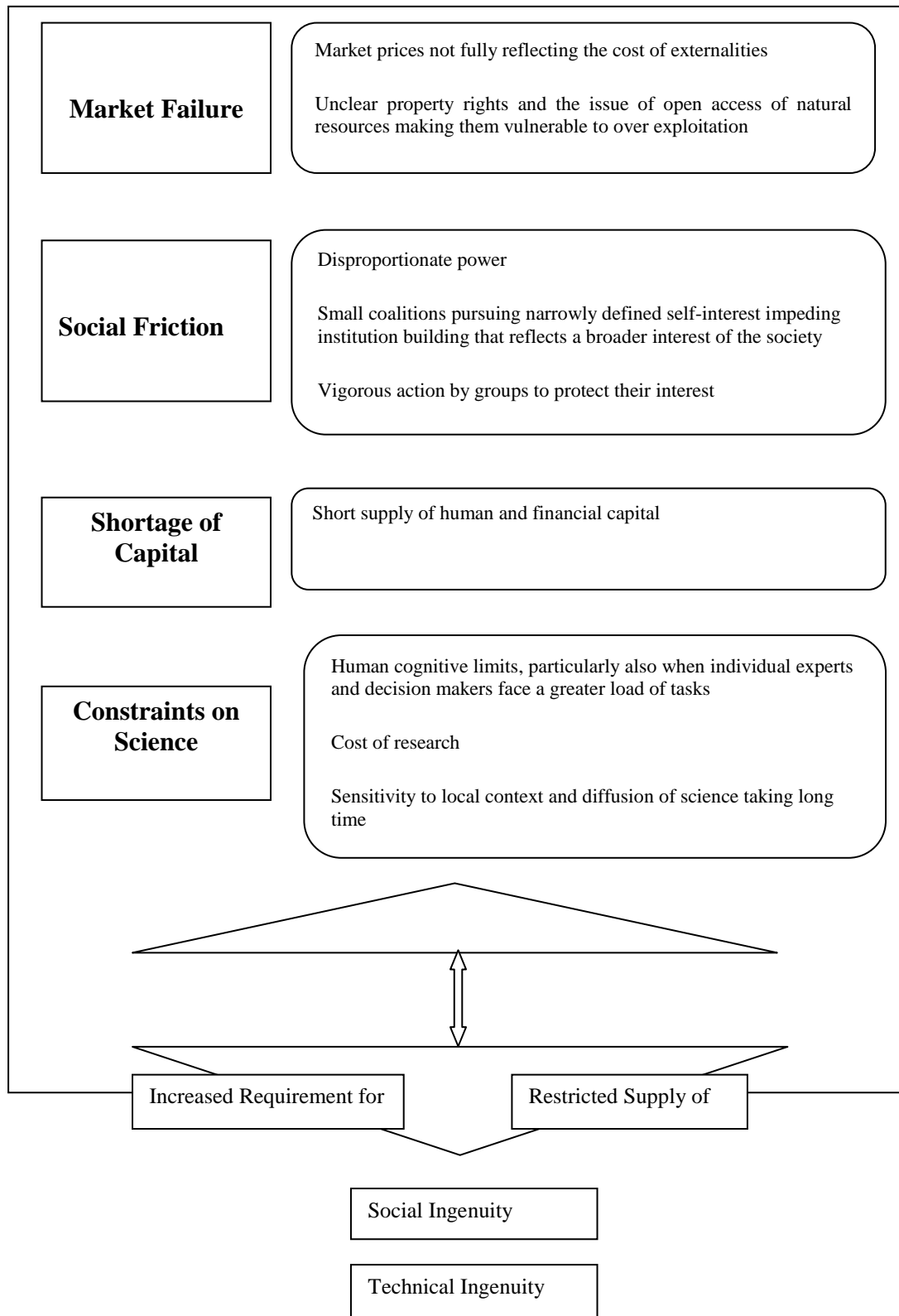


Figure 2.1 The Context of Scarcities and Complexities Leading to Ingenuity Gap Source: Adapted by the researcher from Homer-Dixon, 1995

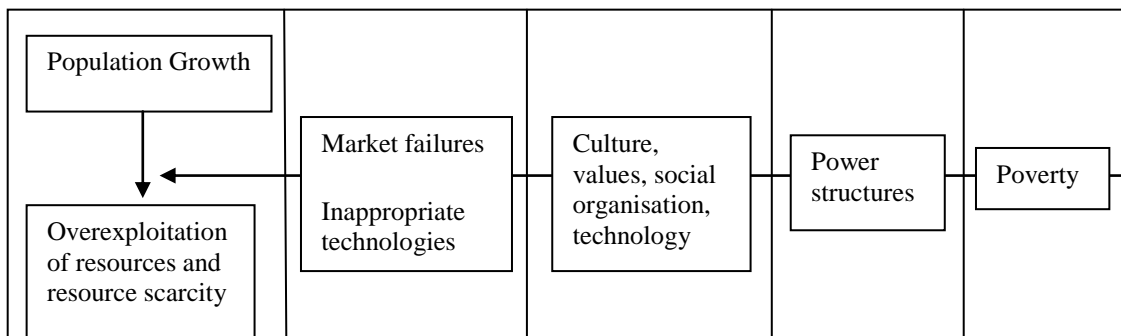
In relation to the increasing scarcities and complexities, a distinct body of demographic literature exists on environmental security that is linked with

environmental scarcities and violent conflicts. The main argument of such literature is grounded in the view that population pressure, combined with environmental degradation and poverty can cause tension which can lead to conflict and violence (Benjaminsen, 2008; Cincotta, Engelman, & Anastasion, 2003; Goldstone, 1999; Theisen, 2008). These studies will be further explored in Section 2.5 of the present chapter; however the main theme that can be drawn from these studies is the following: limiting competition over resources by directly reducing the demographic pressures could decrease the risk of social instability, particularly in developing countries with fragile governments and weak institutions.

Demographers suggest that population is one of a number of variables that affect the environment and rapid population growth can simply exacerbate other conditions such as bad governance, civil conflict, wars, polluting technologies, or distortionary policies, and an ever increasing ingenuity gap (de Sherbinin et al., 2007). These theories include the intermediate (or mediating) variable theory (Jolly, 1994), or the holistic approach (Chi, 2005) in which a population's impact on the environment is mediated by social organisation, technology, culture, consumption, and values (De Souza et al., 2003; Keyfitz, 1991; McNicoll, 1991). Theories by political ecologists see environmental problems deeply rooted in imbalances or poverty (Meinzen, Jain, & Di Tommaso, 2012).

Similarly among the theories in the field of population and environment a case is also made on the vicious circle model (VCM), which attempts to explain sustained high fertility in the face of declining environmental resources and poverty (Dasgupta, 1995; O'Neill, MacKellar, & Lutz, 2001). Identified also as the relevant case in Timor-Leste, this model will be further explored under the Poverty and Environment section of this chapter.

When it comes to assessing which theory or school of thought is more appropriate, de Sherbinin et al. (2007) argue that population-environment theories may simultaneously operate at different scales and, thus, could all conceivably be correct. For instance, the author suggests that at the national level the cornucopian theory (with its belief in technological advancements) may be correct for a country like Denmark, whereas neo-Malthusianism, political ecology, and mediating (intermediate) variable theories may each illuminate different facets of Haiti's environmental crisis.



Neo-Malthusian Neo-Classics Mediating variable theorists Political Economists VCM

Figure 2.2. Differing Theories Explaining the Reasons for Degrading Environments and Resource Scarcity. Source: Prepared by the researcher based on review of literature

Given the schools of thought and theories on population and environment discussed above, this chapter continues with presenting some of the empirical evidence for the study area, Timor-Leste, on the linkages between population growth and land cover change, agricultural land degradation, water resource management, energy and climate change.

The conclusions that can be drawn from the empirical evidence is that the implications of population growth for environmental resources including land, water, forests, climate and air are very much interlinked with other factors such as socio-economic status of populations, land tenure systems, capital markets, government

regulations, and tax policies. Hence, there is a need for a holistic flexible and case-specific approach to explore how these relations are shaped at the local level.

2.3.1. Population, Land Cover Change and Deforestation

The most visible and pervasive form of human impact on the environment is the conversion of natural lands to croplands, pastures, urban areas, reservoirs, and other anthropogenic landscapes (Turner et al., 1990).

As with the demographic and development transitions (Caldwell, 2006; Caldwell & Caldwell, 2005; Eastwood & Lipton, 2001; Notestein, 1945), the world remains divided in various stages of the land-use transition (Lepers, Lambin, Janetos, DeFries, & Achard, 2005). This is partly because most developed countries largely deforested their lands in past centuries, whereas today most land conversion from natural states to human uses occurs in the developing world, particularly in the tropics through forest conversion to agriculture (de Sherbinin et al., 2007).

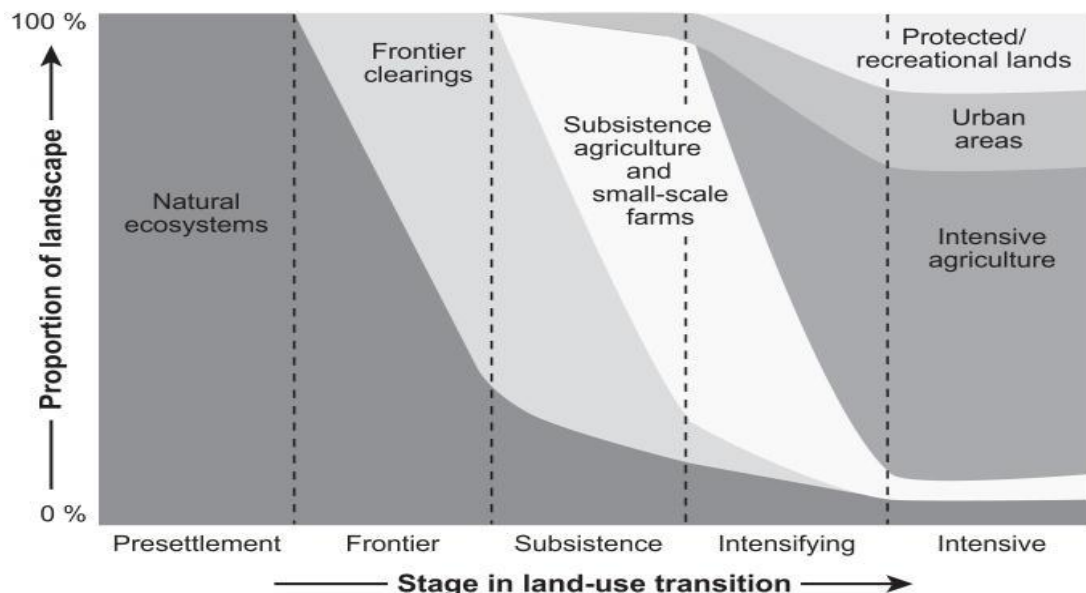


Figure 2.3. Land use transitions. Source: Foley, De Fries, Asner, Barford, & Bonan, 2005

Given the scale of these transformations as illustrated in Figure 3 and their intimate but complex linkages with population dynamics, research on land-use/-cover change and particularly deforestation constitutes a large portion of the population-environment literature. Although there is agreement on the fact that deforestation is a complex and dynamic process in which the role of population growth is neither static nor monotonic, there is disagreement on the extent to which population growth contributes to deforestation. Some studies suggest that demographic dynamics contribute more than any other process to deforestation (Mather & Needle, 2000), while others suggest that economic factors are dominant for deforestation (Geist & Lambin, 2001).

In a review of 152 case studies of tropical deforestation, Geist and Lambin (2001) reported that population growth was just one of the numerous and indirect factors contributing to tropical deforestation as interacts with a host of economic, environmental, political and societal factors to affect land-cover change (Geist & Lambin, 2001).

In a study of the causes of deforestation in Thailand's poorest region, the Northeast, during the period 1973-82, Panayotou and Sungsuwan (1992) found that population density was the most important factor leading to deforestation, with the other factors being poverty, wood price and agricultural yields. In this context, increasing population density led to deforestation and reduced forest regeneration through two main channels; (i) forest encroachment for conversion to agriculture, and (ii) progressive shortening of the fallow cycle from 10-15 years down to 4-6 years. Another contributing factor that was identified was the artificially high fertilizer and kerosene prices which further exacerbated the effect of high population density on deforestation by acting as taxes on agricultural intensification and fuel substitution,

respectively. Tongpan and Panayotou (1990), again focusing on the same region and extending the study period from 1973 to 1988, found similar results suggesting that a 10 percent increase in the rate of population growth was associated with a 3.3 percent increase in deforestation. They found that population growth and density were the single most important factors contributing to deforestation in northeast Thailand. This was also in a context where population density and growth were relatively high, soil fertility was poor, most agricultural land was insecurely held, and non-farm activities were scarce. Boserup (1981) argues that open access to forest resources, insecurely held agricultural land, lack of access to credit, scarcity of off-farm employment opportunities and low levels of education, all combine to prevent people from responding to growing population density. This is particularly found to be linked with rising labour requirements associated with dependence on open access and scarce resources (such as firewood) that contribute to higher fertility and consecutively higher densities and such findings are noted in Pakistan (Biddlecom, Axinn, & Barber, 2005; Filmer & Pritchett, 2002). There is evidence that in an impoverished rural setting where there is an immediate dependence on open access natural resources to meet basic needs such as fuel wood, fodder and water, human capital in the form of additional children may be complementary to the open access nature of natural capital (de Sherbinin et al., 2008). There is no specific research available which explores similar linkages in respect to Timor-Leste, yet the findings of these studies have been particularly useful in shaping the analysis of this thesis.

In most developing countries, the regions with the highest fertility coincide with the most remotely settled lands where the agricultural frontier continues to advance in areas that are both bio-diverse and ecologically fragile (de Sherbinin et al., 2007). In such regions, children are considered as assets to farm families that are often short on

labour (Caldwell & Caldwell, 1987). Poor health care access can contribute to high rates of child mortality, promoting so-called “insurance births” that guarantee a family a certain number of surviving children (Cain, 1983). Children can compensate for land insecurity through income security to parents in their old age (Stokes, 1984), and a dearth of education and work opportunities for women also maintains high fertility (Singh, Casterline, & Cleland, 1985). Positive correlations between fertility and deforestation have been found in studies in Central America (Carr, 2005; Rosero-Bixby & Palloni, 1998) and South America (Pichón, 1997; Rudel & Horowitz, 1993). However, as pointed out by Panayotou (1993), population generally has to be considered as a causal factor only in context of other factors driving the deforestation process. This research also intends to consider population growth and high fertility as contributing factors to deforestation in Timor-Leste within the context of other interacting factors.

Political institutional and cultural factors particularly play an important role in shaping land cover change and deforestation. For example, government investments in roads, subsidies to the agricultural sector, or land tenure policies are found to directly influence deforestation rates in the Brazilian Amazon (Alves, 2002; Pfaff, 1999). Cultural preferences among Central American frontier farmers on the other hand, such as desire for cattle as a symbol of high social status, were found to be an intervening factor between population and deforestation relationship (Carr, 2006).

2.3.2. Population and Agricultural Land

Discussions around population and land degradation are generally concentrated around two major schools of thought including the vicious circle proponents who believe that increasing population density in the context of high poverty almost inevitably leads to land degradation, and the Boserupians who suggest that increasing

density leads to intensification of agricultural systems such that yields per unit area (and per capita) are increased (de Sherbinin et al., 2007).

The vicious circle model (VCM) has become an influential paradigm in late 1990s to describe the interactions between population growth, low status of women and children, environmental degradation and food insecurity (Agarwal, 1994; Lutz & Scherbov, 1999). This model is based on the assumption that high fertility, poverty, low education and low status of women and children are bound up in a web of interactions with environmental degradation and declining food production, in such a way that stress from one of these sources can trap certain rural societies, especially those living in marginal lands, into a vicious circle of increasingly destructive responses (Lutz & Scherbov, 1999). According to de Sherbinin et al. (2007), poverty can contribute to high fertility through mechanisms such as a demand for farm labour, insurance births owing to high infant mortality, and women's low status. High fertility then leads to population growth which further increases demands for food and resources from an essentially static resource base; the declining per capita resource base reinforces poverty through soil fertility loss, declining yields, and poor environmental sanitation; and poverty, in turn, contributes to land degradation by increasing incentives for short-term exploitation (versus long-term stewardship) and also because poor farmers lack access to costly fertilizers and other technologies (de Sherbinin et al., 2007).

As an example, Panayotou (1994) and Dasgupta (2000; 1995) have suggested that children may be highly valued by rural households, in part, because they transform open access resources (forests, fisheries, and rangeland) into household assets and this results in the "externalization" of the costs of high fertility. The process of "extensification", whereby farm households in frontier areas use additional labour to

open up new lands for cultivation is a good example of this (Bilsborrow & Okoth-Ogendo, 1992). Household-level responses to resource scarcity can lead to problems at the societal level as each household copes with increased risk and uncertainty of environmental scarcity by maximizing its number of surviving children.

For example, although an apparent relationship between a country's population density and land use change is presented by many studies (Bilsborrow & Geores, 1993; Panayotou, 1993), it is concluded that often the interaction of population growth with especially insecure land tenure, poor soil quality and vulnerable ecology results in land degradation. The conditions related to rapid population growth coupled with insecure land tenure, poor soil quality and vulnerable ecology were pointed out particularly for much of Africa.

On the other hand, the Boserupian or intensification hypothesis has been tested in a number of studies spanning Africa, Asia, and Latin America. Tiffen et al. (1994) examining changes in population density and agricultural productivity in the Machakos District of Kenya provide evidence that increased food demand, a denser network of social and market interactions, labour-intensive agriculture and economies of scale helped avert a Malthusian crisis in the district. The authors suggest that infrastructure development, market growth, private investment, increasing management capacity and skills, self-help groups, food relief during drought, and secure land tenure in the district led to positive outcomes despite the sixfold growth in population numbers in a semi-arid environment where population density reached 654 persons per square kilometre.

Studies testing the Boserupian hypothesis conclude that population growth is neither a necessary nor a sufficient condition for either deterioration of, or improvements in

land and agricultural productivity to occur. Depending on the institutional and economic factors, population growth can either operate as a negative factor, increasing pressure on limited arable land and land degradation, or in a positive way, helping to induce intensification through adaptation of improved technologies, higher labour inputs and more secure land tenures (Kabubo-Mariara, 2007). One issue raising only little doubt is that rapid population growth in poor rural areas with fragile environments can be a complicating factor in the pursuit of sustainable land use, especially as policies and markets are rarely aligned in such a way to support communities to use natural resources sustainably.

2.3.3. Population, Climate Change and Food Security

Climatology is a considerably new area of study in trying to piece together a history of weather and climate and there has been growing literature on the impacts of population growth on climate change. The recent explorations of this field of science reveal that there have been drastic changes in the global climate in the recent past. A quote from the policy brief contributing to the International Panel on Climate Change (IPCC) Fifth Assessment Report states that, “warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia” (IPCC, 2013). The largest contributor to changes in the global climate is pointed out as being the increase in the atmospheric concentration of CO₂ since 1750 which has led to increased atmosphere and ocean temperatures, diminishing amounts of snow and ice, rising sea levels and ocean acidification (IPCC, 2013). More than 80 percent of the global energy consumption is derived from fossil fuels (International Energy Agency, 2006), and it is this dependence on fossil energy that is responsible for the release of the greenhouse gases and airborne pollutants that are altering atmospheric composition and processes on a global scale.

The same report suggests that it is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century. The evidence lies in the increasing greenhouse gas concentrations in the atmosphere, positive radioactive forcing, observed warming, and recent understanding of the climate system.

Using national-level data, researchers found an almost linear positive correlation between population size and total CO₂ emissions. Newell and Marcus (1987) found a 99.8 percent correlation between world population growth and growing concentration of carbon dioxide in the atmosphere during the period 1958-83 and call it the “nearly perfect” correlation. Holdren (1991) calculated that over the past two centuries, population growth was responsible for 40 percent of the increase in energy consumption, including traditional fuels. Harisson (1994) using the same methodology, attributes 36 percent of the annual emissions growth between 1965 and 1989 to population growth, and 64 percent to per capita consumption of energy, whilst technology helped offset part of the emissions growth. It is evident that population growth coupled with the increasing consumption patterns leads to changes in climate with implications on broader eco-systems.

Recent studies have raised concerns over food security particularly due to possible adverse effects of climate change on agriculture in developing countries. Even if global strategies to mitigate greenhouse gas emissions were to be introduced, farm households, particularly in the tropics, are expected to experience falls in crop productivity (Valenzuela & Anderson, 2011) due to warmer temperatures, altered rain fall patterns and more-frequent extreme weather events (Cline, 2007; Mendelsohn, 2009; Nelson et al., 2010).

The poor and other vulnerable groups, small-scale farmers and landless labourers, with limited resources of their own and who are underserved by public and private activities, are expected to be the most susceptible to the socio-economic effects of climate change (High Level Panel of Experts [HLPE], 2012). They are also found to be at high risk of food insecurity brought about by climate change. Expected increases in droughts in arid and semi-arid regions, sea level rises, saline intrusion and flooding in low-lying coastal areas and in small island states, are expected to be major threats for the poor in developing countries particularly in Sub-Saharan Africa, South-east Asia and the Pacific (HLPE, 2012). The changes in climate are therefore of major concern for countries like Timor-Leste where agro-climatic conditions are projected to be shaped by decreases in rainfall and more extreme rainfall days, increasing temperatures, rising sea-level and ocean acidification (Timor-Leste National Directorate of Meteorology and Geophysics, Australian Bureau of Meteorology & CSIRO, 2013).

There is no question that humanity faces extreme challenges in the coming decades owing to the scale and pace of changes in human numbers, population distribution, and consumption patterns. Whilst continued emission of greenhouse gases will cause further warming and changes in all components of the climate system, limiting climate change will require substantial and sustained reductions of greenhouse gas emissions. In the face of climate change and its projected impacts, research on culture, consumption, values, institutions, and alternative industrial and food systems will indeed add to what is known about the demographic dimension as societies seek transition to sustainable systems and to the development of adaptation strategies.

2.4. POVERTY AND ENVIRONMENT

The debate on poverty and environment links, just like the discourse on the links between population and poverty or population and environment, dates back to the origins of the population pressure debate of Malthus. Poverty, according to Malthus, arose from the laws of nature, the discrepancy between the powers of reproduction, and the ability to expand food production (Robbins, 2002). People were poor because there were too many of them, and because they kept having children in spite of their poverty.

Since the understanding of the poverty-environment relationship has shifted a little away from the population pressure debate, several crucial links and features have been identified as improving its understanding, but the nexus has been still largely described as a ‘big question’ with little consensus as to what the rural poverty-environment relationship really is (Cavendish, 1998; Iftikhar, 2003). There has been considerable theoretical and empirical research aimed at understanding two questions in particular. The first question relates to whether different types of poor people (varying by level of poverty; location; age; gender or occupational group) degrade or improve various components of the environment to different degrees, or in different ways (Durning, 1989; Leach & Mearns, 1991). The second question is whether particular environmental shocks and stresses impose different kinds of cost, or different levels of cost, on different sorts of poor people (varying by level of poverty; location; age; gender or occupational group (Forsyth, Leach, & Scoones, 1998).

Generating greater interest in the 1970s, particularly when the environmental problems of developing countries gained much more prominence, the poverty-environment discourse was highly influenced by the vicious circle argument which was also described as a downward spiral. The overlapping implications of population

growth and economic marginalization of the poor and environmental degradation have led to a belief in a negative downward spiral for poor communities in the face of economic and demographic change (Durning, 1989; Grepperud, 1997; Mink, 1993; Simonis, 1992). Traces of this thought can be found for example in the Bruntland report by the World Commission on Environment and Development (1987) which also introduced the concept of sustainable development for the first time: “Poverty is a major cause and effect of global environmental problems. It is therefore futile to attempt to deal with environmental problems without a broader perspective that encompasses the factors underlying world poverty and international inequality.” As reflected in the following quote, the links between poverty and environment were also seen to be self-enforcing.

Many parts of the world are caught in a vicious downwards spiral: poor people are forced to overuse environmental resources to survive from day to day, and their impoverishment of their environment further impoverishes them, making their survival ever more difficult and uncertain (World Commission on Environment and Development, 1987).

The idea of an intrinsically linked relationship was the dominant thinking of the era in efforts to address associated problems. Hence, efforts were directed at reducing poverty to address environmental problems. The vicious circle model has been quite persistent and even after decades the poor are still portrayed as operating with a short-term vision due to their pressing needs and are precluded from making investments into soil conservation, to face declining yields and deepening poverty (Bekalo & Bangay, 2002; Dasgupta, 1995; Scherr, 2000). This dominating view also

played a key part in explanatory crisis models of environmental pressure such as the Himalayan theory of deforestation and soil erosion, the fuelwood crisis; desertification, and the negative impacts of shifting cultivation (Brown, Flavin, & French, 1998; Eckholm, 1976; Kasperson, Kasperson, & Turner II, 1996).

The vicious circle model not only inspired empirical testing but also encouraged studies with opposing views to challenge its underlying assumptions (Scherr, 2000; Swinton & Quiroz, 2003), particularly by research focusing on the interactions of biophysical environmental change, diverse local perceptions and valuations of environment, and local institutional responses to resource changes (Forsyth et al., 1998).

New approaches have since tried to better understand environmental change and redefined conceptions of environmental degradation. Some have suggested that changes to landscapes that human societies have themselves shaped over centuries of activity should be less easily defined as degradation (Baland & Platteau, 1996; Berry, 1989). Other studies have found striking heterogeneity in environmental management by the rural poor and in their success in adapting to environmental change (Scherr, 2000). Evidence increasingly suggests that organisation and land management practices and skills of rural populations have frequently served to maintain and even enhance landscape productivity (Forsyth et al., 1998). In fact, local practices shaped by a range of both formal and informal institutions, may mitigate the impacts of environmental degradation. Other criticisms included the failure of top-down macroeconomic poverty eradication measures, economic growth oriented development regimes with tremendous hazards to the local environments, short-term environmental protection schemes failing to meet local livelihood needs, undermined ability of local groups, misrepresented or disregarded importance of

diverse local institutions in managing environmental conditions and risk, all of which influence who has access to and control over resources, and arbitrating contested resource claims (Forsyth et al., 1998).

For example, the view that recognising and facilitating the contribution of Indigenous groups in matters of conservation and sustainable development has been found to be increasingly important in regards to the promotion of good environmental governance (Ellis, 2005; Jeffery, 2005). It has been thought that the indigenous poor possess a wealth of information on, and knowledge of traditional sustainable relationships between humans with the environment which can add to, and complement, the scientific and technical knowledge of existing research methods (Cole & Peters, 1997). Moreover, most studies have found that in systems that have solid land tenure practices with strong social ties, people were able to develop local knowledge that mitigated the environmental impacts of a growing poor population (Palsson, 1998). For example in the Solomon Islands, a case study revealed that the increased pressure of the immigrants on natural resources weakened the sea tenure, however this pressure could be diminished significantly with greater reciprocal ties among close kin or neighbours (Aswani, 1999). A type of indigenous ecological knowledge system in Timor-Leste is explored in this thesis within Chapter 9.

In line with the studies mentioned above, alternative approaches to understanding the poverty-environment linkages have emerged. For example, the “environmental entitlements” approach, adapted from Sen’s work on entitlements in the context of famine (Sen, 1981), has shifted the emphasis from questions of resource availability to those of access, control and management (Leach, Mearns, & Scoones, 1997). The “environmental entitlements” approach emphasises that both environments and societies are diverse, differentiated, and dynamic even within communities and local

settings local institutions and power relationships shape the environmental entitlements and environmental management capabilities among different groups of the society. Research on gender-environment relations in rural areas (Joekes, Green, & Leach, 1996) for instance highlighted how labor and time division arrangements in environmental management tasks among women and men, do not always match the equal ownership of tenure rights and decision-making (Leach, 1992; Rocheleau, Thomas-Slayter, & Wangari, 1996).

Central to the environmental entitlements approach was the role of formal and informal institutions in distributing power, shaping people's resource endowments and entitlements and, hence, in mediating people-environment relations. This approach shifted the emphasis on any relationship between poverty and environment as indirect recognising further that the local institutional arrangements are underpinned by power relations, and are shaped in turn, by interactions with regional, national and global-level environmental, political and economic processes (Forsyth et al., 1998).

These arguments were supported by empirical evidence at the micro level. For example, in Nepal during the 1980s, the Lake Rara national park was established using the forced resettlement of some several hundred of the Chhetri ethnic minority (Forsyth et al., 1998). Such an action was undertaken in order to protect forest and watershed resources and to encourage wildlife tourism to Nepal's rural west. However, the action was later agreed to have increased the factors underlying the poverty of the Chhetri people by lessening the land tenure links available to farmers, and as a result of this, also increasing the causes of local deforestation as the farmers sought new land for agriculture. Similarly, in West Africa, state-controlled approaches to natural resource management were found to deny local institutional

control over resources (Angelsen & Wunder, 2003). In Guinea, national forest departments claim ownership of on-farm trees because of a continued and widespread belief that they represent old fragments of forest rather than the belief they were planted there by successive generations of villagers (Fairhead & Leach, 1998). This control has meant that the forest departments have been able to generate revenue and justify their continued existence as government institutions. Nevertheless this has also meant that farmers lack incentives to invest in tree protection and further planting, or to benefit themselves from harvesting timber or other forest products which negatively impact their livelihoods in return.

There was also an increasing trend of putting the household as the unit of analysis and treating assets which have direct impact on people's welfare at the heart of the discussion about poverty-environment analysis (Bebbington, 1999; Carter & Barrett, 2006; Reardon & Vosti, 1995). By putting the households and their assets front and centre, the trend was heading toward understanding whether certain types of assets or poverty make people more reliant on the environment, making them drivers and victims of environmental degradations. For example, based on data from 197 households in 29 villages in Zimbabwe, Cavendish (2000) found that the income poor households relied more on the environment for income than the rich where the poor derives as much as 40 percent of their incomes from natural resources compared to 30 percent for the rich. Reddy and Chakravarty (1999) based on data from 232 households in 12 Himalayan villages, similarly found that dependence on resources decreases from 22.78 percent for the poor to 4.26 percent for the rich. On the contrary however Adhikari (2003) using data from 330 households in eight forest user groups in Nepal, found that dependence increases with income, from 14 percent for the poor to 22 percent for the rich. The findings of these studies suggest that there

is no consistent trend and environmental dependence of the poor and the rich depend on a number of external factors.

Developments in poverty-environment research have provided greater encouragement to define the environment particularly in relation to actual and varied processes of environmental change, as well as the diverse ways these may be valued by different people. Similarly a meaningful poverty hypothesis is required to holistically understand how poverty manifests itself locally and in relation to the changes in the environment, and how it is mediated through various institutions and processes. It can be concluded that an understanding of poverty based on the varied constitution of livelihoods, including among different members of local populations needs to be the centre of focus while it shall be recognised that mediating forces such as the institutions are influential in shaping the nature of the relationship of poverty and environment. There is also the need to move away from macro scale approaches and policies and towards a greater appreciation of people in places. This change can be justified on the basis that all macro scale change is experienced at the local level (Chambers, 1997; Mearns, 1991), or simply that the experience of poverty and environmental problems is differentiated spatially and within society. As a result, macro scale responses are unlikely to address the multitude of different experiences of environmental or poverty problems experienced locally than would a locally determined approach to address these problems.

2.5. POPULATION POVERTY AND ENVIRONMENT RELATIONS IN THE CONTEXT OF FRAGILITY: LINKS TO PEACE AND SUSTAINABLE DEVELOPMENT

Today one of the biggest challenges of many developing countries is the fragile state of governance. The state of fragility remains as one of the biggest obstacles to global

peace and sustainable development (PSN, 2012). The so-called fragile states currently host 20 percent of the world's 7 billion inhabitants. Many of these fragile countries have the world's highest population growth rates. They host large percentages of the income poor who live in environments that are rapidly deteriorating. Hence, studying PPE relations in fragile states and exploring how national institutions, policies and processes are shaping the manifestations of these in local contexts is important to guide peace, poverty reduction and sustainable development efforts in these countries.

The notion of a fragile state is a highly contested concept and its definitions vary, often focusing on different dimensions of fragility. These dimensions may include a state's level of territorial control, its administrative capacity, prevalence of authoritarian or repressive politics, respect for the rule of law, levels of development and/or presence of violent conflict (Torres & Anderson, 2004).

A growing consensus among development actors suggests that fragility relates fundamentally to the willingness and capacity of the state to perform certain core functions. This view for example is evident in the definition by the OECD (2007) which suggests that states are fragile when state structures lack political will and/or capacity to provide the basic functions needed for poverty reduction, development and to safeguard the security and human rights of their population. The OECD (2013) also defines fragile states as those who lack the ability to develop mutually constructive relations with society and have a weak capacity to carry out basic governance functions which include, as stated above, ensuring safety, maintaining rule of law and justice, providing basic services and managing public resources (OECD, 2013; PSN, 2012). A particular characteristic of this definition is the view that fragile states are unable to keep societal expectations and state capacity in

equilibrium and fail to establish reciprocal state-society relations or create a binding social contract (Steward & Brown, 2009).

Fragile states are often low income countries with low human development. Their citizens are mostly vulnerable to a whole range of internal and external shocks including residue of past conflict (World Bank, 2009b) which in turn make these countries particularly more susceptible to further instability, with potential consequences beyond their borders (OECD, 2013).

The relationship of how fragility, violent conflict and development play out in practice depends largely on the context (Elhawary, Foresti, & Pantuliano, 2010). The underlying political, socio-economic and environmental factors contributing to the state of fragility and potential for conflict may be related to population dynamics, environmental degradation, resource scarcity and inequalities (PSN, 2012). Collier (2007) finds that it is particularly the low income, slow economic growth and primary commodity dependence (such as oil) which make a country prone to civil war. Likewise Barnett and Adger (2007) argue that poor countries are more susceptible to conflict as they often lack institutional arrangements for peaceful conflict resolution and have limited capacities to adapt to changing socio-economic demographic or environmental trends. Collier (2007) suggests while a typical low income country faces a risk of civil war at 14 percent in any five-year period, each percentage point added to the economic growth rate knocks off a percentage from the risk. What is also interesting in his study is that the author finds no significant association between the risk of civil war and political repression or income inequality or ethnic diversity, and whether the country had been the colonial power or how long it had be decolonised. However, Collier finds that being young, being uneducated

and being without dependents make people more likely to engage in political violence.

The United Nations echoes the concerns relating to the destabilising effect of demographic trends by stating that societies currently in conflict or in post-conflict transition, are facing a demographic challenge of extremely high proportion of young population at a time when people in these societies are still recovering from the scars of occupation, an economic slump, and periodic outbreaks of political violence (Crossette, 2010). A number of recent studies have shown that a large youth bulge (usually defined as a high proportion of 15-to-24 year olds relative to the adult population), which is particularly the case for many fragile states, is associated with a high risk of outbreak of civil conflict (Cincotta, 2005). Laipson (2007) suggests that countries with younger age structures combined with poor economic performance, scarce resources, and major development problems are vulnerable to extremist organisations, insurgencies or militia that offer economic incentives and an identity that are not available in the open economy. Choucri (1974) argues that youth belonging to large cohorts will be especially vulnerable to unemployment if their entry into the labour force coincides with periods of serious economic decline because such coincidences may move young people towards the use of violence due to despair. Demographic shifts can certainly lead to a sense of deprivation where youth bulges can result in large numbers of uneducated, unemployed and frustrated young people who feel both absolutely and relatively deprived (Kahl, 2002).

In addition to low or stagnating income and the emergence of a youth bulge, empirical research has also shown that high risk of conflict is strongly correlated with high reliance on natural resources and other demographic factors such as high population density (Bordean & Elbadawi, 2007). Cincotta et al. (2003) found that

countries with low availability of cropland or renewable fresh water are 1.5 times more likely to experience conflict than others. Disputes and violent conflict between farmers over land are increasingly found frequent as availability of arable land decreases in the face of various factors including population increase (Brown, 2009). According to Neo-Malthusians, environmental degradation and demographic and environmental stress (DES) produce three interrelated strains on societies: renewable resource scarcity, economic marginalisation and demographic shifts (Kahl, 2002).

It is suggested that population growth environmental degradation and maldistribution of critical resources often work in tandem to produce chronic poverty, landlessness and income inequality in rural areas of the developing world (Goldstone, 1999). Economic marginalisation due to DES may also be further aggravated by a weakened state and social elites who capitalise on scarcities on cropland, timber or other resources to enrich themselves at the expense of others (Goldstone, 1999). Population growth and internal migration on the other hand can reduce a state's relative coercive power by creating a large concentration of individuals in urban areas or outlying rural areas that are increasing costly to control (Goldstone, 1991).

Bejaminsen (2008) argues that DES played a significant role in the Tuareg rebellion in Mali during 1990-1996, a conflict over resources following repeated droughts and forced migration for the nomadic Tuareg. Theisen (2008) found that in several countries that face severe poverty and DES, resource scarcity has contributed to violence and political uprising through increased social inequalities (such as civil war in Sudan, clashes in Kenya, genocide in Rwanda).

While high population growth and the resulting pressures on natural and public resources can intensify social, economic and environmental concerns in all countries (PSN, 2010), these pressures can cause extreme challenges for fragile state contexts. In support of this, Goldstone (2001) and Homer-Dixon (1994) agree that population and environmental pressures can generate intense hardship and increase incentives to engage in civil strife but add that deprivation leads to violence only in the context of a dramatically weakened state. Literature suggests that the dual strains that DES has placed on societies and governing institutions have played important causal roles in recent civil strife in Bougainville in Papua New Guinea (Boge, 1992), Gaza (Kimberly & Homer-Dixon, 1996a), and Pakistan (Kimberly & Homer-Dixon, 1996b).

Goldstone (2001) however notes that neither environmental degradation nor population growth by themselves act as motors of regional political crises. In a similar vein, Homer Dixon (1994) argues environmental scarcity produces its effects within extremely complex ecological-political systems and when it does contribute to violence it always interacts with other political economic and social factors. Hence, environmental scarcity's causal role can never be separated from the contextual factors which are often unique to the society in question.

In very recent years, the role of climate change is being discussed and for the first time the UN in its IPCC report designates climate change a threat to human security (International Panel for Climate Change [IPCC], 2013). There is general agreement that climate change may lead to significant reductions in agricultural productivity in developing countries through changes in temperature and precipitation, soil moisture and soil fertility, the duration of growing season and an increased probability of extreme climatic conditions (McGuigan, Reynolds, & Wiedmer, 2002). The IPCC

suggests that a mean global temperature increase of 2.5°C would lead to an increase in food prices (IPCC, 2013).

The Pentagon and the CIA for instance have released a number of threat assessments identifying climate change as a threat to military installations, and as a potential driver of conflict (Goldenberg, 2014). The UN (2013) states that although climate change would not start a civil war on its own, it agrees with the argument that climate change can indirectly increase risks of violent conflicts in the form of civil war and inter-group violence. Poverty and economic shocks (for example, in the form of decrease in food supply or spiralling international food prices), and natural resource scarcities contributing to competing demands over land and water, are identified to be particularly sensitive to changing climate. The impacts of conflict themselves on the other hand are also argued to dampen a state's capacity to fulfil its social contract to protect its own people, thus, making people more vulnerable to climate change (Barnett & Adger, 2007).

Recent scholarship by both neo-Malthusians and neo-classical economists suggests that a careful analysis of population growth and natural resource pressures is imperative if we are to understand the causes of some, although certainly not all, internal wars (Kahl, 2002). The Rio Declaration of the United Nations Conference on Environment and Development in 1992, in its Principle 25, states that, "peace, development and environmental protection are interdependent and indivisible" (UN, 1992). In support of this principle, it is important that the foundations for reducing the risk of violent conflict, sustainable development and peace building efforts in fragile states need to be built on a sound analysis of the country's unique DES and PPE relations.

2.6. CONNECTING THE LINKS: A CONCEPTUAL FRAMEWORK FOR STUDYING POVERTY, POPULATION AND ENVIRONMENT RELATIONS FOR PEACE AND SUSTAINABLE DEVELOPMENT

Given the theoretical approaches and empirical evidence shedding light on the debates around the population-poverty and environment (PPE) nexus, it is fair to conclude that a clearcut or at least a one way link between PPE is hard to establish because the relationships are not directly causal but instead shaped by a number of mediating factors particularly the institutions and processes. Moreover the review of literature provided in this chapter suggests that the debates are continuously changing in relation to new understandings by each proponent, including that of the complex nature of poverty and environmental change and shifts in population trends and dynamics. Therefore, the complex and ever changing human-environment-development interactions require multi-disciplinary research involving theoretical flexibility and a multiplicity of data collection tools that can capture the variety of sources of change and the variety of responses by the population (de Sherbinin et al., 2008). It is important to explore these interlinkages in the context of transition to sustainability at the micro level because often their unique interactions are experienced spatially and within societies.

The literature reviewed in this chapter pertains to countries other than Timor-Leste, primarily because there are no studies of the aspects reviewed here specifically for Timor-Leste. This research hence proposes a conceptual framework for studying PPE relations in Timor-Leste based on the knowledge gained from the literature provided in this chapter and knowledge of the country. In spite of the shortcomings which this literature review might have, this research identifies that the sustainable livelihoods approach offers a useful organising framework to study PPE relations in Timor-Leste both from a micro and a macro perspective.

The origins of the sustainable livelihoods approach (SLA), of which a recently modified version is improved and which has been conceptualised and adapted in this thesis, has emerged from the paradigm shifts in rural development through the 1980s and 1990s and was much inspired by the work of Amartya Sen (1981) and Richard Chambers (1992) on capabilities and entitlements (De Haan, 2012). The approach was particularly evolved from many decades of changing perspectives on poverty: how poor people construct their lives in the context of constraints and opportunities; and how structural and institutional issues play an important role in shaping people's capabilities and activities in constructing their lives (Ashley & Carney, 1999). The framework is people-centred and focuses on human well-being and sustainability whilst mainstreaming the environment (Carney, 1998). The SLA is also regarded by some as the "operational vehicle" of human development (Singh & Gilman, 1999).

Since the 1990s, SLA has become increasingly popular in development thinking and has been used by a growing number of research and applied development organisations including the Department for International Development (DFID) of the United Kingdom, the United Nations Development Program (UNDP), as well as non-governmental organisations such as CARE and Oxfam (Carney et al, 1999; De Haan, 2005; DFID, 1999). There have been conceptual contributions to the framework also from research institutions such as the International Development Institute of Sussex (IDS), the Overseas Development Institute (ODI), and the Society for International Development (SID) (De Haan, 2012). This research has modified some of the components of the framework in order to better reflect the Timor-Leste context.

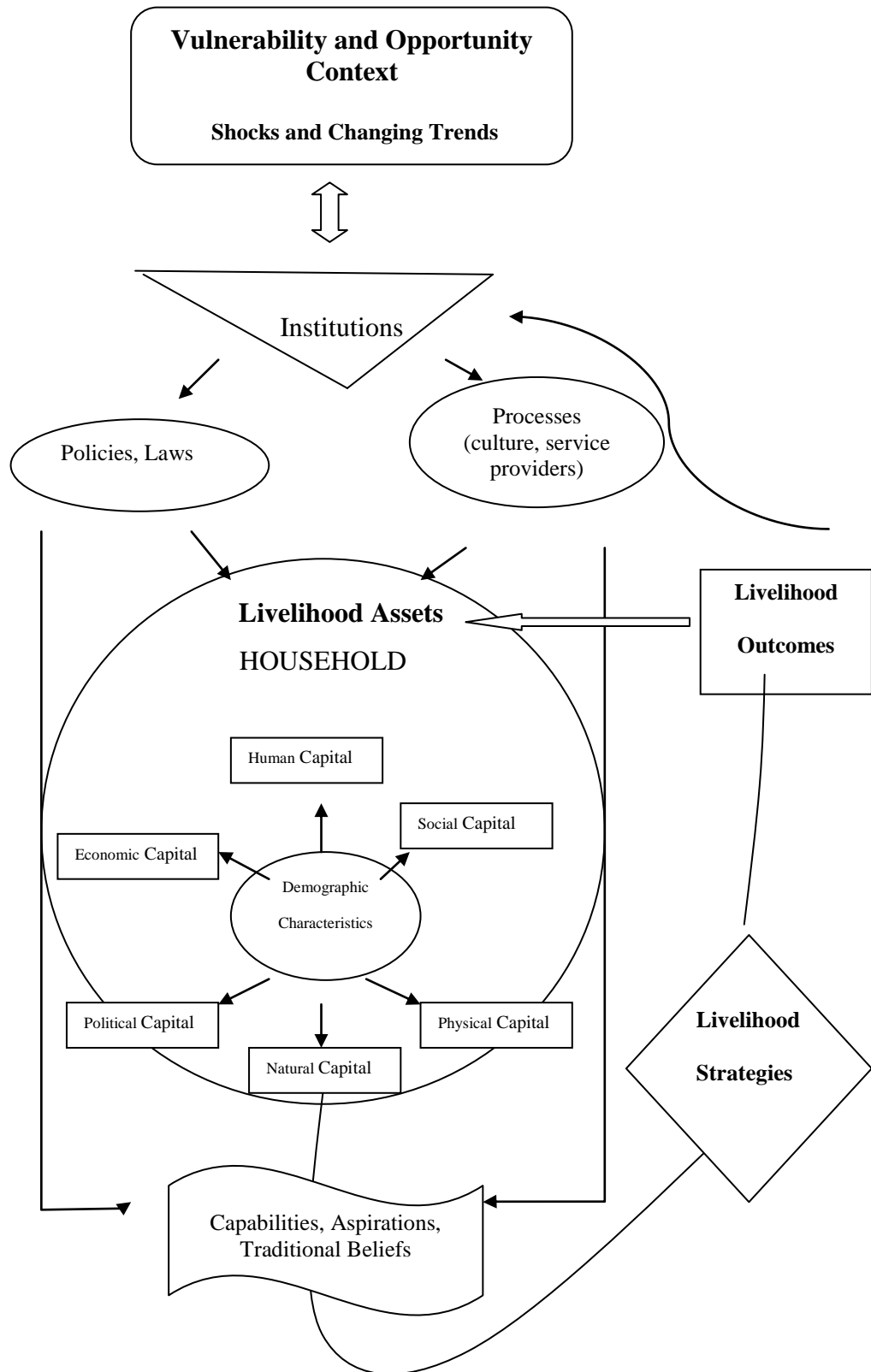


Figure 2.4. *Modified SLA Framework adapted to the present research. Source: Prepared by the researcher based on the review of relevant literature*

The modified SLA framework used in this thesis (illustrated in Figure 2.4) places households³ and their demographic characteristics (such as age and gender of the household head, household size, number of children) at the centre of a web of inter-related influences.

Closest to the people in a household are the resources and livelihood assets that they have access to and can use. People's ability to access, use, reinvest and accumulate these livelihood assets is largely influenced by their asset portfolio, vulnerability and opportunities context. The accumulation of one asset often results in the accumulation of others, while insecurity in one can affect other assets (Moser, 2006). The vulnerability context can include for example economic political or social shocks, civil strife, trends over time and space such as the population trends and urbanisation, technological trends, seasonality such as changing prices and employment opportunities, natural disasters and climate change. The vulnerability context in this framework affects the institutional structures and their functioning whilst mediated through the same supported by policies, laws and processes. These mediating drivers in the context of vulnerabilities impact on people's capabilities, aspirations and traditional beliefs which fundamentally affect the ways in which people develop their livelihood strategies, in other words, the way they combine and use their livelihood assets to achieve their livelihood goals. These livelihood goals can include increased food security, increased income, increased spiritual and social well-being, or simply increased livelihood assets as an end to themselves.

³ Household is defined as a group of people, normally family members, living under the same roof, and pooling their livelihood assets. See UN, 2007.

According to the generally accepted definition, livelihood comprises the capabilities, assets and activities required for a means of living. It is considered sustainable when it can cope with and recover from stresses and shocks, and maintain or enhance its capabilities and assets both now and in the future, without undermining the natural resource base (Carney et al., 1999). On the contrary, livelihood is perceived as vulnerable if it lacks the capacity and the capability to cope with forces and factors threatening its sustainable existence. Therefore, poverty arises from vulnerability and reflects the lack or loss of sustainable livelihood. Assets referred also as capitals in this framework are considered not only as resources from which poor people make a living, but also as the sources that give meaning to a person's life, allow them to engage more fruitfully and meaningfully in the world, and have the power and capability to be, to act and to ultimately bring about change (Morse & McNamara, 2013). Bebbington (1999) for example suggests that the capitals (included as economic, human, social, political, natural and physical capital in this thesis) take three distinct roles. These roles are: firstly, being the vehicles for instrumental change (make a living); secondly, providing hermeneutic action (making living meaningful); and thirdly, supporting emancipatory action (challenging the structures under which one makes a living). Assets in SLA therefore shall not be understood only as things that allow survival, adaptation and poverty alleviation, but as the basis of an agent's power to act and reproduce, challenge and change the rules that govern the control, use and transformation of resources (Bebbington, 1999). Moser (2006) argues that first generation asset accumulation provides social and physical infrastructure which are essential for human and economic capital formation, and are the preconditions for individuals and households to further accumulate their own and move out of poverty. Second generation asset accumulation, on the other hand, focuses on the erosion of accumulated micro level assets in the context of risks

including global warming and natural disasters, corruption, post-conflict contexts, accelerated urbanisation, increasing inequality, and growing violence, for instance. The author identifies economic and natural capital as protective or preventive assets providing a critical buffer against shocks that precipitate households to fall into poverty, whilst human and political capital are viewed as promotional assets and social capital that hold everything together.

The SLA framework offers many advantages for its use as an organising framework. To start with, it is a people-centred framework which is holistic in the sense that it acknowledges that many mediating factors such as institutions and processes are involved in shaping the way people construct their livelihoods. The framework promotes a link between micro and macro level findings to feed into structural and policy adjustments for sustainable livelihoods through broad partnerships among multiple stakeholders. These include the civil society, the government, the private sector, community-based and international organisations. Ultimately, it aims to highlight the entry points for supporting people's sustainable livelihoods and asset accumulation in a context-specific setting (Moser, 2006). From a more micro level perspective, the approach promotes coherence between poverty reduction concepts and definitions of poverty. It responds to the understanding of the multi-dimensional nature of poverty by including aspects of, for instance, human, political and social capital that go well beyond material well-being. It assures that diversity of livelihoods (hence the multi-faceted rationalities in people's decision-making) is taken into account, and capabilities and aspirations are embedded in livelihood systems where they become functional in pursuing livelihood strategies. Moreover, the approach helps integrate culture into development thinking and practice as an essential dimension without promoting cultural determinism of development and

calls for further understanding of cultural and spiritual aspects of sustainable livelihood. Previous versions of the SLA were criticised for not placing participation and empowerment as an end goal, however the improvised version of the framework used in this thesis recognises that they can be an end in themselves.

Although the conceptual framework offers a great deal of advantages as discussed above, like in any other approach it has its own weaknesses. Some argue that culture needs to be regarded as an additional asset as it is not the same with social capital (Cahn, 2006). This research acknowledges that despite the overlaps between social and cultural capital⁴, culture has its features which are not reflected in social capital such as heritage, custom, tradition and values. However this thesis treats culture as embedded in all six of the livelihood assets. This research is also aware that by adapting this conceptual framework and analysing the household as the unit of analysis, it will not be able to reflect on the gender-related power dynamics within a household or the society as a whole. There is a whole body of recent literature that shows that, in reality, poor people, particularly women, do not get equal opportunity of access (Hausmann, Tyson, & Zahidi, 2010). Although not directly addressing the gender inequality matters specifically in the livelihood asset analysis, this thesis makes relevant policy recommendations and acknowledges that participation and empowerment of the poor, particularly women, through their involvement in decision-making is an end in itself. Thirdly, by adapting a flexible framework where measures are not pre-defined, it also acknowledges that the methodology designed to analyse livelihood assets in Timor-Leste may not be applied to a different context for

⁴ Cultural capital is defined as the cultural resources (heritage, customs, traditions) upon which people can draw in pursuit of livelihoods. Source: Human Sciences Research Centre, 2002.

cross-country comparative analysis, and it may not be fully representative of the reality as it is impossible to cover all aspects of a diverse livelihood.

Applying this conceptual framework in Timor-Leste's post-conflict fragile state context, this research will initially explore the population growth and changing demographic trends in peace, sustainable development and poverty reduction at a macro level. It will then focus on assessing the household's livelihood assets in order to provide a multi-dimensional poverty assessment at the household level, and on exploring the relations between household demographics, a household's asset portfolio, and choice of forest dependence as a livelihood strategy. In the latter sections of the thesis, a detailed review of the institutions, policies and processes will be provided to understand the mediating drivers of asset accumulation and livelihood strategy development in Timor-Leste. Finally, entry points will be identified for policy directions, and institutional and structural adaptations to improve people's sustainable livelihood.

CHAPTER 3: METHODOLOGY

3.1. INTRODUCTION

This thesis has predominantly used a research method that involves primary and secondary data for its core analysis. Multiple data collection tools have been used in order to capture the multidimensional dynamics of human and environment relations in the context of Timor-Leste. This thesis puts a trans-disciplinary approach, public participation, communication, and mutual learning at the centre of the research undertaken. Thus, its methodology has allowed theoretical flexibility and dynamic change within the research design following participatory consultations undertaken with the local Timorese community, donors, government agencies, civil society and scholars from Timor-Leste and Australia working in the field of population and development.

The core analysis of this thesis predominantly relies on the primary data that were collected during field work conducted in Timor-Leste between October 2011 and May 2012 over a period of eight months. This research uses secondary and primary data together in order to achieve a broader picture of the population, poverty and environment relations feeding into a policy dialogue that is essential for Timor-Leste's sustainable development. This research is distinctive in trying to process the secondary data to analyse the current population dynamics of Timor-Leste and to develop a future population scenario for the period between 2010 and 2030, in order to highlight macro level opportunities and challenges related to the population, development, and the fragile state nexus. These will include, for example, relations between population growth and its impact on peace, development and environment; age structure and its links with poverty reduction, labour dynamics and beyond.

Through the analysis of the primary data, on the other hand, this thesis provides empirical evidence for a micro level population, and poverty and environment relations at the household level. It provides empirical evidence of, for instance, whether household size, socio-economic status and the livelihood asset portfolio of a household are linked to the level of a household's reliance on forest resources. On the basis of community consultations, the macro and micro level findings are then combined to provide the desired public policy directions for sustainable development and poverty reduction in Timor-Leste.

The present chapter is organised in two parts. The first part starts with a brief introduction to the use of secondary data for analysing Timor-Leste's current population dynamics and projecting its population to 2030. It involves information about the secondary data sources that are used, as well as the population projection method that is adopted. The second part of this chapter introduces the process of primary data collection and survey methods used through a detailed assessment of the field work. Section 3.3.1 highlights the process of study area selection and describes the selected research sites to give relevant information on the context which influences human-environment relations. Section 3.3.2 presents the design of the survey questions used in the household level and village level questionnaires while introducing the guiding principles and ideas for focus group discussions and in-depth interviews. Section 3.3.3 introduces the recruitment and training process of the research team consisting of local Timorese students who took part in the data collection. Section 3.3.4 describes the process of sampling and final size of the sample, while section 3.4 discusses the limitations of the primary data collected. Finally, Section 3.5 gives a brief review of the analytical tools used for processing the primary data and reporting of the statistical results.

3.2. METHODS OF POPULATION ANALYSIS AND POPULATION PROJECTION

The major sources of demographic and socio-economic data include population censuses, household-based sample surveys, vital registration systems and administrative records. As in most developing countries, the main sources of data in Timor-Leste are the population censuses and household-based sample surveys. This is mainly because other data sources such as vital registration systems and administrative records are not yet fully operational and hence their coverage is low, offering very limited demographic data (Government of Timor-Leste, 2010d). This thesis mainly uses the recent national population censuses 2004 and 2010 and the Demographic and Health Surveys (DHS) of 2003 and 2009 for a systematic exploration of Timor-Leste's current population status and changing trends in the past decade.

In addition to a detailed analysis of a country's current population dynamics, preparing population projections is the second critical step in incorporating population concerns into comprehensive development planning (United Nations, 1989). Comprehensive planning and its inseparable component policy-making, requires the recognition of an existing problem and its placement on the policy agenda for an open dialogue.

Population dynamics are central to many development objectives and therefore their analysis is generally considered a key ingredient of development planning. Rapid population growth, explained further in Chapters 4 and 5, is a major issue exacerbating development problems in Timor-Leste, just like in many other developing countries with rapidly growing populations.

Population projections serve as very useful tools to illustrate the future magnitude of the problems associated with population growth and changing demographic characteristics of a country. Population projections can help countries direct their policies to achieve their favoured goals and objectives on the basis of the future demographic scenario. Population modelling also provides evidence in relation to population composition, in terms of its age and sex distribution and broad ranging consequences for development, environmental sustainability, peace and political stability (United Nations, 1989). Population projections are therefore valuable in demonstrating the macro level interrelatedness of population dynamics with overall development objectives.

A variety of methods can be used to project a nation's population. Among these is the cohort component method which can project population by age and sex, employing the initial age and sex structure of the population together with realistic assumptions about the future course of the components of population change such as fertility, mortality, and migration (United Nations, 1989).

The cohort component method generally takes 5-year age and sex groups of the population and ages them over time using survival rates. The numbers of those surviving populations are added to the quantity of births that take place during the projection period (calculated based on age-specific fertility rates), and amount of net migrants to project the future population by age and sex groups.

The major strength of this technique is its ability to project a population in a straightforward and unambiguous manner without embodying restrictive or arbitrary assumptions (United Nations, 1989). This method generates sound projection results

which are indispensable to any planning exercise which seeks to take the future population change into account (United Nations, 1989)

Based on the strengths of this method, the research utilises population projection software named SPECTRUM that is based on the cohort component method and is a Windows-based system of integrated policy model (Stover & Kirmeyer, 2007). The SPECTRUM policy model system is an integrated package of seven components, two of which are used in the analysis of this thesis, namely DemProj and RAPID.

The DemProj model was first developed in 1980 and the RAPID model was originally created in 1978 and both have been subsequently updated several times since then. Both models are widely used by a large number of planners and researchers around the world as well as policy makers and national governments (Stover & Kirmeyer, 2007). Details of these two projection components and the basic input and output that can be generated by these are presented in Appendix 1. Specific assumptions made in relation to basic input are predominantly explained in Chapter 5; however, it is important to mention that the sourcing of these assumptions relies heavily on secondary data, and an extensive literature review that covers the changing trends between Timor-Leste's latest two censuses in 2004 and 2010 and two demographic health surveys (DHS) in 2003 and 2009. Various national and international reports as well as the country's strategic development plans were also used to make assumptions required for Timor-Leste's future population scenario. Although population projections are traditionally done with three different scenarios termed as low, medium and high, for the purpose of this research the thesis will only present the findings of the medium path. This is mainly because it is the medium path which represents the most likely future population scenario and generates the most essential debate on that scenario becoming a reality.

3.3. METHODS OF PRIMARY DATA COLLECTION: THE FIELD WORK

Field research has been a common technique in social sciences since the 20th century (Angelsen, Larsen, Lund, Smith-Hall, & Wunder, 2011). Today, Malinowski's (1922) argument suggesting that the anthropologists needed to get off the verandas of the missionaries' and government officials' houses to see what local people were really doing in their homes and fields, can easily be attributed to the development of a modern tradition of fieldwork. Field research provides a deep understanding of the local contexts, allowing the researcher to investigate the origins, scope and scale of a problem whilst gauging local opinions on the causes, consequences and means to resolve it (Angelsen et al., 2011).

With the recognition of the value of field research in terms of providing opportunities to observe the natural setting and understand the local dynamics, this thesis uses field research technique as its main methodological tool to collect primary data to better understand PPE relations. This is also because the available secondary data were not sufficient to address the research questions. The thesis applies both quantitative and qualitative methods to collect primary data for a broad investigation on how population, poverty and environment relations are shaped by human behaviour, cultural, and institutional elements.

Prior to the commencement of the field work, ethics approval was sought from the Flinders University Social and Behavioural Ethic Committee. This is because all research conducted with an affiliation of an Australian body and involving human contact requires ethics approval under Australian Law. Upon submission of a detailed report on the proposed plan of data collection and the tools provided to ensure participants' consent, privacy and anonymity, the ethics approval for the field work was granted in November 2011 with the SBREC project number, 5412.

The field work was conducted in five out of thirteen districts in Timor-Leste between November 2011 and June 2012. The selected districts included Ainaro, Lautem, Manufahi, Liquica and Dili and had a geographical distribution covering mainly the Eastern and Central regions of the country. The method of selecting these districts is described in sub-section 3.3.1 below. The research method of the field work consisted of structured interviews of villages and households, semi-structured focus group discussions, and in-depth interviews with various stakeholders and site visits to various sustainable development projects. A research team of five Timorese students was recruited and trained for five consecutive days in Timor-Leste for data collection in the selected study areas.

3.3.1. Selection and Description of the Study Area

3.3.1.1. Selection of the Study Area

Timor-Leste, located at the eastern end of the Lesser Sunda archipelago, occupies the eastern half of Timor Island and includes an enclave within the Indonesian province of West Timor (Timor-Kupang). It is geographically situated between latitudes 8°15 and 10°30 south, and longitudes 124°50 and 127°30 east. To the north, it is bounded by the Sawu Sea and Straits of Wetar while the 500-km gap between Timor-Leste and Australia is filled by Timor Sea to the south (Government of Timor-Leste, 2012).



Figure 3.1. Map of Timor-Leste. Source: Australia Timor-Leste Friendship Network, 2009.

Timor-Leste's administrative structure comprises 13 districts, 65 sub districts and 442 villages (Government of the Democratic Republic of Timor-Leste, 2010). The current population of Timor-Leste which was reported as 1.06 million according to the 2010 census is the target population of this research. Evidently, it is not possible to cover the entire population and the whole country in this research due to time and budget constraints. Instead, a sample survey approach has been adopted which serves the scope of the research adequately. The sample survey consisted of selecting five districts and a nominated number of stakeholders for interviews and focus group discussions according to the following selection criteria.

The first consideration in selecting the study areas was to include villages that were representative of the Timorese population as far as possible. Given that 75 percent of the Timorese population is rural, the sample group needed to be selected predominantly from rural areas, yet still include a proportionate representation of urban places. Secondly, the selected villages needed to provide variations in key variables regarding the focus of this research: these were district level fertility, poverty rates, and district level forest cover.

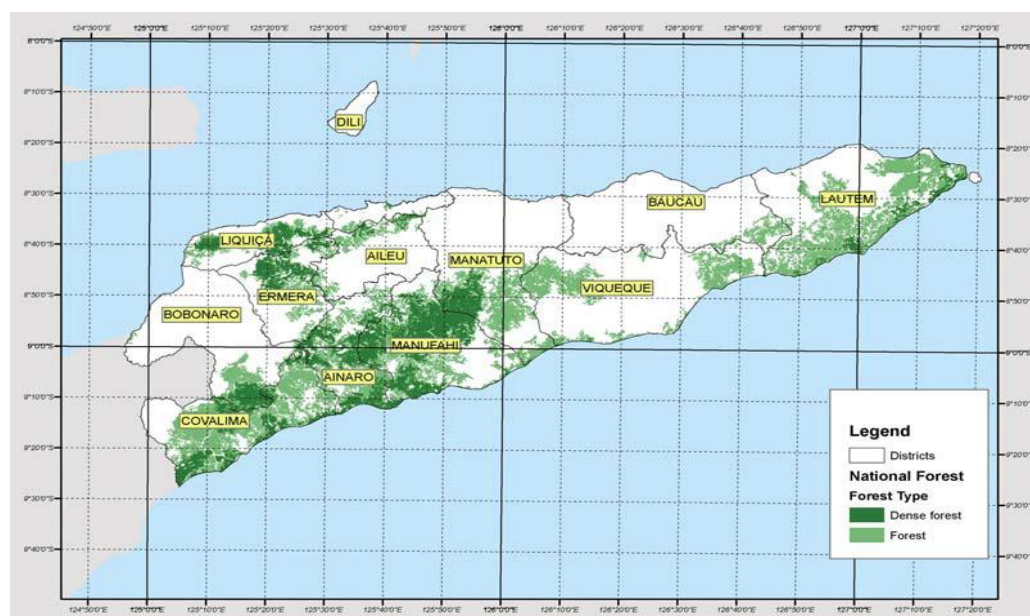
A multi-stage sampling method was hence applied to initially identify clusters of geographical areas to be included in the sample. Initially, a comparative analysis was undertaken to explore the trends in high fertility, poverty and forest cover among the 13 districts of Timor-Leste. Then, the five districts shaded in grey in Table 3.1 were selected as the study areas. By including these districts, the sample aimed at covering the regions with the highest and lowest fertility and poverty rates as well as including rural and urban areas within a broad geographical spectrum with variations in forest cover. Table 3.1 gives a quick illustration of the district level variables that were taken into account in the selection of the research areas, and Figure 3.2 maps out the forest cover in the country.

Table 3.1

Indicators Used to Select Study Areas (District)

Districts of Timor-Leste	Total Fertility Rate (2010)	Multi-dimensional Poverty Index (MPI) ⁵ by OPHI (2011)	Forested Area
Aileu	5.6	0.38	Sparse
Ainaro	7.2	0.44	Dense
Baucau	5.5	0.36	Rare
Bobonaro	6.0	0.41	Rare
Cova-Lima	4.4	0.31	Dense
Dili	4.6	0.13	Rare
Ermera	6.6	0.5	Sparse
Lautem	6.7	0.37	Moderate
Liquica	5.5	0.39	Dense
Manatuto	5.5	0.30	Moderate
Manufahi	5.9	0.35	Dense
Oecussi	6.6	0.51	Rare
Viqueque	5.6	0.4	Sparse

Source: Government of Timor-Leste, 2010d; OPHI, 2011; UNDP, 2011d.



⁵ MPI is calculated by multiplying the incidence of poverty by the average intensity across the poor. It has three dimensions and ten indicators. These dimensions include education, health, and standard of living. The indicators are based on years of schooling, school attendance, child mortality, nutrition, cooking fuel, sanitation, water, electricity, flooring material and asset ownership. See Alkire, José, Santos, & Suman, 2011.

Figure 3.2. Map of Forest cover in Timor-Leste. Source: Democratic Republic of Timor-Leste, 2011.

Following the identification of districts, a second stage of sampling was applied using aerial photographs to select one to two villages in each district based on their distance from both the dense forest cover and the district capitals. Finally, a total number of eight villages (see Figure 3.3) were selected among five districts for village and household interviews and focus group discussions. A random sampling with a systematic start was used to recruit households to be interviewed.



Figure 3.3. Approximate Locations of the Eight Villages Selected for this Research. Source: Adopted by the researcher from Ministry of Finance, 2010

3.3.1.2. Description of the Research Areas

The following tables provide descriptive information about the eight villages selected as research sites for this project. The information presented in the tables are gathered from Timor-Leste’s national census (2010) and the village level surveys undertaken for this research. As can be observed from the three tables below, the selected villages cover a broad range of development and urbanization levels with striking differences in their population sizes, levels of infrastructure development they enjoy,

the socio-economic differences such as the rates of school attendance, youth literacy rates, and involvement in agricultural production.

Table 3.2

Demographic and Socio-Economic Indicators Selected To Describe the Characteristics of the Villages Selected As Study Areas (i)

Name of the district	Name of the village	Village Population	Number of Households in each village	Availability of a usable road during all seasons	Distance to major market	Time spent to access from Dili
Ainaro	Ainaro	6,837	871	Yes	< 1 km	6 hours
	Manu Tasi	1,704	265	No	5 kms	6.5 hours
Manufahi	Letefoho	6,759	1015	Yes	< 1 km	8 hours
	Hola Rua	5,384	885	No	4 kms	8 hours
Lautem	Iliomar 1	1,205	253	Yes	34 kms	7.5 hours
	Fuat	887	156	Yes	40 kms	9 hours
Liquica	Ulmera	2,916	465	Yes	18 kms	1.5 hours
Dili	Comoro	65,404	9,941	Yes	< 1 km	0.5 hours

Source: Government of the Democratic Republic of Timor-Leste, 2010; Fieldwork, 2011-2012.

Table 3.3

Demographic and Socio-Economic Indicators Selected To Describe the Characteristics of the Villages Selected As Study Areas (Ii)

Name of the district	Name of the village	Mother Tongue	Percent never attended school	Percentage Youth Literacy (age 15-24)	Percentage involved in crop production	Major Crops
Ainaro	Ainaro	Tetum Prasa	18	94	69	Coffee, Corn, Cassava, Banana
	Manu Tasi	Tetum Prasa	22	86	80	Coffee, Corn, Cassava
Manufahi	Letefoho	Tetum Prasa	22	84	62	Banana, Avocado, Cassava
	Hola Rua	Mambai	38	71	64	Corn, Cassava
Lautem	Iliomar I	Makalero	50	50	55	Vegetables, Cassava
	Fuat	Makalero	40	88	79	Banana, Avocado, Corn, Cassava
Liquica	Ulmera	Mambai and Tetum prasa	28	87	85	Corn, Coconut
Dili	Comoro	Tetum prasa	12	93	16	Corn, Cassava

Source: Government of the Democratic Republic of Timor-Leste, 2010; Fieldwork, 2011- 2012.

Table 3.4

Demographic and Socio-Economic Indicators Selected to Describe the Characteristics of the Villages Selected As Study Areas (Iii)

Name of the district	Name of the village	Availability of a Health Clinic	Births attended by skilled health personnel	Improved water access (percent range)	Access to sanitation (percent range)	Percent use of wood for cooking	Percent Use of electricity for lighting
Ainaro	Ainaro	Yes	41%	80-100%	40-60%	95	60-80%
	Manu Tasi	No	22%	60-80%	20-40 %	94	20-40%
Manufahi	Letefoho	Yes	39%	80-100%	40-60%	90	80-100%
	Hola Rua	Yes	17%	60-80%	0-20%	96	20-40%
Lautem	Iliomar I	No	8%	0-20%	20-40%	96	40-60%
	Fuat	No	7%	80-100%	20-40%	94	0-20%
Liquica	Ulmera	Yes	19%	60-80%	20-40%	90	40-60%
Dili	Comoro	No	72%	80-100%	90%	64	80-100%

Source: Government of the Democratic Republic of Timor-Leste, 2010; Fieldwork, 2011- 2012.

3.3.2. Design of Survey Questions

3.3.2.1. Village Level Survey

In Timor-Leste, each village has a village leader, known in Tetum as a *xefe de sucu* (village chief), that is selected by the community. These leaders generally have a good knowledge of their village in relation the customs, customary rules and regulations, economic and social practices, development progress, resources available to the villagers, and also the major problems and challenges experienced by the local community. They are also representatives of the local government who are elected by the people of Timor-Leste. For the above reasons, village level questionnaires are directed at village leaders to collect information on village level variables that are common to all the households within the area. The questions are designed in a semi-structured way and have both qualitative and quantitative components. The questions are predominantly aimed at generating background and contextual information to assess vulnerabilities experienced at the village level and also to be used for micro-level statistical analysis.

The survey was organised in four parts. In the first part of the village level survey, information was gathered on infrastructure and public services such as the availability of a health centre or a usable road in the village, the distance to the district market, and the time spent getting there. In the second part of the survey, information was collected on incidents experienced by the majority of the villagers in the past year which caused vulnerability and stress among them. These incidents included food and water shortages, flooding and drought, major infrastructure deterioration, wild fire in crops or forests, widespread crop pests or animal disease, major political problems, and land or natural resources related conflicts. For those incidents which affected almost all villagers, semi-structured interview questions

were directed at the village chief to collect information about the details of the events, and how they were dealt with at the village level. The third part of the survey was used to collect the details of any type of external support received in relation to better management and sustainable use of forest resources. The fourth and last part of the survey gathered information on the existing local structures of natural resource management and the perceived value of forests for the economy and livelihoods of the villagers. Some of the information gathered from the village level surveys is presented in Tables 3, 4 and 5 which describe the village characteristics. The original village level survey used in the field work is included in this thesis in Appendix 2.

3.3.2.2. Household Survey

The household survey is considered as an essential part of most fieldwork research. In the present research, household surveys were conducted with a focus on human-environment relations. The respondents in the present household survey were the heads of the selected households. A household in this research is defined as a group of people, normally family members, living under the same roof, and pooling resources such as labour, assets and income (Angelsen et al., 2011). Generally, a household head is well defined and understood by the customary rules in Timor-Leste. In most cases this person would be the eldest married male member of the household, but in some situations the household head can be a female or somebody else in the family if several generations are living together. Nationwide, 12 percent of the households are reported to be female-headed (Government of the Democratic Republic of Timor-Leste, 2010). This percentage is quite small when compared with Cambodia, for example, with 22 percent, but is similar to Indonesia's 15 percent (World Bank, 2014). In the sample of households selected for the present research,

only 7.1 percent of the households were headed by a female (12 households were female-headed and 158 were male-headed).

The structured household survey designed for this research allows the application of a sustainable livelihoods approach to measure multidimensional poverty and is focused on the collection of quantitative data that can be used in the statistical analysis to explore micro level population, poverty, and forest reliance relations. The variables included in construction of the household poverty and forest reliance indices are explained further in Chapters 6 and 7.

The design of the household survey is heavily inspired by the content and format of a prototype questionnaire that was developed by the Poverty and Environment Network (Centre for International Forest Research [CIFOR], 2008). This prototype questionnaire and its adopted versions are applied by many researchers to a number of studies conducted in various countries related to sustainable livelihoods and forest dependence. It is a detailed questionnaire exploring poverty and environment relations, aimed at measuring household and environmental income in monetary terms. This research employs the prototype format as the basis of the household questionnaire. However, it has undergone major adaptations given the identification of local barriers, and in the context of the social and cultural settings during the pretesting of the questionnaire. Questions were also added to collect certain types of data to enable an analysis of multi-dimensional poverty and forest reliance when it is not possible to consider any monetary value for these variables.

The final format of the household survey used during the field work is divided into ten thematic parts to collect information in a systematic way. The first part is related to the identification of the household with a specific code for the district and village

name in which the household is located. The second part is focused on collecting information about the household's composition and its demographic characteristics. Information on age, sex, educational level and occupation of all members of the household is collected in this part. Further questions in this section elicited information on the household head's length of residence in the village, his/her current and desired number of children.

The third part of the survey collected information on access to, and ownership of land and farm-based livelihoods. The questions included in this part are related to the type and size of land owned and the sort of crops that are grown. The fourth part focused on some of the economic assets held by the households such as cars, tractors, motorbikes, bicycles, mobile phones, televisions, radios, gas stoves, boats, chainsaws, machetes, axes, generators and water pumps. Information about the household's property/house ownership, and the construction materials of their house were also collected in this section. The fifth part is structured to gather information about the natural resource base to which the household has access, the perception of change in its availability, and the household's choice of livelihood strategy in response to the perceived change in forest resources. The questions included in this section relate to the distance of the household from the nearest forest and the time spent getting there, whether the household collects firewood, the time and labour spent on this activity, any perceived change in the availability of firewood, whether the household plants trees, and the reasons behind tree planting.

Part Six of the household interview deals with significant expenditure or shock experienced by the households as indicators of possible vulnerabilities imposed on them during the past year. The questions asked included whether the household had a bad harvest, whether anybody in the household became seriously sick or died,

whether the household lost anything due to floods, land slide or fire, whether they spent a great deal of money on a wedding, funeral or a cultural ceremony, and finally whether any household member received a fine or punishment from the government, village or traditional leader.⁶ Then, the households were asked about how they dealt with the situation, whether they had to rely on their assets and savings, use forest products, had to borrow from family and friends, or whether they employed a mix of these strategies.

Part Seven of the household survey focused on the household's self-reflective welfare perceptions and social capital that are available to them. The questions asked included whether the household had enough food to feed its members during the past year, how well off the household was compared to other households in the village at the present time and to its own situation five years ago. This part concluded by asking whether the household found their village an agreeable place to live, whether the household members trusted people in the village, and whether they could get help from the village people if needed.

From the eighth part onwards, the focus of the survey shifted toward collecting information on natural resource use and management. Part Eight asked whether the household received any cash, training or material from the government, NGOs or other development agencies during the last year for any of the improved natural resource strategies including tree planting, terracing, protecting areas such as forests or parks, implementing or socialising local customary laws, and for using energy

⁶ The member of the household may get a fine from incidences such as theft, sexual abuse, misuse of natural resources etc.

efficient stoves or solar panels. If the answer to any of these questions was in the affirmative, details of what they received and from which source were all recorded.

Part Nine gathered information on whether the household cleared any forests and if so what the size, type and ownership of the forested land were, how far it was from their house, and for what reasons it was cleared. Finally, Part Ten of the survey involved questions about the types of forest products collected by the household, the household members that are involved in the collection of each product, the ownership and type of land from which each product was collected, and finally the purposes and variety of uses of these products. A copy of the household survey both in Tetum and English is included in Appendix 3.

3.3.2.3. Focus Group Discussions

Focus group discussions were aimed at collecting qualitative information among a sub-group of people that were included in the household survey to further investigate some of the questions raised in the survey. In villages where the focus group discussions took place, the household heads were invited to attend the group discussion to talk further about the issues raised in the household survey. Focus group discussions were arranged to provide an open and safe platform to allow participants to raise their views freely and participate in a debate directed dialogue through a semi-structured list of questions prepared for the discussion (see Appendix 4 for a list of questions raised during the community discussions). Focus group discussions were targeted at sub-groups of household survey participants. The guiding discussion questions were structured to be completed within one to two hours. The questions were related to the popular types of trees that were used for firewood and timber in the village as well as types of food and medicine extracted from the forests. The questions also aimed at understanding deliberate methods of

natural resource management at the village level. The discussion was directed toward shedding light on customary practices and rules, whether they were respected by the local people, and the local perception of their effectiveness.

The information gathered through the focus group discussions allowed for a better understanding of rural people's environmental dependence and their use of natural resources. Discussions also highlighted local people's knowledge of their immediate environment, their perceived change as well as their local environmental management mechanisms. The input received from the focus group discussions, which included community expectations of support from the policy leaders, helped this research to develop policy recommendations for Timor-Leste's sustainable future.

3.3.2.4. In-depth interviews

In depth interviews were designed to be used for key policy leaders, program officers, researchers, scholars and advisors working at different levels of decision-making in Timor-Leste, including in government ministries and international development agencies, NGOs and donors. A number of questions were drafted in relation to poverty reduction, family planning and natural resource management, and were directed at the key informants mentioned above. These interviews were aimed at collecting qualitative information regarding rural development programs, existing legal structures, and strengths and weaknesses in institutional, legal, financial and managerial issues when it comes to governance for sustainable development initiatives. The research design didn't have a nominated number of stakeholder interviews. The intention was rather to collect as much information as possible (until the responses seem not to diverge from previous ones collected) within the

timeframe of the fieldwork. Within this scope, a total number of 40 in-depth interviews were found adequate.

3.3.3. Recruitment of Research Team and Their Training

Timor-Leste is a culturally rich society and has a broad linguistic diversity. There are over twenty languages spoken across the country (Australian Broadcasting Corporation, 2004; Hull, 2000) but there are two official languages, Portuguese and Tetum. Tetum is the indigenous language with roots linked to the Malayo-Polynesian languages. The other indigenous languages which have official recognition under the Timorese constitution include Fataluku, Kemak, Makassae, and Galoli (Hull, 2000).

Portuguese on the other hand was the language used by the colonial powers which coexisted with Tetum and other languages for centuries. Under the Portuguese rule, all education was delivered through the medium of Portuguese. Portuguese particularly influenced the dialect of Tetum spoken in the capital, Dili, and is known as Tetum Prasa, as opposed to the more traditional version spoken in rural areas, known as Tetum Terik (Hull, 2000).

Under Indonesian rule, Portuguese and Tetum were banned and Bahasa Indonesia was enforced as the means of communication and education. Indonesian is therefore still widely spoken today, particularly among younger people who were educated entirely under the Indonesian system. Currently, in addition to the local and official languages, Indonesian and English are defined as working languages under the Constitution in the Final and Transitional Provisions (Hull, 2000).

As illustrated in Figure 3.4, the diversity of languages spoken in Timor-Leste required the recruitment of a research team for data collection who had relevant language skills spoken in the chosen study areas. These languages included Fataluku

in Lautem district, a mix of Tetum Terik, Tetum Prasa and Mambai in Dili, Ainaro, Manufahi and Tokodede in Liquica district.

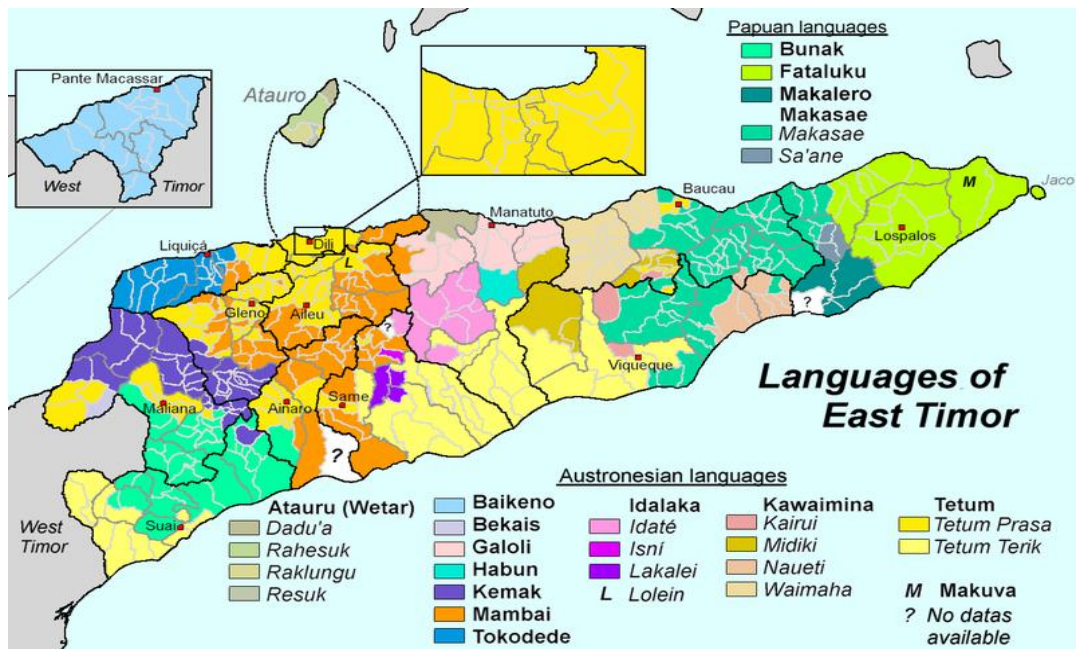


Figure 3.4. A Map of Languages Spoken in Timor-Leste. Source: Government of the Democratic Republic of Timor-Leste, 2010

Upon arrival in Timor-Leste, the network of Timorese student alumni from Flinders University was approached to seek guidance on recruiting a research team with relevant language and data collection skills. Contact was established with a former Flinders University graduate, a Timorese national who was a lecturer at the time at the National University of Timor-Leste. Based on his referral and guidance, five university student candidates were selected based on the following criteria:

- The student must be a Timorese citizen and be from one of the districts selected as study areas. This way the project aimed at contributing to the employment and training of local people, while benefiting from their awareness of cultural sensitive issues and customs and also their comprehensive knowledge of the local area.

- The student must have a high level of proficiency in English and knowledge of one or two of the local languages that are dominantly spoken in the study areas. By having these skills, the language issues were solved and effective communication with the principal researcher was maintained.
- The student needed to have experience in data collection in rural communities. As the interviewers were to be predominantly working in rural areas, familiarity with the local setting and experience in household level data collection related to sustainable development projects were highly desired.
- Gender balance was also considered during the recruitment process. Hence the research team involved two female and three male students.

Upon the recruitment of the research team, an extensive training period was undertaken prior to the data collection. During this five day workshop, the research team was trained in every relevant aspect of collecting data in the selected villages. The content of the training consisted of background studies in understanding poverty and environment issues, and practice runs in filling in the questionnaires and in observing the requirements of research ethics. A great deal of effort was also put into establishing trust, setting up group norms and encouraging motivation among members of the research team in order to achieve quality results. Team members were also asked to sign a statement agreeing to keep the confidentiality and anonymity of the information given by the participants.

The research team as well as many other local Timorese colleagues were involved in the process of translating questionnaires into the local language, Tetum. Having worked on the translation of the questionnaires, the interviewers were then ensured that they understood and knew the questions very well. They were expected to

undertake simultaneous translation if the local language spoken in the village differed from Tetum.

The questionnaires were tested in a pilot study of 20 surveys in two villages in the Dili district where the respondents resembled the target sample. Pretesting allowed identification of certain alterations required in the questionnaire (such as replacing monetary values with alternative variables), and also provided the opportunity to monitor and supervise the research team in order to ensure data quality.

3.3.4. Process of Sampling and Data Collection

3.3.4.1. Sample size

Prior to the commencement of the fieldwork, with 95 percent confidence interval and five percent margin of error in mind, a sample size of 384 household interviews was targeted to achieve a representative sample (see Table 3.5 for a pre-calculated statistical table adjusted for the size of the approximate target population).

Table 3.5

Sample Size Table

Population	Margin of Error			Confidence Interval		
	10%	5%	1%	90%	95%	99%
100	50	80	99	74	80	88
500	81	218	476	176	218	286
1,000	88	278	906	215	278	400
10,000	96	370	4,900	264	370	623
100,000	96	383	8,763	270	383	660
1,000,000+	97	384	9,513	271	384	664

Source: Payne & McMorris, 1967

However, major limitations were encountered upon the commencement of the field research. The acknowledgement of numerous constraints, as discussed below,

imposed great restrictions on the attainment of the desired sample size and led to a few adjustments in terms of determining the final size of the number of household interviews to be conducted. These limitations included the following:

- Extremely poor infrastructure and lack of public transport made transportation costs very high as a private vehicle had to be hired each time to access to the research sites.
- Seasonal variations, mainly wet season conditions, negatively impacted on the already poor infrastructure and made it nearly impossible to access remote villages at certain times. The problems associated with access and the high cost of transportation made it very difficult to organise visits to most of the selected villages. This meant accommodation, transport and other basic necessities had to be organised in advance for the research team to have short stays in the villages which was again costly and challenging to arrange in the country's extreme rural setting.
- Applying the selection criteria in an environment of low human resources made it hard to recruit a capable research team with the required language skills. The recruitment process of a capable research team and achieving a consensus in terms of the required time commitments and financial terms was a time consuming and challenging task. The language diversity in the research sites also created a dependence on the availability of certain members of the team for data collection and correction in some villages.
- The topography and terrain of the villages were mostly hilly or mountainous making it very difficult and tiring for the research team to reach target households on foot and walk from one household to another.

Considering the scope of this research, several consultations were also made with the local academics and consultants about an appropriate sample size. People consulted included Mr. Rui Gomez and Mr. Abílio Fonseca who have been heavily involved in socio-economic research in Timor-Leste. Their recommendations were towards a smaller sized sample on the basis of the expected homogeneity⁷ of the villagers in a specific area and hence the anticipated similarity of their livelihood strategies (Fieldwork 2011-2012).

The final and most feasible size of the primary data set was decided on 170 household level surveys to be collected in eight villages from five different districts. A sample ranging between 19 and 30 households was chosen from each selected village, with a total distribution of 30 households from urban areas, 20 households from semi-urban, and 120 households from rural areas. A total number of eight village surveys were conducted. One focus group discussion was also held in each Ainaro, Manufahi, Liquica and Lautem districts with a total number of four focus group discussions involving 28 participants. In Dili, seven government officials and around 40 stakeholders from civil society and development agencies were interviewed by the researcher. Moreover, three UNDP project sites (including solar energy, bio-gas and mangroves projects) were visited to evaluate the ongoing examples of sustainable livelihoods projects in order to identify the successes, failures and challenges in project implementation. A summary on the components of primary data can be found in Table 3.6.

⁷ Homogeneity was more referred to the level of economic wealth, physical infrastructure and natural resources villagers have access to. Although fieldwork data represented somewhat homogenous groups within villages, considerable differences in livelihood portfolios were found between different villages.

Table 3.6

*Components of Primary Data of this Research*⁸

Total number of districts selected	5
Total number of villages selected	8
Total number of household surveys	170 (<i>Ainaro-15; Manutasi-24; Holarua-27; Letefoho-15; Fuat-19; Iliomar 1- 21; Comoro-31; Ulmera-18</i>)
Total number of village surveys	8
Total number of focus group discussions	4 (<i>in Ainaro, Fuat, Ulmera, Holarua</i>)
Total number of focus group participants	28 (<i>6-8 people in each group</i>)
Total number of in-depth interviews	40
Project site visits	3

Source: Fieldwork, 2011- 2012.

3.3.4.2. Collecting Village Level Interviews

To conduct village level interviews, the research team first made contact with the leaders of the selected villages via telephone before an actual meeting took place. The village leaders were given a brief introduction to the research project and were informed that a research team would be coming to visit their village to collect socio-economic, environmental and demographic information from a randomly selected sample of households and a sub-sample of household heads. They were informed of the research objectives, the intended data collection methods, the significance of the study, and how the study findings could be used by local planners and policy makers. The village leaders were asked to give their consent to such data collection. Once their consent was obtained, the village leaders were requested to convey this information to the villagers at a regular village meeting prior to the arrival of the

⁸ The household and village surveys were conducted between November 2011 and June 2012. There were no recall periods and the surveys were administered for one time only due to time and budget constraints.

research team. They were also requested to give a short interview about the village level issues. On the agreed day and time, the research team met with the village leaders and asked that they commit around twenty minutes of their time to answering the village level survey questions. For their participation in the survey, the village leaders were presented with a small gift as a token of appreciation from the research team (see Figure 3.5).



Figure 3.5. Image of an interview with the village chief. Source: Photo taken by the researcher.

3.3.4.3. Household Level Interviews

Once the village level interview was completed and verbal consent for household interviews was obtained, the research team visited the given number of houses in each village which were selected by systematic sampling with a random start. The sampling interval was calculated in each village by dividing the number of households in that village by 20, an exception being Comoro village in Dili where the number was 30. The heads of the selected houses were given information on the objectives and methods of the research project and requested to participate in the survey which would take about 40 to 60 minutes. If the household heads were not

available for participation, their partners were asked to participate in the survey. Once consent from the participant was granted, the participants were interviewed based on the survey questions. They were presented with small gifts as a token of appreciation for their time and participation. The researcher continuously supervised and monitored the team with systematic data scanning, feedback and debriefing mechanisms to minimize problems related to data quality. This was done on a daily basis throughout the data collection period.

3.3.4.4. Conducting Focus Group Discussions

During the process of interviewing household heads, the research team took the initiative to select some of the household heads to be invited to focus group discussions. At the end of their household level interviews, the selected participants were informed of the format, objective and the venue of the focus group discussion that would take place the following day. Approximately 15 people were invited to each focus group discussion and were asked to commit around an hour of their time for this purpose. On average, seven people attended each of the four focus group discussions which took place in Ainaro, Manufahi, Lautem and Liquica districts. In each focus group discussion, the members of the research team took on the roles of facilitators and note-takers in turn. The focus group discussions were also recorded in the language in which they were conducted and later translated into English (see Figure 3.6 for images of focus group discussions).



Figure 3.6. Images taken from focus group discussions in Ainaro and Lautem. Source: Photographs taken by the researcher

3.3.4.5. Conducting In-depth Interviews with Government Officials and NGOs and other Key Stakeholders

A number of government officials, NGO staff, and other key stakeholders including academics were identified based on their roles and involvement in projects and programs linked with population, environment and poverty reduction. A list of names of the potential candidates was prepared by the researcher through searching government and development agencies' web-sites, relevant literature, key policy documents, by consulting with UNDP colleagues, and by networking in the field. The first contact with these stakeholders was made via an e-mail or a telephone call, wherein they were requested to participate in an in-depth interview and commit around 40 minutes of their time. They were provided with a letter granting the government's approval for the research as well as an introduction letter which described the research objectives, what the participants would be asked to do and the research outcomes. Once their willingness to participate was obtained, they were directly visited at an agreed meeting place and time.

3.3.4.6. Project Site Visits

In order to gain an idea of the implementation of some of the ongoing development projects related to environmental conservation and improved livelihoods, and also to evaluate the successes, failures and challenges of these projects in the Timorese context, three UNDP project sites were visited in the districts of Dili, Manatuto and Liquica. These projects involved tree planting, and biogas and solar energy initiatives for improved livelihoods. During the site visits, approximately 20 beneficiaries of the projects were interviewed about their satisfaction with these initiatives, what problems they were facing and whether they thought these projects would result in positive change. These interviews and personal observations were used for the recommendations of this thesis for future policy formulations and project implementations.

3.4. LIMITATIONS OF THE PRIMARY DATA

This researcher is aware of three limitations of the primary data. To begin with, due to one of the major focus of this research being forest dependence, the sample collected for this research may have under-represented the characteristics of the coastal and sparsely forested areas. Secondly, the findings of this research will predominantly reflect the male perspectives of the population for three reasons. These include the fact that female-headed households comprised only 7.1 percent of the total households sampled for this research. All of the village chiefs interviewed were males and it was observed that the female focus group participants were shy and participated less compared to males in four of the villages. The third limitation may be linked to difficulties in applying the rule of random sampling at all times. In mountainous and hilly villages, where the wet season made it very difficult to access

sparsely located dwellings and also due to time constraints, the researchers may have walked to the most accessible houses rather than adhering to the sampling interval.

3.5. DATA ENTRY, ANALYSIS AND REPORTING STATISTICAL RESULTS

For the statistical analysis of the quantitative primary data, this research utilised a software package named Statistical Package for Social Sciences (SPSS), now produced by the IBM Corporation (2012). Extensive data cleaning took place before and after data entry using the software above-mentioned which included consistency checks for internal integrity and correct coding. The analysis of relevant data was carried out through bi-variate analysis using the Chi-squared test of association. Due to the considerably small sample size, this research utilised Cramer's V test of association to report on the strength of the associations between any of the two explored variables (Gravetter & Wallnau, 2004).

The qualitative primary data gathered through in-depth interviews and focus group discussions were mainly used for descriptive purposes and were instrumental in understanding the context that shaped the traditional practices of the sampled Timorese people with respect to their livelihoods, their use and management of natural resources. Original hard copies of the in-depth interviews and focus group discussion notes (transcribed from audio recordings), were organised into coherent categories that bring meaning to the subject of inquiry by using techniques to identify themes, concepts and phrases.

3.6. CHAPTER SUMMARY

This chapter initially presented the population projection method applied in this thesis to process secondary data in the projection of Timor-Leste's population to 2030. It provided information on the applied population projection software,

DemProj, and its embedded cohort component analysis. It also highlighted the types and sources of secondary data that were used as input in the production of the population projection results.

The second part of this chapter introduced the process of primary data collection and survey methods used. It highlighted the selection process of eight villages as the study areas and described the relevant demographic and socio-economic indicators at the village level. It presented the design of the survey questions used in the household and village level questionnaires and introduced the guiding principles and ideas for focus group discussions and in-depth interviews. It outlined the recruitment and training process of the research team which consisted of the five local Timorese students who participated in the data collection. It described the data collection process, limitations experienced during this process, the final size of the sample and its limitations. Finally, the chapter gave a brief review of the methods used to analyse and report quantitative and qualitative primary data results.

CHAPTER 4: A REVIEW OF TIMOR-LESTE'S POPULATION DYNAMICS AND DEMOGRAPHIC TRENDS

4.1. INTRODUCTION

The population dynamics of a country are central to achieving its development objectives such as reducing poverty, improving human wellbeing, and raising living standards. It is widely acknowledged that efforts to promote sustainable development cannot succeed if they remain disassociated from the knowledge and policy options linked to population dynamics (UNFPA, 2012). While economic growth and good public policy are necessary conditions for reducing poverty and inequality, the role of demographic factors in development certainly cannot be neglected.

Demographic information is important for any country's strategic planning, but it is particularly crucial for maintaining peace and sustainable development in conflict-affected communities (Goldstone, 2002; Neupert & Lopes, 2006; Urdal, 2011). This is because social, economic and environmental challenges exacerbated by demographic factors can lead post-conflict countries to relapse into conflict with enormous drawbacks in their sustainable development efforts (PSN, 2012). If demographic information is not integrated into the reforms and strategic development planning of conflict-affected countries, securing peace and sustainable development would be put at high risk. Effective post-conflict planning requires sound evidence of past and current demographic changes so that a clear perspective on the country's future demographic scenario can be grasped. The sort of development planning in any country heavily relies on the available data on demographic and socio-economic characteristics of their population. The demographic information mentioned above includes indicators such as population

size, births and deaths (in particular, fertility and mortality rates), the age and sex composition of the population, and its spatial distribution of the population and migration patterns. These indicators have an influence on and are affected by the socio-economic characteristics of the population.

As in most developing countries, the main sources of demographic data in Timor-Leste are the population censuses and household based sample surveys. This is because other data sources such as the vital registration system and administrative records are not yet fully operational and hence their coverage is restricted, offering very limited demographic data (Government of Timor-Leste, 2010b).

The 2003 Timor-Leste Demographic and Health Survey (TL DHS) is the first comprehensive assessment of the demographic, health and nutrition status of Timor-Leste's population after its independence. Prior to its independence, the then province of East Timor was included in the samples of the 1991 and 1997 Indonesian Demographic and Health Surveys, but only a small number of households were sampled in this province (Ministry of Health and National Statistics Office Timor-Leste, Dibley Pty Ltd, University of Newcastle, & The Australian National University Australia, 2004), as they were in other Indonesian provinces with small population sizes. During the UN transitional administration (UNTAET) between 1999 and 2002, a lack of credible demographic and socio-economic information was a major constraint in national planning efforts. Hence, mindful of the need for reliable demographic data for strategic planning, the new nation of Timor-Leste undertook its first DHS in 2003. The survey provided data on fertility, family planning, maternal and child health and nutritional status of adults and children.

Soon, thereafter the Government of Timor-Leste, in collaboration with the UNFPA carried out the first post-independence population and housing census in the country. The pilot census in July 2003 revealed great challenges in conducting a total enumeration. These challenges included the difficulties of ensuring complete survey coverage in a setting where there are no post codes, detailed addresses of households, street names or cadastres.⁹ This was overcome by locating households using a global positioning system (GPS) and creating a database containing of unique identity numbers of each house which were affixed on the front door (National Statistics Directorate, 2006). The 2004 Census of Population and Housing provided data on the country's physical and administrative structure, general population characteristics, age, economy and employment, language and education, and fertility and mortality.

In a new and transitional country like Timor-Leste where the demographic and socio-economic scenario is rapidly changing, updating such indicators regularly and accurately is very important for evidence-based decision-making for developing and implementing policies. Timor-Leste has shown a commitment towards establishing a regular and high quality database through the production of the country's second Demographic and Health Survey in 2009 and the second Population and Housing Census in 2010.

This chapter is organised to systematically explore the current population trends and the changing demographic characteristics of Timor-Leste predominantly by using the mentioned national censuses and surveys produced in the past decade. By doing so, this chapter aims to highlight Timor-Leste's unique demographic characteristics in

⁹ A cadastre commonly includes details of the ownership, tenure, precise location, dimensions (and area), and the value of individual parcels of land.

comparison with some of the selected developing countries and also to set out the grounding for demographic assumptions made in the next chapter for projecting Timor-Leste's population by 2030.

4.2. TIMOR-LESTE'S CHANGING POPULATION TRENDS

4.2.1. Population Size

According to the 2010 National Population and Housing Census, the total population of Timor-Leste was recorded as 1,066,582 people as of the night of the 11th/12th July 2010 (National Statistics Directorate, General Directorate of Policy Analysis and Research, & Ministry of Finance Democratic Republic of Timor-Leste 2010). This showed an increase of 143,384 persons since 2004, representing a 15 percent increase in the total population size in six years. With just over a million people, Timor-Leste's population is smaller than almost all of the countries of Southeast Asia, with the exception of Brunei (see Figure 4.1).

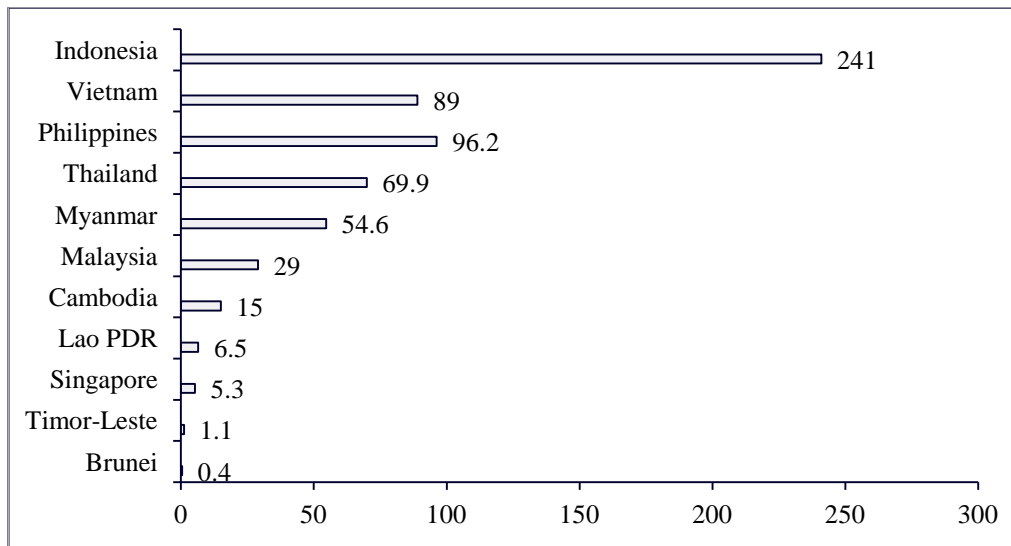


Figure 4.1. Size of the Total Population of Selected Southeast Asian Countries (millions), 2012. Source: World Bank, 2013d

Although it is one of the smallest countries in the Southeast Asian region, Timor-Leste, also grouped as one of the small island developing states, is among the larger

island countries of the world. Its population is larger than that of any of the developing countries or territories in Oceania other than Papua New Guinea. Its population, for instance, is larger than Fiji or the Solomon Islands (World Bank, 2013d).

Despite its moderately small size, Timor-Leste's population has been continuously growing since 1980 with a record annual growth rate of 3.2 percent in 2004, followed by 2.41 percent in 2010. Table 4.1 provides a snapshot of Timor-Leste's population change since 1980. The very small increase in the annual rate of population growth in 2001 can be partly explained by the conflict years under Indonesian occupation which will be further discussed in this chapter.

Table 4.1

Selected Indicators Reflecting Population Trends in Timor-Leste, 1980- 2010

	1980	1990	2001	2004	2010
Population Size	555,350	747,557	787,340	923,198	1,066,582
Population Change	-	192,207	39,783	135,853	143,384
Average annual increase	-	19,220	3,616	45,286	23,897
Population increase (%)	-	34.6	5.3	17.3	15.5
Annual rate of growth	-	2.97	0.47	3.2	2.41

Source: Government of the Democratic Republic of Timor-Leste, 2010.

The annual rates of population growth in Timor-Leste have been very high since 2004 and, in fact, they were some of the highest in the world and the fastest in the Asia Pacific region. Ahead of its Southeast Asian neighbours, Timor-Leste's growth pattern has been quite similar to some of the trends experienced in the African continent which hosts nearly all of the world's fastest growing nations today (see Table 4.2 and Figure 4.2). Just like Timor-Leste, many African fragile states have

rapidly growing populations which put a great strain on those countries' sustainable development efforts.

Table 4.2

Annual Population Growth Rates for Selected Countries from Fragile States and Southeast Asia (percentages), 2010

	Annual Population Growth Rates (Percentage)
■ Angola	3.2
■ Burkino Faso	2.9
■ Congo	2.8
■ Gineau	2.6
■ Timor-Leste	2.4
■ Papua New Guinea	2.2
■ Singapore	1.8
■ Philipinnes	1.7
■ Indonesia	1.5
■ Malaysia	1.5

Source: World Bank, 2013c

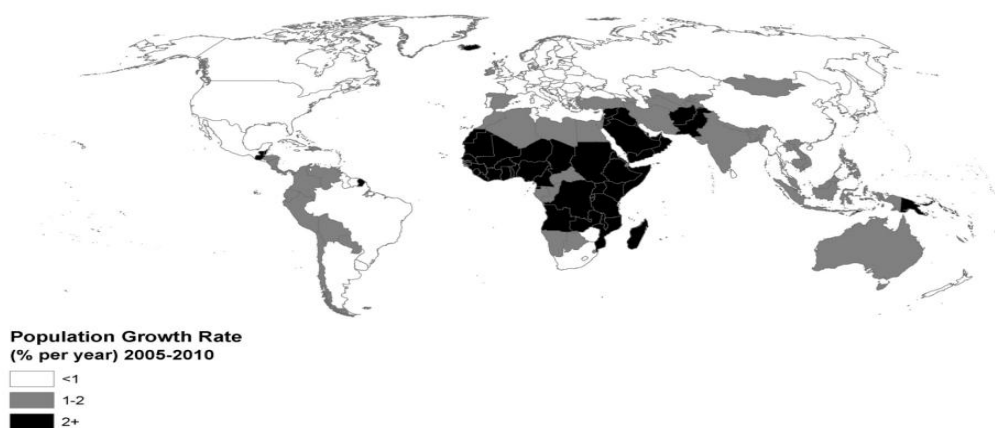


Figure 4.2. Global Map of Population Growth Rates (percentages), 2005-2010. Source: UN, 2011

4.2.2. Population Densities

According to the 2010 Population and Housing Census Timor-Leste's population density was reported as 72 persons per square kilometre which is an increase from 67 in 2004 (National Statistics Directorate, 2006; National Statistics Directorate et al.,

2010). This rate is similar to the density of other smaller countries in the region (Brunei, Myanmar, Malaysia, for example), and almost half of the Southeast Asian average which is weighted toward countries with large populations and high population densities (Indonesia and Philippines, for example) (UNDESA, 2011a).

There is a striking difference in urban and rural densities in that, on average, 352 persons occupy one square kilometre in the urban areas as opposed to 53 persons occupying one square kilometre, on average, in rural places (Government of the Democratic Republic of Timor-Leste, 2010). Although population density in rural areas seems to be low, the density in urban areas represents a sharp contrast. Moreover, a low population density in rural areas could be misleading when the ratio of rural population to agricultural land is considered. In Timor-Leste, 23 percent of the land is reported as agricultural which accommodates around 75 percent of the total population, making Timor-Leste predominantly a rural country (United Nations Population Division, 2007). Based on the agricultural population and land indices, Timor-Leste had 212 rural inhabitants per square kilometre in 2005 (World Bank, 2008). This density is very close to the ratio of rural population to agricultural land in large and densely populated Southeast Asian countries such as Indonesia and the Philippines (see Figure 4.3). This indicates that as rural population grows rapidly in Timor-Leste, the agricultural land will be even more densely populated.

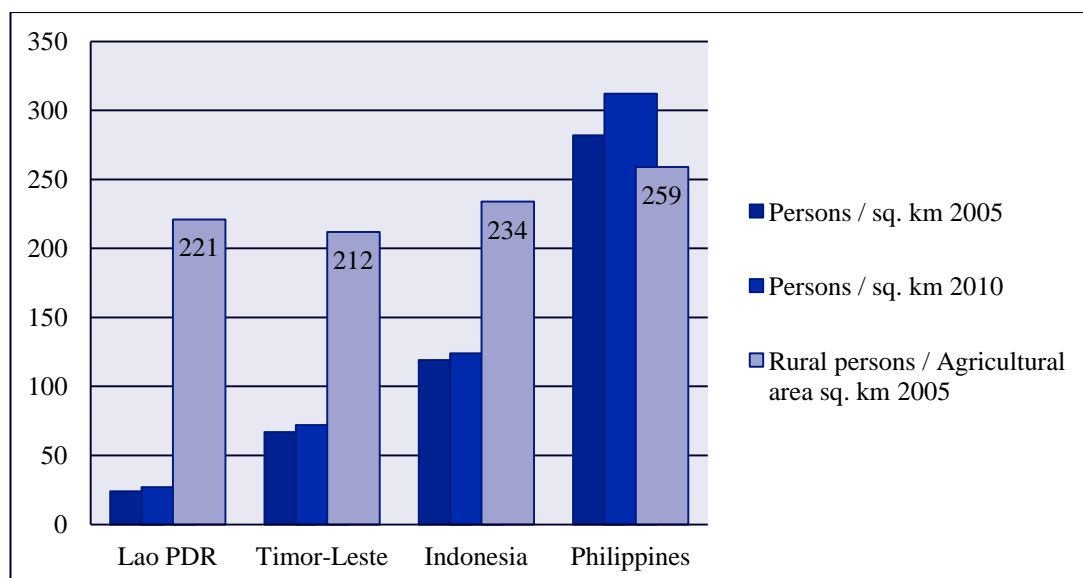


Figure 4.3. Alternative Population Densities for Timor-Leste and Selected countries, 2005 and 2010. Source: Government of the Democratic Republic of Timor-Leste, 2010; World Bank, 2008.

Among the 13 districts of Timor-Leste (see Figure 4.4), the capital city Dili is the most densely populated. With 639 persons per square kilometre in 2010, Dili's density is nine times the country average. Relatively higher densities are concentrated in the central and western districts of the country including Ermera, Liquica and Oecusse districts as compared to the most sparsely populated districts in the eastern regions including Manatuto, Manufahi, Lautem and Viqueque.



Figure 4.4. A Map of Timor-Leste's Districts. Source: Ministry of Finance, 2010

4.2.3. District Level Population Distribution and Sex Composition

The sex ratio of the population of Timor-Leste is 102.99 which means that for every 100 women there are about 103 men in the population (Government of the Democratic Republic of Timor-Leste, 2010). For biological reasons, the average natural sex ratio for humans is generally around 105 and Timor-Leste's sex ratio can be considered to be within normal range. When it comes to the district level sex ratios, however the situation becomes more complicated. While four out of 13 districts have sex ratios less than 100, Dili, the capital city, stands out on the opposite side of the scale with 113 men for every 100 women (Government of the Democratic Republic of Timor-Leste, 2010). The high proportionate number of men in the major urban district Dili can be partially explained by the selective nature of the urbanward migration trend into the capital city which is dominated by men. On the other hand, the districts with the lowest sex ratios, namely Bobonaro, Lautem, Oecusse and Viqueque have an excess of females (see Table 4.3).

When it comes to district level growth rates, among all other districts, Dili, grew most rapidly at 4.8 percent annually between 2004 and 2010. Its share of the total population increased from 19 percent in 2004 to 22 percent in 2010, while 10 districts experienced losses in their population shares of the total during the same

period. Although all districts experienced an increase in their population densities, the greatest change took place in Dili (see Figure 4.5).

Table 4.3

Selected Indicators Reflecting District Level Population Trends, 2004 and 2010

	Sex Ratio 2004 (males per 100 females)	Sex Ratio 2010 (males per 100 female)	Annual Pop. Growth Rate 2004-2010	Percent Share of Total Population 2004	Percent Share of the Total Population 2010	Average Household Size 2004	Average Household Size 2010
Aileu	107.47	104.95	3.02	4.11	4.27	4.9	6.3
Ainaro	102.95	102.2	2.06	5.68	5.57	4.6	6.1
Baucau	101.22	100.19	1.69	10.91	10.45	4.4	5.2
Bobonaro	99.30	97.93	1.19	9.05	8.42	4.5	5.4
Covalima	100.71	101.05	2.07	5.75	5.63	4.5	5.4
Dili	114.25	113.18	4.80	19.03	21.97	5.6	6.7
Ermera	102.85	100.87	1.73	11.19	10.75	4.9	6.1
Lautem	95.63	95.72	1.12	6.10	5.65	5.1	5.3
Liquica	103.54	102.28	2.36	5.95	5.94	4.2	6.1
Manatuto	102.32	102.11	2.65	4.00	4.05	4.1	6.0
Manufahi	104.00	105.63	1.35	4.88	4.58	5.4	6.5
Oecusse	98.87	96.79	2.14	6.24	6.14	4.2	4.7
Viqueque	97.46	98.28	1.16	7.09	6.58	4.3	5.2

Source: National Statistics Directorate, 2006; Government of the Democratic Republic of Timor-Leste, 2010

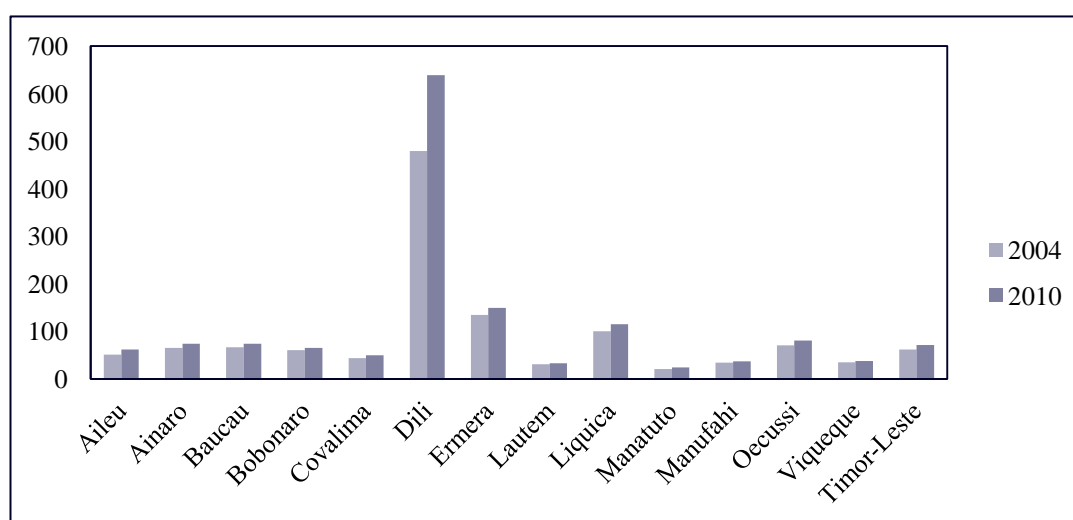


Figure 4.5. District Level Population Densities, 2004 and 2010. Source: National Statistics Directorate, 2006; Government of the Democratic Republic of Timor-Leste, 2010.

One interesting aspect of increasing population densities and different growth rates of the districts is the changes in household size. In line with the population growth rates, all districts seem to experience an increase in their household size, but not surprisingly household size appears the largest in Dili with 6.7 persons per household.

Urbanization is a significant part of development and everywhere in the world more and more people are moving to urban areas. This is also the case in Timor-Leste although the comparative size of its urban population is much smaller than its neighbours in the region. The percentage share of urban population has been estimated to have increased from 10 percent in 1950 to 20 percent in 1990 to 29.6 percent in 2010 (UNDESA, 2011b).

Currently Timor-Leste defines urban populations based on a citizen's place of residence. In the Timor-Leste 2010 census, the urban and rural status was conferred on an area by the government purely for local administration or the size of the population (National Statistics Directorate & UNFPA, 2012). One of the criteria for urban classifications included that they be district capitals. However, those that were not district capitals but possessed the following characteristics: had a population of approximately 2,000 people or more; had less than 50 percent of its population employed in agriculture or fisheries and the remaining employed in the modern sector; had electricity, piped water, access to schools, medical care and recreational facilities, could also be considered urban areas (National Statistics Directorate & UNFPA, 2012). Hence in some districts, the number of urban villages could be more than one. According to national accounts, Timor-Leste has an urban population of 315,216, of which 61.4 percent resides in the capital city Dili (National Statistics Directorate & UNFPA, 2012). The city grows at a rapid rate of 4.8 percent annually.

Better economic opportunities, market access, infrastructure and services are some of the pull factors that attract people from other districts to Dili. Nevertheless, this also means that there is an increasing concentration of people in Dili in need of urban infrastructure, services and socio-economic opportunities. The continuing concentration of the country's population in one major city raises concerns about the huge stress put on its infrastructure, clean water, sanitation and adequate housing, as well as job security which are all related to the peace, stability and sustainable development of this new nation.

4.2.4. Demographic Profile: Age and Sex Cohort Analysis

The demographic profile of Timor-Leste is that of a country at the end of the first stage of demographic transition. High fertility and mortality rates have led to an extremely young population base and this is well reflected in the age distribution of the population. As reflected in Figure 4.6 the population pyramid of Timor-Leste has a wide base relating to high fertility and a large cohort of young populations while the narrowing top hints at low life expectancy and high mortality among older aged populations. The relatively small cohort between the ages of 30 and 34 may reflect low fertility rates in the years 1970-1975 and poor infant and child survival after the Indonesian invasion in 1975 (Neupert & Lopes, 2006).

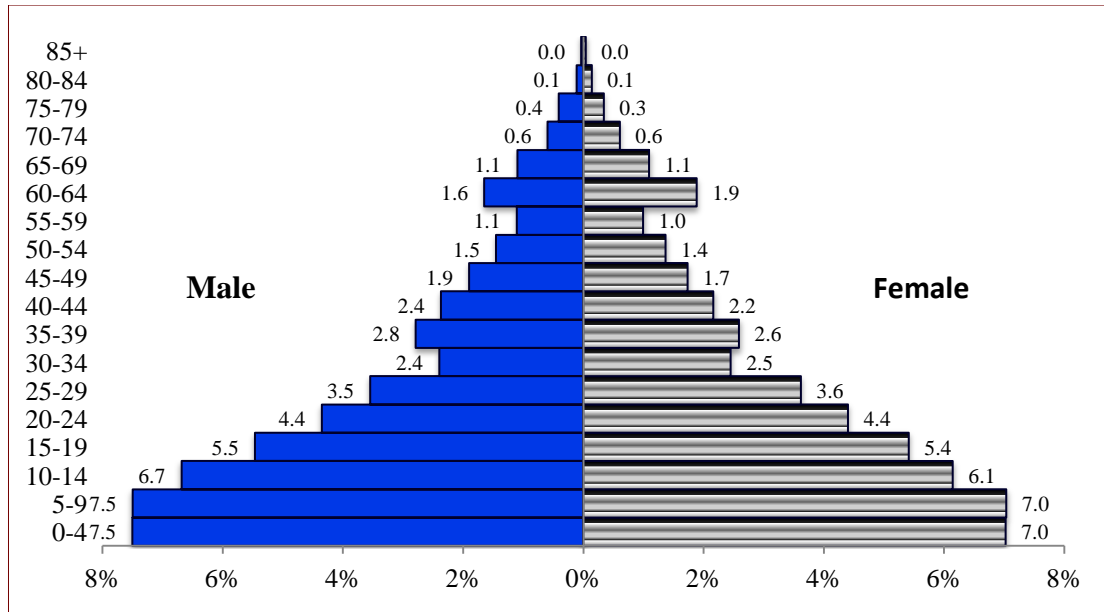


Figure 4.6. Timor-Leste Population Pyramid 2010. Source: Prepared by the researcher using Timor-Leste's 2010 census Government of the Democratic Republic of Timor-Leste, 2010

According to the 2010 census, 41.7 percent of Timor-Leste's total population is aged below 15 while only 4.7 per cent of the population is aged above 65. This translates into the very low median age of the total population which is just 18.8 (Government of the Democratic Republic of Timor-Leste, 2010). In fact, the United Nations reports even an lower median age for Timor-Leste which is only 16.8 with a rank of sixth youngest country in the world (see Table 4.4) (UNDESA, 2011a).

Table 4.4

Ten Youngest Countries of the World, 2011

Country	Median age
Niger	15.5
Uganda	15.8
Mali	16.4
Zambia	16.6
Afghanistan	16.7
Angola	16.7
Timor-Leste	16.8
Dem. Republic of Congo	16.8
Malawi	16.9
Burkina Faso	17.2

Source: UNDESA, 2011a.

The working age population on the other hand, which is defined between the ages of 15 and 64, constitutes 53.4 percent of the total population. Particularly noteworthy is the indentation in the 30-34 year age category for both males and females. The population in this age group are the survivors of the children born during 1975-79, a turbulent period in Timor-Leste's history, which saw the withdrawal of Portuguese colonial power and the annexation of East Timor by Indonesia. During these difficult times, the fertility rate dropped heavily. The bulge in the 25-29 age group and younger age groups indicates a return to high fertility (Dasvarma, 2011).

Comparing the percentage age distribution of the population of some of the selected countries of the Asia-Pacific region, as well as the group of fragile African states, it is very clear that with a youthful population and smaller working age cohort, Timor-Leste's population composition is more similar to that of African countries and Papua New Guinea, than it is to its regional neighbours such as Indonesia, Malaysia or the Philippines (see Figure 4.7).

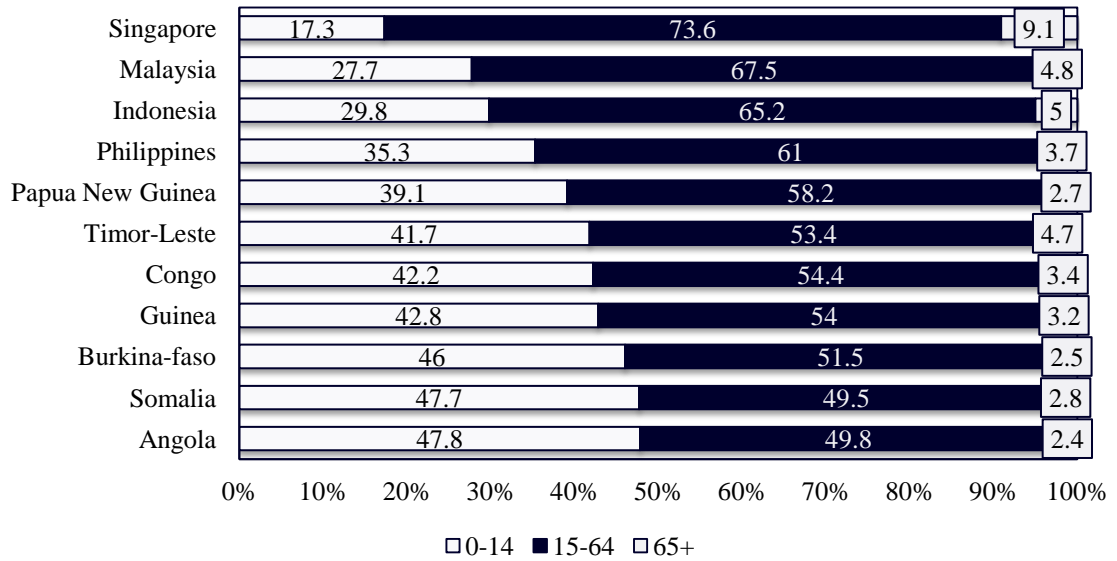


Figure 4.7. Percentage Distribution of Population by Age for Timor-Leste and selected Southeast Asian and Fragile African countries, 2010. Source: World Bank, 2013c

4.2.5. Dependency Ratios

The age distribution of a country also relates to the dependency ratio of a population which shows the ratio of the population outside working ages to the population of working ages.¹⁰ In case of Timor-Leste, where the working age is between 15 and 64 years, the dependency ratio is the ratio of the number of persons aged between 0-14 and 65+ to those aged 15-64 years. The ratio reflects the pressure put on the potential productive population (workforce) in a given country.

A high dependency ratio may cause serious problems for a country if a large proportion of the government expenditure is continuously spent for the youngest and the oldest people in a population, leaving the productive sectors of the economy underinvested with the burden of high costs on health, education and social security

¹⁰ The dependency ratio relates the number of children (0-14 years old) and older persons (65 years or over) to the working-age population (15-64 years old). It is expressed as the number of dependents for every 100 workers.

costs. Moreover, fewer people in the working age group means that there is less support for schools, health care facilities, pensions and less assistance for the youngest and the oldest members of the population. This is very much the case for Timor-Leste with its very high total dependency ratio of 87 percent, which means that every 100 persons of working ages have to support 87 persons outside the working ages (The Government of the Democratic Republic of Timor-Leste, 2010). This rate is strikingly high in comparison to that of most Asia-Pacific countries, for example 53 percent in Indonesia and 48 percent in Malaysia (UNDESA, 2011a). Total dependencies are predominantly driven by the populations aged under 15 and are much of a reflection of the child dependency ratios in developing countries. This is even more so for countries where life expectancies are extremely low resulting in smaller number of older aged populations, such as in the case for many African countries where HIV is the major cause behind people dying at early ages resulting in extremely small size of older aged populations (UNDESA, 2011a).

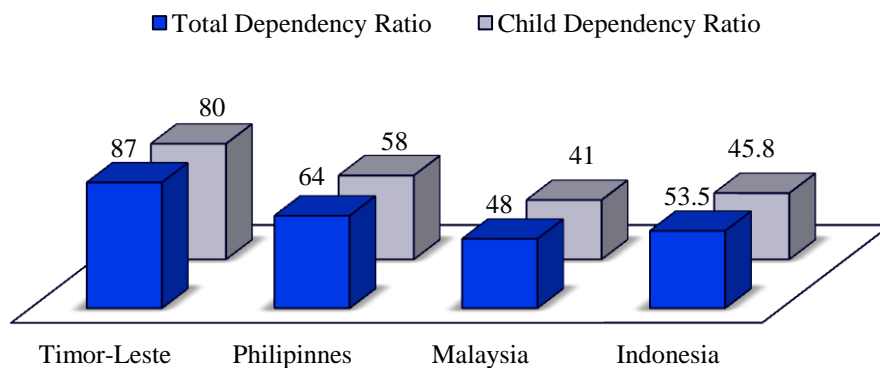


Figure 4.8. Child and Total Dependency Ratios for Timor-Leste and Selected Southeast Asian Countries (Percentage), 2010. Source: UNDESA, 2011a.

4.3. COMPONENTS OF POPULATION CHANGE

In any country changes in national population size are driven by two factors: natural increase (births minus deaths), and net migration (the difference between

immigration and emigration). Current national population changes in Timor-Leste are mainly attributable to the natural increase caused by higher fertility rates than mortality. Net migration is almost negligible (National Statistics Directorate, 2004). Therefore this chapter is focused on the measures of the components of natural population increase such as life expectancy at birth, child and infant mortality rates (measures of mortality) and the total fertility rate (measure of fertility).

4.3.1. Life Expectancy at Birth

Timor-Leste's national life expectancy at birth (for both sexes) is reported to have increased from 57.8 years in 2002 to 59.7 years in 2005 and increased further by more than two years by 2010, reaching 62.1 (UNDP, 2011d). This life span is eight years shorter than the world average, which was 70.3 in 2010 and five years less than the South East Asian average (World Health Organisation [WHO], 2013). Conversely, people in Timor-Leste live around six years longer than the people living in the African continent during the same year.

Due to many advances in health science and technology, the human life span has been continuously increasing. Life expectancy at birth has increased globally by six years since 1990 (WHO, 2013). However, life expectancies are highly related to a country's overall developmental progress. The comparatively low life expectancy in Timor-Leste can be linked to high poverty, poor health and wide spread food insecurity (UNDP, 2011d).

Table 4.5

A Comparison of the Life Expectancy at Birth for Timor-Leste and Selected Regions, 2011

Region/Country	Life expectancy at birth (in years)		
	Male	Female	Both Sexes
Africa	55	58	56
South East Asia	65	69	67
Western Pacific	74	78	76
World	68	72	70
Timor-Leste	61	63	62

Source: WHO, 2013

In almost all countries, women live longer than men. This is believed to be due to a combination of biological and socio-cultural reasons (Mascitelli, Pezzetta, & Sullivan, 2006). Women usually live 4 years longer than men in the Southeast Asian region (Table 4.5) and 3 - 3.5 years longer in developing countries. Unlike its regional neighbours however, the gap between female and male life expectancy in Timor-Leste is small, only 2 years. One of the major causes of this small gap may be explained by the high maternal mortality rate in Timor-Leste. High fertility rates, short birth spacing and a low rate of attendance by skilled health personnel during childbirth contribute to high maternal mortality ratios (UNDP, 2011d). Timor-Leste's recent Human Development Report (HDR) (2011) indicates substantial improvements in the maternal mortality ratios with a decline from 666 maternal deaths per 100,000 births in 2004 to 380 maternal deaths per 100,000 live births in 2010 (UNDP, 2011d). However, according to the 2010 DHS, the maternal mortality ratio was much higher at 557 per 100,000 live births in 2010 indicating a much slower improvement in maternal mortality (Government of Timor-Leste, 2010d). A global study by UNFPA revealed that among 180 countries included in the study in

2010, the global maternal mortality was estimated at 210 per 100,000 live births in 2010 (WHO, 2012). In the Southeast Asia region, this rate was estimated at 150, whereas Sub Saharan Africa had the highest average maternal mortality ratio with 500 maternal deaths per 100,000 live births (WHO, 2012). Timor-Leste's maternal mortality ratio therefore, is still among the highest in the world. Two major factors that contribute to the high maternal deaths in Timor are the low use of skilled birth attendants in delivery and lack of access to emergency obstetric care (WHO, 2012). For example, only three in ten births are assisted by a trained health professional, while close to half of all births are assisted by untrained friends or relatives (Government of Timor-Leste, 2010c).

4.3.2. Infant and Child Mortality

In countries where data on age-specific death rates are not available with any level of accuracy and completeness (such as Timor-Leste), an indirect method of estimating life expectancy at birth is adopted. In such cases, the life expectancy estimates are derived from the probability of dying before age 1 (the infant mortality rate or IMR). Based on the government records, there have been substantial improvements in reducing both the infant and child mortality rates in Timor-Leste since 2004.

According to Timor-Leste's Human Development Report for 2011 (HDR 2011), the achievement in reducing infant and child mortality rates can be predominantly attributed to the increase in the percentage of mothers receiving at least one ante-natal care check-up. The report indicates that the incidence of women visiting at least one ante-natal care by a skilled professional increased from 55.4 percent in 2007 to 86 percent in 2009, and 32 percent of women received a post-natal check-up in the same year (UNDP, 2011d).

Despite the mentioned achievements, there are still problems associated with hardship in accessing health services and with high percentage of women giving birth without attendance of skilled health personnel. Figure 4.9 shows district level infant mortality rates (IMR), access to health services, and percent of the share of child delivery attended by skilled health personnel. These indices show a general association among them. In other words, in the districts where percentage of child births attended by skilled health personnel is low, the IMR appears to be high. However, there are exceptions to this, as exemplified by the districts of Baucau and Dili. Baucau has about twice the infant mortality rate of Dili, but has similar access to health services and skilled attendance at child birth as has Dili.

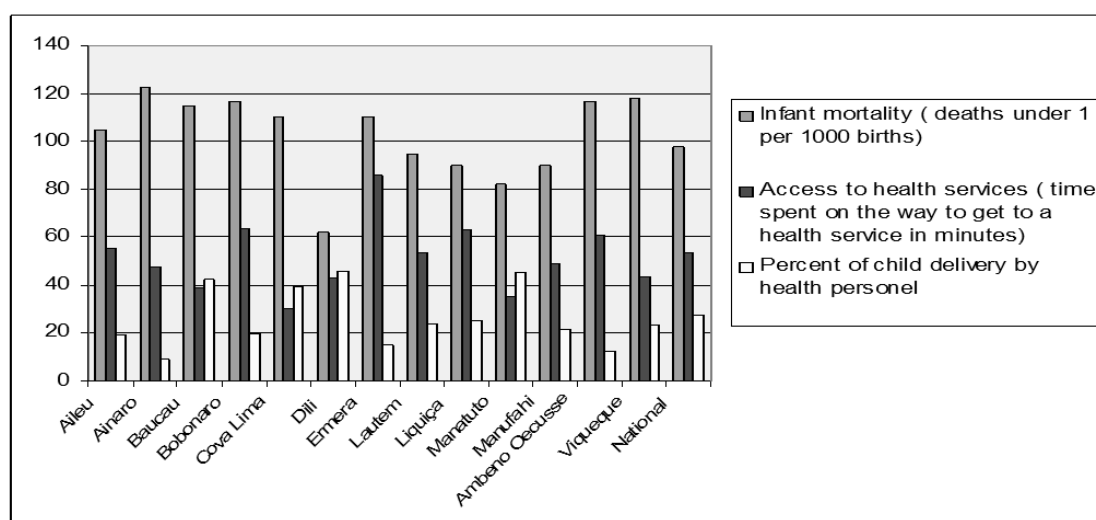


Figure 4.9. Selected Indicators that are related to District Level Infant Mortality Rates in Timor-Leste, 2004 Source: Reproduced from UNMIT, 2008

The infant mortality in Timor-Leste is reported to have declined from 68 per every 1,000 live births in 2004 to 44 per 1,000 live births in 2009. Likewise, the child mortality rate is reported to have declined from 94 per 1,000 live births in 2007 to 64 in 2009. With these reductions managed in the past decade Timor-Leste achieved its 2015 MDG targets for infant and child mortality rates which were 53 and 96

respectively. However, these rates still lag behind the world average, and the regional averages in East Asia and the Pacific (see Figure 4.10).

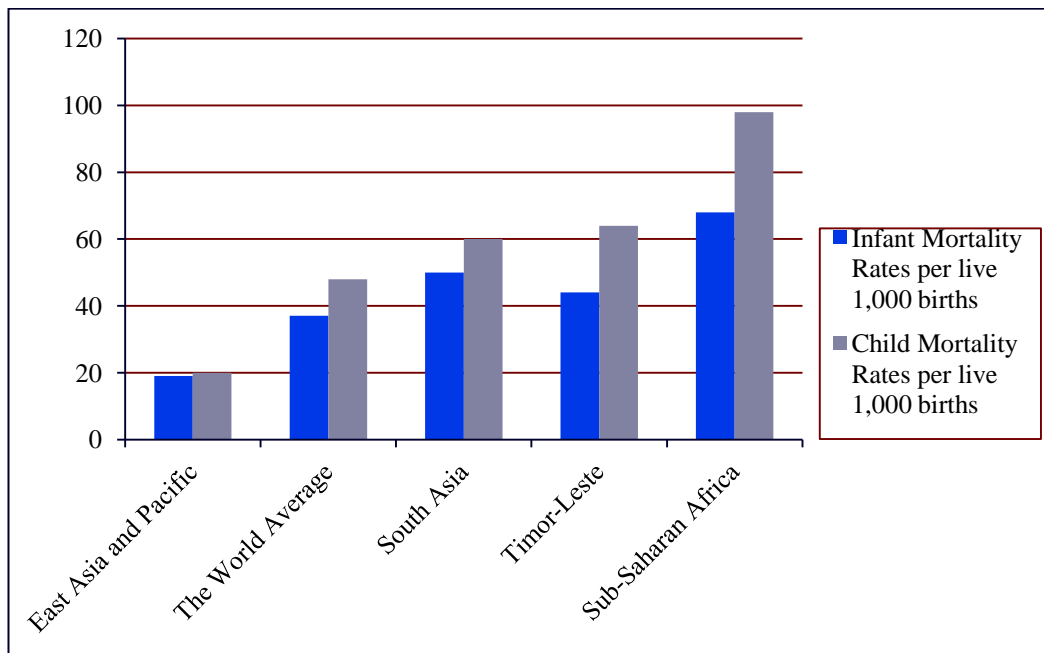


Figure 4.10. Infant and Child Mortality Rates for Timor-Leste and Selected Regions, 2010. Source: United Nations International Children’s Emergency Fund [UNICEF], 2013

4.3.3. Fertility

The 2010 Demographic and Health Survey of Timor-Leste (TL DHS 2010) estimated the country’s current total fertility rate as 5.7 children per women in her reproductive age, between the ages of 15 and 49 years (Government of Timor-Leste, 2010d). The fertility rate in Timor-Leste has been one of the highest fertility rates in the world during the past decade with a TFR of 7.8 in 2003 (Ministry of Health and National Statistics Office Timor-Leste, et al., 2004). According to the CIA (2013) estimates, Timor-Leste’s total fertility rate ranks 16th in the world following a group of 14 fast growing African countries as well as Afghanistan. Timor-Leste’s continuing high fertility rate is in fact the major contributor to the country’s unprecedented population increase (Saikia & Hosgelen, 2010).

Table 4.6

List of Countries with the World's Highest Fertility Rates, 2013 Estimates

World Ranking	Country	Total Fertility Rate (Estimates for 2013)
1.	Niger	7.03
2.	Mali	6.25
3.	Somalia	6.17
4.	Uganda	6.06
5.	Burkina Faso	6.00
6.	Burundi	5.99
7.	Zambia	5.81
8.	Afghanistan	5.54
9.	South Sudan	5.54
10.	Angola	5.49
11.	Congo	5.49
12.	Mozambique	5.34
13.	Nigeria	5.31
14.	Ethiopia	5.31
15.	Malawi	5.26
16.	Timor-Leste	5.22

Source: CIA, 2013

In exploring Timor-Leste's fertility trend since the 1970s (see Figure 4.11), it can be concluded that it has not followed a path of a typical demographic transition which would indicate continuously declining fertility rates. It is important to recognise that Timor-Leste is a conflict-affected country and this may have impacted on its atypical fertility trends. Many studies on fertility among conflict-affected populations emphasise the complexity of reproductive responses and behaviours to violence and adversity, including both biological and socio-economic factors. According to some, fertility rates can decrease due to conflict-related insecurity involving situations like increasing violence, psychological stress, wealth uncertainty, and poor health (Guha-Sapir & D'Aoust, 2011). These factors can determine age at marriage, the frequency of sexual intercourse, contraception use, abortion, breastfeeding and abstinence, all of which can lead back to changing fertility and reduced number of children per woman (Agadjanian & Prata, 2002; Blanc, 2004; Lindstrom & Berhanu, 1999).

Lindstrom and Berhanu (1999), studying the specific impacts of conflict on fertility in Ethiopia for example, found a sharp temporary decline in fertility during the early years of violent conflict and famine, followed by a rebound in fertility. The authors suggested that Ethiopian couples postponed births as a strategy to avoid impoverishment in the short term, thereby accepting higher risk in the long term, when fewer children would present to secure their own livelihood at old age. Agadjanian and Prata (Agadjanian & Prata, 2002), in their study of post-war Angola, found that women living in conflict-affected regions have lower fertility rates during conflict, followed by a baby boom in the same regions once conflict ends. Fertility decline during the conflict years is often attributed to the debilitating effects of trauma on reproductive health, the break-up of marriages and widowhood, displacement, the separation of spouses, famine, hunger and malnutrition, the loss of financial ability to support more children, and the loss of health infrastructure all of which increase numbers of still-born babies and maternal mortality.

It is important to acknowledge the evidence provided by studies mentioned above as such conflict situations may have had an impact on Timor-Leste's atypical fertility trends. During the Indonesian occupation, the Indonesian Demographic Health Survey in 1997 estimated the TFR in the province of East Timor to be 4.4 children per woman (Indonesian Central Bureau of Statistics, 1998). From 1999 onwards, and particularly after the independence however, the TFR was reported to have increased dramatically up to a point in 2003 where, on an average, 7.8 children were produced per women (see Figure 4.11). This fertility rate was then reported to have declined to 5.7 in 2010.

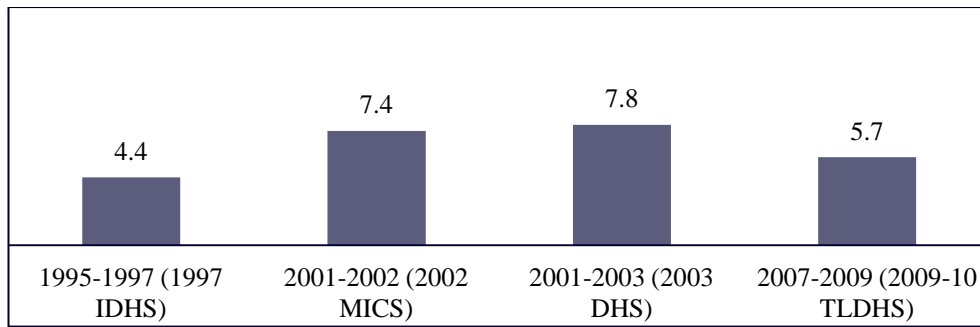


Figure 4.11. Trends in Fertility Rates, Timor-Leste 1995-2010. Source: Government of Timor-Leste, 2010d; Indonesian Central Bureau of Statistics, 1998; Ministry of Health and National Statistics Office Timor-Leste et al., 2004

It is argued that the fertility in Timor-Leste has always been traditionally high (Saikia, Dasvarma, & Wells-Brown, 2009). There may be a few arguments which explaining why the fertility rate was reported as low as 4.4 during the Indonesian administration. To begin with, this research argues that the traditionally high fertility may have declined due to the ongoing conflict and increase in violence, psychological stress, uncertainty, and poor health during the Indonesian occupation between 1975 and 1999. Secondly, the use of contraception in the form of injectables was highly promoted and the commodities were made easily available to the Timorese as a fertility population control mechanism (Saikia, et al., 2009). This may have been due to the Indonesian administration supporting a strict family planning program under occupation circumstances. Thirdly, it may be due to the fact that Indonesian women with lower fertility rates were included in the survey lowering the average fertility rates, while many Timorese women with high fertility rates were not included as they fled the country during the occupation years. It was estimated that 57,823 males and 56,863 females aged 10 and above left Timor-Leste between 1995 and 2005 (Saikia, et al., 2009). This drastic population movement is argued to be sufficient to change the level of TFR substantially.

The increase in fertility rates to 7.4 just after the independence may well be a relative increase rather than a real increase for, again, a number of possible reasons. Following the independence of the new nation, the post-conflict psychology of rebuilding of families after large scale losses may have led to an increasing fertility or recovering the traditional fertility (Kiernan, 2003). The uncertainty and insurance effect as discussed previously may have also led to families producing more children to preserve a minimum level of income for survival and diversify coping mechanisms. One other aspect is also the fact that once the Indonesians withdrew from Timor-Leste, the availability of family planning and contraceptives was largely diminished which may have caused a dramatic increase in unplanned fertility due to the unmet demand. And lastly, it can be argued that the TFR in post-conflict Timor-Leste became inflated as a result of out-migration of non-Timorese who had comparatively lower fertility and the return migration of Timorese who had traditionally high fertility (Saikia, et al., 2009).

Despite these previously discussed fluctuations, the fertility in Timor-Leste has been declining since 2003. For example, the total fertility rate (TFR) has been declining in almost all districts except Oecussi; however, there are considerable variations at the district level ranging from 4.4 births per woman in Covalima to 7.2 births per woman in Ainaro (Government of Timor-Leste, 2010d).

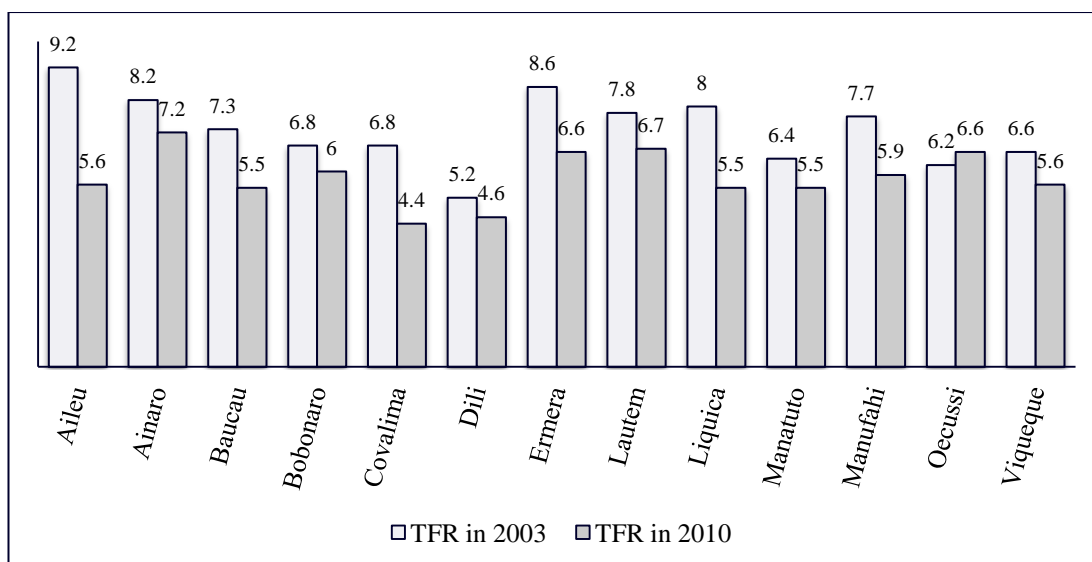


Figure 4.12. District Level Fertility Rates, Timor-Leste, 2003 and 2010. Source: Government of Timor-Leste, 2010d; Ministry of Health and National Statistics Office Timor-Leste, et al., 2004

It is argued that the relative political stability following the 1999 and 2006 crises and the return of people from remote rural areas to semi-urban or urban areas, may have exposed them to social and economic influences that encourage smaller families (UNDP, 2011d). Increased exposure to family planning messages through the mass media, and wider and easier access to modern family planning methods may also have had an impact in reducing fertility from 7.8 in 2003 to 5.7 in 2010. Among the many factors that may have contributed to the slow decline and continuing high fertility rates in Timor-Leste are the proximate determinants of high fertility which will be explored below.

4.3.3.1. Understanding the Proximate Determinants of High Fertility in Timor-Leste

There may be many socio-economic, cultural, environmental or institutional factors that indirectly affect the fertility in a given country. Biological and behavioural factors, however, affect a woman's likelihood of becoming pregnant directly and are named as intermediate variables (Davis & Blake, 1956), or proximate determinants (Bongaarts, 1978) of fertility. Among the eight intermediate variables identified by

Davis and Blake, four were found to be the most influential upon quantification by Bongaarts, who termed them as proximate determinants of fertility. These proximate determinants consist of proportions married, postpartum infecundity, contraceptive use, and induced abortion (Bongaarts, 1978), which are in turn affected by the socio-economic, cultural, environmental or institutional factors mentioned above.

In societies where sexual activity usually takes place within marriage, marriage signals the onset of a woman's exposure to the risk of childbearing. Therefore, populations with a smaller proportion of married women will potentially have lower fertility than populations with larger proportions of married women. Postpartum infecundity, on the other hand affects the duration of a woman's insusceptibility to pregnancy, while abortion is directly linked to the prevention of a birth. Lastly, the use of contraception prevents pregnancy. These variables taken together determine the length and pace of a woman's reproductive life and are, therefore, important in understanding fertility (Bongaarts, 1978).

Currently the percentage use of contraception in Timor-Leste is very low. It is below many other countries in Southeast Asia but promisingly higher than that of some fragile African countries (see Table 4.7)

Table 4.7

Rates of Contraception Use among Selected Countries

Contraceptive Prevalence Rate (Percent of married women currently using any method of contraception)	
Vietnam	67 (2010)*
Indonesia	58 (2012)
Myanmar	46 (2010)
Philippines	36 (2011)
Papua New Guinea	24 (2007)
Timor-Leste	22 (2010)
Guinea Bisau	10 (2010)
Niger	12 (2012)
Afghanistan	16 (2010)

*The parentheses denote the year of the survey. Source: United Nations, 2012

Although the use of contraception in Timor-Leste appears low with 22 percent of married women currently using a contraceptive method, the progress in its use is considerable when noted that the rate was only 10 percent in 2003 (Ministry of Health and National Statistics Office Timor-Leste et al., 2004). Data on current use of contraception has a special significance as it also reveals the cumulative success of programs promoting the use of family planning among couples. Figure 4.13 shows the trends in the current use of contraception (any method and any modern method), in Timor-Leste from 1997 to 2010. The threefold increase in use of modern contraception between the DHS of 2003 and 2010 reflects some progress in the family planning programs in Timor-Leste, although the contraceptive prevalence rate is still low at 21 percent.

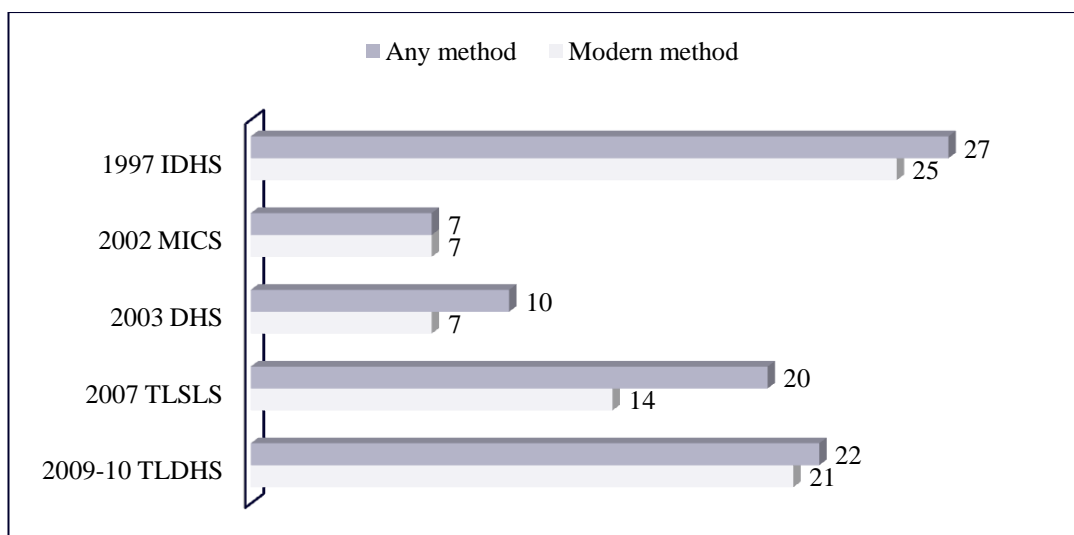


Figure 4.13. Trends in Contraception Use among Currently Married Women (Percentage), 1997-2010. Source: Government of Timor-Leste, 2010d; Ministry of Health and National Statistics Office Timor-Leste, et al., 2004

Women marry at an early age in Timor-Leste. The legal age for marriage is 16 years and the DHS reported that the average age at marriage was 20.9 in 2010. With limited contraception use and early age at marriage, it can be assumed that child bearing also starts at an early age in Timor-Leste. For example, among the group of women aged between 25 and 49, the median age at first birth was recorded as 22.4. The birth spacing pattern is also very short in Timor-Leste compared to some regional averages partly due to the low percentage use of contraception and short periods of breastfeeding. The length of postpartum insusceptibility is reported to be as low as 9 months, which has declined from 11.1 months in 2003. The median birth interval was also recorded as 29 months which is shorter than the Southeast Asian and the world averages (see Table 4.8), which has implications on the maternal, infant and childhood mortality rates (Government of Timor-Leste, 2010d).

Table 4.8

Actual and Preferred Birth Intervals

	Actual Birth Interval (Median/Months)
Sub Saharan Africa	32.7
South and Southeast Asia	33.6
World	32.1
Timor-Leste	29

Source: Rutstein, 2011

Abortion, on the other hand, is not illegal but only allowed under extreme circumstances and is forbidden in Timor-Leste also due to religious reasons (Belton, Whittaker, Fonseca, Wells-Brown, & Pais, 2009). In most cases it is practised informally without being recorded. Culturally and religiously, abortion still remains a very sensitive issue and there are no official and accurate data available on its prevalence. Illustrated in Table 4.9 among the proxy determinants of fertility, the percent increase in contraception use appears to be the only contributing factor to declining fertility rates in Timor-Leste between 2003 and 2010, whilst declining age at marriage and declining postpartum insusceptibility would have had a counteracting impact.

Table 4.9

Proximate Determinants of Fertility, 2003 and 2010

	2003	2010	Expected Impact on Fertility Rate
Contraception use (Any method)	10%	22%	-
Age at first marriage (age in numbers)	21.4	20.9	-
Percentage of women aged 15-49 who are married		57.8%*	
Insusceptibility (number of months since birth/ median)	11.5	9.1	-
Abortion	N/A	2.6%	-

*Data from 2003 DHS on marital status was derived from the household-level questionnaire administered to ever-married women only, so no comparison on marital status can be made. Source: Government of Timor-Leste, 2010d; Ministry of Health and National Statistics Office Timor-Leste et al., 2004

The use of contraception in Timor-Leste can be attributed to a variety of factors including, for instance, being exposed to family planning messages through mass media, having knowledge of contraception, and having easier access to modern family planning methods (Government of Timor-Leste, 2010d). At the national level, the exposure to family planning messages is quite low at 33 percent and, as illustrated in Table 4.10, there are great variations in the knowledge and use of contraceptives at the district level. For example, in the Manatuto district, the percent of men that are aware of a type of modern contraception method is 100 percent, whereas this rate is as low as 18 percent in Ermera. The percentage of women using any type of contraception is 44 percent in Covalima (twice the percent of the national average), whilst it is only 8 percent in Baucau. These large variations are also seen when it comes to the percentage of women exposed to family planning messages, as 73 percent of the women in Dili are exposed to family planning compared to 6 percent of women in Oecussi. Given the large district level differences, it is important that further research aims at understanding the causes of such variation,

and the reasons that some districts like Covalima are far ahead of the country averages whilst Ermera and Oecussi lag behind.

Table 4.10

District Level Selected Indicators 2010

Districts	TFR (2010)	Percent of women exposed to family planning messages	Percent of women that know a type of modern contraception method (CM)	Percent of men know a type of modern CM	Percent of women using a type of any CM	Median Age at first Marriage (Years)	Postpartum insusceptibility (Months)
Aileu	5.6	43.4	68.7	59.6	20.7	20.6	8.0
Ainaro	7.2	18.6	57.4	50.7	14.1	20.8	9.4
Baucau	5.5	24.8	55.8	31	8.0	22.2	9.5
Bobonaro	6.0	33.7	78.3	87.6	20.4	21.0	7.8
Cova-Lima	4.4	20.7	95.5	92.8	43.8	19.7	12.1
Dili	4.6	72.6	92.6	87	33.2	21.4	4.6
Ermera	6.6	8	71.3	17.5	19.6	20.8	11.7
Lautem	6.7	25.2	87.6	87.1	17.7	20.4	7.0
Liquica	5.5	36.8	75.6	75	24.5	20.7	11.6
Manatuto	5.5	32.5	74.6	100	20.7	21.3	9.5
Manufahi	5.9	33	77.8	37.4	25.3	20.7	10.2
Oecussi	6.6	6.4	94.9	91.2	24.1	19.8	10.7
Viqueque	5.6	14.6	61.8	47.2	15.1	21.0	9.6
TIMOR-LESTE	5.7	32.5	78	66	22	20.9	9.1

Source: Government of Timor-Leste, 2010d; Ministry of Health and National Statistics Office Timor-Leste et al., 2004

As a concluding remark, it can be stated that Timor-Leste's proximate determinants such as early age at marriage, low contraception use, short period of breastfeeding, and limited abortion opportunities contribute to high fertility rates and, hence, rapid population growth in the country. This research suggests that further studies are

needed to look into the socio-economic, cultural and religious factors that influence these proximate determinants.

4.4. CHAPTER SUMMARY

Having explored the recent trends in demographic change in post-conflict Timor-Leste, this chapter highlighted Timor-Leste's current population size, age-sex distribution and components of population change. This chapter has also pointed out that the major contributor to Timor-Leste's youthful population and its rapid growth is the high fertility rate among women. The proxy determinants of fertility in Timor-Leste is characterised by low percentage use of contraception, early age at marriage, short postpartum insusceptibility period, and limited abortion opportunities. This chapter demonstrated that the current demographic characteristics of Timor-Leste stand out in the Asia-Pacific region with its rapidly growing population and similar characteristics to several of the fragile African nations. With 69 percent of its population under the age 30, and 42 percent of the population under the age of 15, it is alarming that the majority of people will be still in the reproductive age group in the near future, a fact which has major implications for sustainable development and peace building efforts of this new nation. Timor-Leste's future demographic trajectory and a discussion on its possible implications on peace, stability and sustainability will be presented in Chapter 5.

CHAPTER 5: TIMOR-LESTE'S DEMOGRAPHIC TRAJECTORY BY 2030: A DISCUSSION ON FUTURE POPULATION AND ITS IMPLICATIONS FOR PEACE, POVERTY REDUCTION AND SUSTAINABLE DEVELOPMENT

5.1. INTRODUCTION

When a nation emerges as a new country after a long-drawn conflict, its demographic parameters such as fertility, mortality and migration rates exhibit patterns that can be partly explained by events and conditions related to unusual situations such as loss of men women and children, internal displacement of populations or rapid out-migration before during and after a conflict or political condition (Dasvarma, 2011).

Timor-Leste has been no exception to this when it comes to its demographic patterns. Since 2008 however, the country has been relatively stable and it managed to have peaceful elections in 2012. This stability, with implications for relatively predictable demographic trends for the country, makes it justifiable to project the future population scenario of Timor-Leste and generate meaningful discussions.

As discussed previously in this thesis, demographic information is particularly important for the nation building process of post-conflict countries. In this respect, Timor-Leste needs to be aware not only of its current population dynamics, but also of the future population scenarios and the possible implications of this scenario becoming reality in order to plan accordingly and take necessary steps for maintaining peace, reducing poverty and ensuring environmental sustainability.

Therefore, taking 2010 as the base year, this chapter projects the population of Timor-Leste for every 10 years until 2030 and presents its implications, particularly, in the areas including population density, age-sex cohort, labour force and urbanisation. Timor-Leste's 2010 census offers the most recent and reliable population data set for base year population input and a population projection period of nearly 20 years aligns with Timor-Leste's Strategic Development Plan which sets medium to long term targets for the period 2011 to 2030 (Government of Timor-Leste, 2010a). A considerably shorter period of 20 years also allows making assumptions about demographic change of a transitional society like Timor-Leste more reasonable. Based on the findings, this chapter creates a discussion on the challenges of Timor-Leste's prospective demographic profile for securing peace, reducing poverty and achieving environmental sustainability in the country.

5.2. TIMOR-LESTE'S POPULATION TRAJECTORY BY 2030

5.2.1. Assumptions for Population Projection of Timor-Leste

The government of Timor-Leste has produced two sets of population projections; one based on the 2004 census, and the other on the 2010 census (National Statistics Directorate, 2004; National Statistics Directorate & UNFPA, 2012). There are also alternative population projections produced by the World Bank (2008) using 2004 census data, and the United Nations (2012) using 2010 census data. This research has produced its own projections to incorporate the latest (2010) census results and to re-examine future prospects by creating an outlook for the most likely (medium variant) scenario. One reason for constructing new population projections is that the United Nations is forecasting a somewhat different scenario compared with the national projections. The population projection produced in this thesis is also unique because the results can be used to make sectoral projections to discuss the socio-economic

implications of the projections becoming reality. The projection undertaken in this thesis relies on a number of assumptions that are made on the basis of demographic knowledge, information specific to Timor-Leste, and available data. The key demographic assumptions are outlined below.

5.2.1.1. Future Course of Fertility

As discussed in the previous chapter, Timor-Leste is currently going through the latter stages of the first demographic transition with its declining fertility and mortality rates. The future course of fertility for the population projections is based on its past trends and current levels. Thus, the total fertility rate in Timor-Leste is assumed to decline further between 2010 and 2030; however this decline is predicted to be slow for a number of reasons. The assumed total fertility rates for the years 2015, 2020, 2025 and 2030 are respectively 5.33, 4.95, 4.58 and 4.20. In summary, this projection assumes that the total fertility rate will decline from 5.7 in 2010 to 4.2 in 2030. The reasons for adopting these assumed TFRs are discussed below.

According to Timor-Leste's DHS (2010), the desired number of children still remains high with almost 61 percent of the women with five children wishing to have one additional child or more. The mean ideal number of children among women of the age group 20-24 is 4.4, but it is 6.1 among women aged 45-49 years.

Moreover, the fertility rate in Timor-Leste, as discussed previously in Chapter 4, is argued to be always traditionally high and deeply rooted in culture (Saikia, Dasvarma, & Wells-Brown, 2009). Therefore, this thesis finds it unreasonable to hypothesise a dramatic fertility decline by 2030. Moreover, the declining age at marriage between 2003 and 2010 suggests that the reproductive span for women within marriage has been increasing with possible implications for continuing high

fertility. Furthermore, little knowledge about family planning and limited use of contraception among women make it unlikely that a dramatic fall in fertility will be expected in the next two decades. One interesting point to highlight however is the fact that although Timor-Leste is a highly patriarchal society where the husband's decisions on reproduction are dominant, only in 8 percent of the cases is a husband's refusal indicated as the reason for not intending to use contraception (Government of Timor-Leste, 2010d).

The unmet need for family planning is estimated at 20 percent for birth spacing and 10 percent for limiting child bearing (Government of Timor-Leste, 2010d). In the future demographic scenario, this research assumed that considerable progress will be made in meeting the unmet need for family planning, and that fertility will approximate the ideal number of 3.9 children that women in the 15-19 age group currently desire. Together with the assumed declines in the TFR, this research also assumed that the age composition of fertility will change slightly. At present, women have children throughout their reproductive life. A decline in fertility is expected to imply that women 35 to 49 years will reduce their fertility much more than those in the prime reproductive age (20-29 years). Thus, as fertility declines, it is assumed that the fertility will become more concentrated in women aged 20 to 34 years (see Figure 5.1).

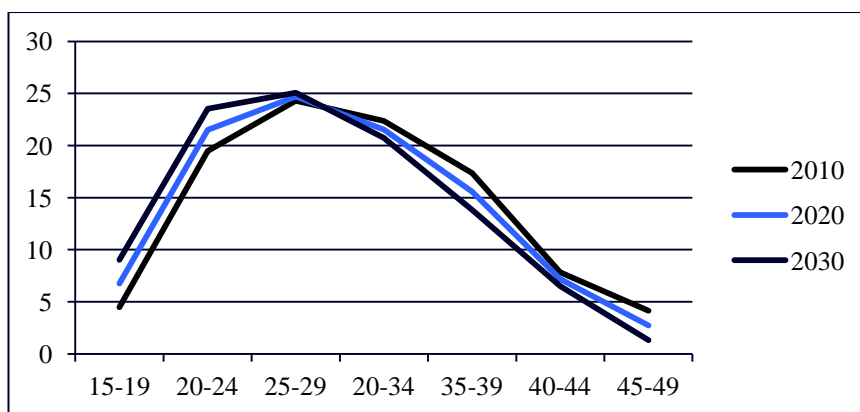


Figure 5.1. Age Distribution of Fertility between 2010 and 2030 (percentage). Source: Prepared by the researcher based on population projections of this research

5.2.1.2. Future Course of Mortality – Assumptions about Life Expectancy at Birth

The United Nations Human Development Report for 2011 estimates that for the group of countries with high human development, the average life expectancy is 73.1 years compared with 72.4 years for East Asia and the Pacific (UNDP, 2011b). For the present population projection, this research assumed that by 2030, the life expectancy at birth for Timor-Leste will be near what the average life expectancy at birth currently is for the highly developed countries, as well as for countries of East Asia and the Pacific. More specifically, it is assumed that life expectancy for men will increase from 63 years in 2010 to 72.1 years in 2030, whilst that of women will increase from 66 years in 2010 to 75.5 in 2030. These are also the estimates used by the UN (2012) projections for Timor-Leste.

Timor-Leste's national population projection based on the 2004 census uses the East model of the Coale-Demeny Regional Life Tables as the most suitable model to be used for indirectly estimating under-five and infant mortality (National Statistics Directorate, 2004). For early-age mortality, this model represents a very large difference between infant and child mortality. In other words, the under-one component of early-age mortality rate is very high while the 1-4 years component is

comparatively low. This was in fact the relevant case in Timor-Leste following the 2004 census results. However, the infant mortality rates in Timor-Leste have dropped substantially in the past few years (from 83 in the 2000-2006 period to 44 infant deaths per 1000 newborn), due to widespread immunisation programs and an increase in pre- and post-natal care for pregnant women and mothers (UNDP, 2011d). This reflects that there has been considerable improvement in the country's health indicators in the past 10 years.

The United Nations projections used the West model of the Coale-Demeny Model Life Tables for projecting Timor-Leste's future life expectancies at birth. The infant mortality rate (IMR) in this life table suggesting 51 infant deaths per 1,000 live births is the closest to the current IMR in Timor-Leste. Therefore, the projection in this thesis also uses the West model of Coale-Demeny model since this model is also recommended for situations where no other basis for choice exist (Becker, 2008).

5.2.1.3. Future Course of International Migration

Since this is a projection of the total population of Timor-Leste, discussions about the future course of migration will be confined to international migration; that is, migration to or from Timor-Leste. For reasons related to a lack of credible data and the volatile history of Timor-Leste following its independence, it is very challenging to propose an analytically credible hypothesis about the future trend of international migration. One of the major limitations in estimating international migration is the fact that most recent population movements in Timor-Leste were caused by political, social and economic instability and, therefore, are not indicative of international migration under normal conditions. One could argue that, once stability is ensured and displaced persons have returned to Timor-Leste, "push" factors may lead Timor-Leste to become a net labour exporter. However the migrant flow would indeed

depend on what cross-national social networks develop and how migration policies evolve in potential destination countries (World Bank, 2008). In the absence of established flows, it is difficult to project future volume and trends of international migration. Although the recent elections have provided progress towards peace and stability, in a fragile country like Timor-Leste it is difficult to predict political events that could produce large movements of people in the coming decades (World Bank, 2008). For the purpose of this thesis, it is found reasonable to assume that international migration will be negligible and, hence, unlikely to be a major component of population change in Timor-Leste in the next two decades. This projection therefore utilises the default data that is incorporated in the Demproj model for international migration figures for Timor-Leste. These figures are derived from the United Nations (2010) World Population Prospects. Its 2010 revision suggests that the male outmigration will decline from 2,863 in 2010 to 520 in 2013 and will remain stable from then onwards up until 2030. For women, the outmigration number is 2,629 in 2010, declining to 478 in 2013 and staying constant until 2030. While the reasons behind the decline in outmigration may be related to improving stability and development progress in the country, the UN fails to provide an explanation as to why it will remain constant from 2013 onwards.

5.2.2. Presenting Timor-Leste's Future Demographic Scenario by 2030

Using the assumptions outlined above, this thesis projects that the total population of Timor-Leste will increase from 1.06 million in 2010 to 1.39 million in 2020 and to 1.82 million by 2030. Table 5.1 provides a comparable outlook on alternative projection results that use the 2010 census findings as their base year. According to this table, the projection findings of this thesis are somewhat lower than the national projections, yet somewhat higher than the UN medium variant projections.

Table 5.1.

Alternative Projections for Timor-Leste's Population by 2030

	Total Population (millions)		
	2010	2020	2030
Projection of this thesis	1.06	1.39	1.82
UN Projection (medium variant)	1.06	1.31	1.63
National Projection (Recommended Scenario)	1.06	1.42	1.89
National Projection (Optimistic Scenario)	1.06	1.42	1.83

Source: National Statistics Directorate & UNFPA, 2012; United Nations, 2012

Although the total size of the population with 1.82 million may seem small, the absolute increase of 760.000 people on an island country in 20 years is still quite considerable. This is particularly so where poverty is widespread, 64 percent of the current population is reported as being food insecure, 42 percent do not have access to water, and 64 percent do not have adequate sanitation (World Bank, 2009d). This list of descriptive factors continues with limited access to adequate housing, electricity and job opportunities as well as quality of health and education services to be discussed later on in this chapter.

As discussed previously in Chapter 4, Timor-Leste has a very youthful population. According to this projection, this will not remain the case for the future population of Timor-Leste. Nevertheless, its aging will be much slower than typical in the next two decades, having only a tiny impact on its youthful composition. The implications of such demographic composition on peace and poverty reduction will be discussed later in this chapter. The median age in Timor-Leste is projected to rise by only one year, from 19 in 2010 to 20 years in 2030, as opposed to a five year increase in the less developed regions (reaching 31.4 years), and 6.3 year increase in Southeast Asia (reaching 33.6 years) in the same time period. The average median age of the populations on the African continent will even be higher than Timor-Leste's

increasing from 19.2 in 2010 to 21.3 in 2030, leaving Timor-Leste as one of the youngest countries in the world (United Nations, 2012).

The youthfulness of the population of Timor-Leste is partially reflected in the percentage of its population under age 15. The population at ages 0–14 years will only fall from 42 percent of the total population in 2010 to 40 percent by 2030 due to a slowly declining fertility rate. This could reflect that Timor-Leste's share of children in the total population will continue to be very large. For example, the percent share of this age cohort is projected to be 22 percent for the Southeast Asia region, and 25 percent for the group of less developed countries by 2030 as compared with 40 percent in Timor-Leste.

Timor-Leste's working age population, on the other hand, will increase from 54 percent in 2010 to 56 percent by 2030. Although an increase of two percentage points may not seem to be significant, the population within working age will, in fact, experience a considerable absolute increase. According to this projection, the size of the working age population will increase from half a million people (0.56 million) in 2010 to over a million people (1.01 million) in 2030. This implies a dramatic increase in the absolute number of potential workers; in other words, the potential supply of labour in the next two decades. The implications of the expansion of the working age group will be discussed further in this chapter. Based on the future age distribution, the older age group (aged 65 and above) in contrast, will continue to compose a small share of the total population with four percent in 2030. In this respect, Timor-Leste will very much resemble Africa rather than its Southeast Asian neighbours (see Table 5.2). While Southeast Asia and other less developed regions will continue to have the proportion of their working age populations around 65 percent and over for the next two decades, Timor-Leste's proportion of working

age population will not exceed 56 percent and will remain lower than the African averages. One may expect that the situation might reverse after 2030 as the elderly population in most of Southeast Asia will become an increasingly larger group while Timor-Leste's working age population will grow continuously with increased proportion in the total population (due to declining fertility rates). However, it is also possible that any benefits to be obtained by then may be overshadowed by decades of proportionally small working-age cohorts. This situation may also apply to countries in the African region. This is particularly important for Timor-Leste's poverty reduction efforts in the next two decades for the reasons explained below.

Table 5.2

Current and Future Age Structure of Populations in Timor-Leste and Selected Regions (percentages)

	Age 0-14			Age 15-64			Age 65+		
	2010	2020	2030	2010	2020	2030	2010	2020	2030
Less Developed Regions	29	27	25	65	65	65	6	7	10
Africa	41	40	37	55	57	59	3	4	4
Southeast Asia	28	25	22	66	68	68	5	7	10
Timor-Leste	42	41	40	54	55	56	5	5	4

Source: United Nations, 2012

The age structure is often represented by way of the dependency ratio when the percent share of the children is considered in comparison with the share of working age group in that population. The total dependency ratio in Timor-Leste, which, as explained previously, is the ratio of the presumably dependent population (younger than 15 years and older than 65 years) to the population aged 15–64 years, is projected to fall slightly from 88 percent in 2010 to 83 percent in 2020 and to 80

percent in 2030. This rate reflects that every 100 persons of working ages have to support nearly 80 dependents, mainly young ones, by 2030. This is reflected in the very high child dependency ratios for 2010, 2020 and 2030 which are projected to be respectively 77 percent, 74 percent and 72 percent. This suggests that the old dependency ratios will continue to be small and decline from 11 percent in 2010, to 9 percent in 2020 and 8 percent in 2030. Comparatively, Timor-Leste's total dependency will be much higher than the African average and almost double the Southeast Asian average by 2030. Apart from a few exceptional countries such as Niger, this dependency ratio will in fact be one of the highest in the world (see Figure 5.2).

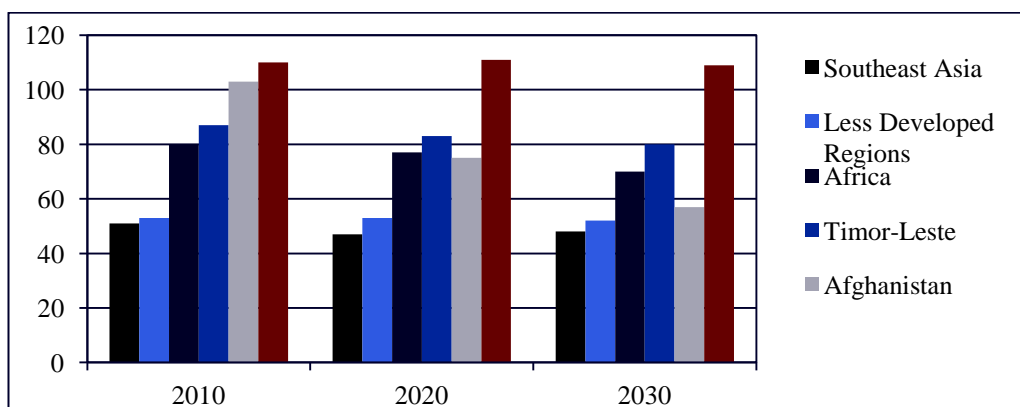


Figure 5.2. Total Dependency Ratios for Selected Countries, 2010-2030. Source: United Nations, 2012

A key to understanding this dependency relationship is also related to grasping the concept of demographic bonus or demographic dividend (Mason, 2003). As fertility declines, a large proportion of the population moves into and through the working age bracket while the proportion of children in the population continues to decline. At this stage of the demographic transition, the proportion of the elderly population aged 65 years and over remains low. This opens a window of opportunity with potential for increasing savings and investments for economic growth as fewer resources would be required for supporting the proportionately fewer dependents,

creating opportunities for investments in education and health. Meanwhile, less population pressure on the educational and health systems may facilitate qualitative and quantitative improvements in these sectors and lead to the accumulation of human capital which would feed back into further economic development (Leete & Schoch, 2003; Mason, 2003). Approximately, one-third of the economic growth experienced by several East Asian countries during the last quarter of the past century is attributed to an adequate utilisation of the demographic bonus (Williamson & Higgins, 1997). The potential for continuing economic development holds until the bonus ends when the number of elders increases substantially and the country then needs to divert investments to care for its elderly population. The country may have the resources to cope with this new demographic change related to growing size of the older population, if the demographic dividend is fully utilised to generate economic development. In the case of Timor-Leste, it is evident that with the projected population scenario the increase in the labour supply will be substantial with a very slow decline in its growth rate after 2020. Hence, only a larger fertility decline, which will require a faster demographic transition, would result in an economically absorbable working age population size, allowing the country to have the benefit of a demographic bonus starting sometime after 2030.

5.3. EXPLORING THE POSSIBLE IMPLICATIONS OF FUTURE POPULATION TRAJECTORY ON PEACE, POVERTY REDUCTION AND SUSTAINABLE DEVELOPMENT

5.3.1. Population and Conflict: Youth Bulge, Rapid Urbanisation and Contributing Factors

The United Nations echoes the concerns relating to the destabilising effect of demographic trends by stating that societies currently in conflict, or in post-conflict transition, are facing the demographic challenge of having an extremely high

proportion of young population at a time when people in these societies are still recovering from the scars of foreign occupation, an economic slump, and periodic outbreaks of political violence (Crossette, 2010). A number of recent studies have shown that a large youth bulge (usually defined as a high proportion of 15 to 24 year olds relative to the adult population), is associated with a high risk of outbreak of civil conflict (Cincotta, 2005). Countries in which young adults constitute approximately 40 percent or more of the adult population were found to be more than twice likely to experience an outbreak of civil conflict than countries with lesser young adult populations (Aning & Atta-Asamoah, 2011).

Urdal (2006) in a recent cross-national time-series study of the 1950-2000 period, found that the risk of conflict increases by more than four percent with each percentage point increase in the proportion of youth (15-24 years-olds) and in the adult population (aged 15 and above). The statistical relationship holds even when a number of other factors such as level of development, democracy, and conflict history are controlled. Moreover, the author finds that when youth make up more than 35 percent of the adult population, which they do in many developing countries, the risk of armed conflict is 150 percent higher than in countries with an age structure similar to that of most developed countries.

The analysis conducted by Urdal (2011) as mentioned earlier, also provides the empirical evidence that the youth bulge is associated with a higher risk of conflict in countries where dependency ratios are particularly high (high growth in 0-14 age group), while countries that are well underway in their demographic transitions are likely to experience a 'peace dividend'.

A study conducted by Population Action International shows that countries grouped as “very young” (over 67 percent under 30 and population doubling time 20-35 years), and youthful (60-67 percent under 30 and population doubling time 35-50 years), are far more likely to experience civil conflict than countries grouped as transitional (45-60 percent under 30, doubling time 50-125 years), or mature (30-45 percent under 30, doubling time 125-2,400 years) (Leahy, Engelman, Vogel, Haddock, & Preston, 2007). This particular study also indicates that once a country moves from the first phase of demographic transition characterised by high proportion of young age population to mature age population structure, social conflict tends to reduce rapidly. It is important to point out that the demographic transition does not occur in a vacuum, but is associated with socio-economic changes (from pre-industrial to industrial, from rural to increasingly urban, from poor to rich), that address the problems of unemployment, poverty, malnutrition, mal-distribution of income. In other words, demographic transition is associated with improvements in situations that are rife for conflict.

The above-mentioned authors, however, are careful to suggest that although youth bulge can be the pressure point for violent conflict, the impact of population factors on nation building and political stability are mediated by various factors including the quality of institutions and the provision for employment, socialization, and economic opportunities for urban youth among others. These mediating factors are discussed in the section below.

In the light of the relevant study findings on population and conflict, it can be noted that Timor-Leste’s current and near future population composition represents a comparably high demographic risk that is associated with conflict. As projected in this thesis, Timor-Leste has and will continue to have the structure of a very young

population with 69 percent of its population aged below 30 for the next two decades. This thesis has found that the percentage of youth (described as the population aged between 15 and 24), was 34 percent of the adult population (aged 15 and above) in 2010, and that this proportion will decline to only 31 percent by 2030. Other things kept equal and following the study findings of Urdal (2011), it can be argued that the continuing youth bulge positions Timor-Leste in the group of countries where the risk of armed conflict is almost 150 percent higher than others with age structures similar to those of developed countries. Timor-Leste's future experience is, however, a test of the existing theories and is conditioned on the mediating factors shaping whether Timor-Leste can cope with this demographic situation to prevent and lower the risk of violent conflict.

5.3.1.1. Demographic Risks and Contextual Factors Contributing to Social Conflict

Although demographic analysis can help analysts anticipate the risk levels associated with conflict, the demographic characteristics of a population by themselves are not determinative factors of social or political change (Weiner & Russell, 2001). One must, therefore, be careful not to overstate their predictive value. There are certain conditions under which the demographic situation of a country can trigger a threat to national security.

Laipson (2007) suggests that countries with younger age structures combined with poor economic performance, scarce resources, and major development problems are vulnerable to extremist organisations, insurgencies or militia that offer economic incentives and an identity that are not available in the open economy. Choucri (1974) argues that youth belonging to large cohorts will be especially vulnerable to unemployment if their entry into the labour force coincides with periods of serious

economic decline. This is because such coincidences may move young people towards the use of violence due to despair. Moreover, poor countries are also argued to be more susceptible to conflict as they often lack institutional arrangements for peaceful conflict resolution and have limited capacities to adapt to changing socio-economic demographic or environmental trends (Barnett & Adger, 2007).

Although geographical crowding, mainly in the form of rapid urbanisation, has not been the central focus of population and conflict debate, urban population pressures were highlighted to generate motives for political violence (Brennan-Galvin, 2002). Theoretical approaches that offer a number of possible insights into how increasing urban population pressure might be transformed into political violence, range from nearly deterministic assumptions about ethnic hatreds and associated security dilemmas (Horowitz, 1985; Kaufmann, 1996; Posen, 1993) via modernisation-based arguments of radicalisation of aggrieved, unemployed youths (Goldstone, 2002; Huntington, 1996; Sciubba, 2011), to classical theories of structural inequalities and relative deprivation (Gurr, 1970). Despite the variety of approaches, these have one aspect in common, and that is their attention to the distribution of opportunities and privileges among the populations.

Historically, the coincidence of youth bulges with rapid urbanisation, especially in the context of unemployment and poverty, has been an important contributor to political violence (Goldstone, 2001). This is argued for the case when youth are abundant in a relatively small geographical area, in turn increasing the likelihood of grievances arising due to crowding in the labour market or educational institutions (Sciubba, 2011).

In the case of Timor-Leste, Neupert and Lopes (2006) argue that the demographic composition and youth bulge in the form of a remarkable prominence of the age groups 15-19 to 30-34 in the country's major capital city Dili may have played a substantial role in the 2006 conflict. Dili is by far the largest urban centre of the country with one in almost five people of the population of Timor-Leste living in the capital city. According to national accounts, Timor-Leste currently has an urban population of 315,216 persons which is 29.5 percent of the total population of the country. Out of this total urban population, 61.4 percent resides in the capital city. This thesis projects that if the urban population grows at a rate of 3.5 to 4 percent during the projection period as estimated by the UN (UNDESA, 2011), it will increase by 107 percent reaching a population of 655,430 in 2030. Hence, the share of urban population will be 36 percent of Timor-Leste's total population in 2030. It is also important to note that urbanisation is not purely the result of rural to urban migration, but also of natural increase of urban areas. Although this share may seem small compared to other countries of the region, Timor-Leste's rate of urbanisation is recorded as one of the fastest in the world with much higher rates than Africa, Melanesia, Southeast Asia and the group of least developed countries (UNDESA, 2011).

When it comes to concentrated urbanisation trends, this research projects that if Dili continues to accommodate 61 percent of the urban population of the country, the city's population will increase from 192,388 in 2010 to 297,819 in 2020 and 454,070

in 2030.¹¹ This reflects a 136 percent increase suggesting that Dili's population will increase by more than double by 2030 (see Figure 5.3). When it comes to the expansion of urban youth, it is projected that the group of young people aged 12 to 25 will increase by more than double and reach 218,876 in 2030.

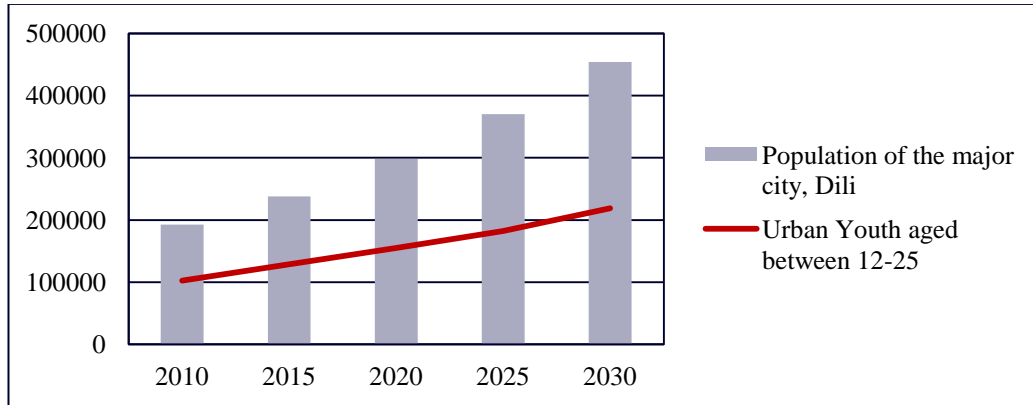


Figure 5.3. Projected Population Increase in the Capital City Dili and Projected Numbers of Urban Youth Aged between 12 and 25, 2010-2030. Source: Prepared by the researcher based on population projections of this research

The concentration of the urban population in one major city and the rapidly growing numbers of the urban population and youth within this pool raise concerns about possible frustrations that may arise from unemployment, insufficient infrastructure and public services, and crime and conflict due to unmet desires or needs of the young population.

As mentioned at the beginning of this sub-section, demographic factors alone do not act in a vacuum to create situations of conflict. They can trigger a conflict if other factors such as governance, institutional mechanisms and socio-economic situations are favourable to the addressing of demographic factors such as youth bulge. A

¹¹ This assumption foresees that much of the urban growth will predominantly take place in Dili, but other places are likely to grow as urban centres with additional villages becoming urban in the next 20 years

recent study by Buhaug and Urdal (2013), using a data set covering 55 major cities in Asia and Sub-Saharan Africa and, spanning a period of 46 years (1960-2006), shows that large male youth bulges aged 15-24 years are generally not associated with increased risks of either violent or non-violent social disturbance. Instead, urban disorder is found to be primarily associated with a lack of consistent political institutions, economic shocks, and ongoing civil conflict (Buhaug & Urdal, 2013). Hence, in the context of the urban youth bulge, the authors point to the need to address the institutional, socio-political and economic structures that provide a particular condition and enable the demographic trigger to create civil conflict.

A study conducted by Conciliation Resources and Safer World assessing local people's perspective on violence and rising social conflicts in post-independent Timor-Leste has found that the limited livelihood opportunities among the youth population have resulted in apathy and lack of engagement with their community, thus making them even more susceptible to political manipulation (Bowd, 2012). A quote by an NGO worker taken from this particular survey suggested that most of the times, conflict happens because the youth have limited options and are frustrated:

Young unemployed [and] disfranchised young men with very limited opportunities in front of them – that represents a significant enabling factor to violence. You could have one small incident ... and they turn up, like a crowd [that comes] together quite quickly (Bowd, 2012).

One of the greatest challenges for Timor-Leste is the excessive growth in the working age population, but poor growth in employment opportunities. Timor-Leste has a dual economy, with one activity group based on subsistence agriculture and the

other on petroleum. This economy has been developing with volatile growth rates including negative values due to uncertainties related to recent conflicts. In the past five years, Timor-Leste's economy has been developing with very high growth rates ranging from between 6 to 10 percent annually (IMF, 2012). This growth was largely backed up by government spending fuelled by the petroleum fund. The oil industry is the largest source of the country's gross national income (see Figure 5.4).

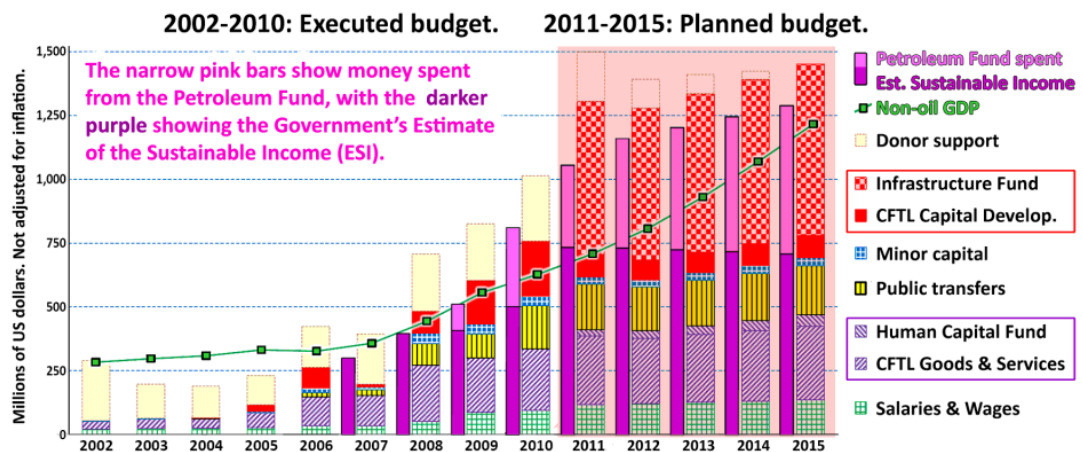


Figure 5.4. State Expenditures over time including autonomous agencies. Source: Lao Hamutuk, 2011. Graph by La'o Hamutuk based on IMF forecast and RDTL Ministry of Finance data and projections

According to La'o Hamutuk (2011), despite the optimism Timor-Leste's oil and gas revenues are limited in scope, particularly because the state budget is growing much faster than the economy. According to their projection, the balance of petroleum funds will be exhausted between 2030 and 2035, if the expenditures of the 2011 general state budget continue to increase at 3.5 percent annually (see Figure 5.5).

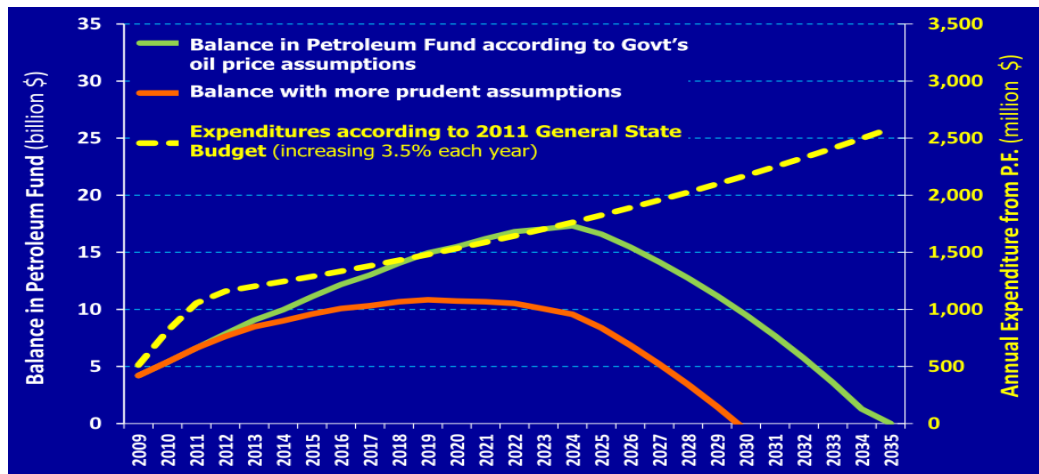


Figure 5.5. Petroleum Fund Balance in the Future. Source: Lao Hamutuk, 2011

The adequate and strategic spending of the income from petroleum revenue is also questionable. The 2011 state expenditure prioritised infrastructure development where 52 percent of the budget was spent particularly on the national electricity project, whilst 10 percent was spent on health and education, and three percent on economic and agricultural development (Lao Hamutuk, 2011). Moreover, this technology-intensive industry has done little to create jobs for the unemployed in Timor-Leste. Currently, the petroleum sector only employs 0.1 percent of total employment (Hill, 2013). This is also partly due to the fact that oil and gas production takes place off-shore and there are no onshore production facilities that could employ local workers.

Presently, the formal sector employs only 15 percent of the labour force in Timor-Leste (ILO, 2008). While the rural sector shares 71 percent of both the informal and formal employment, manufacturing, mining and industry employ only 5 percent (ILO, AusAID, & Youth Employment Promotion, 2010). The agriculture and forestry sector is particularly prone to seasonal patterns of employment, and their labour force is generally characterised by a significant share of self-employed persons and unpaid family workers. The labour force participation rates reported as 57 percent for men

and 27 percent for women are much lower than those of the Southeast Asian and the Pacific averages, and the gender disparity of labour force participation in Timor-Leste is quite concerning (ILO et al., 2010).

When it comes to the young population aged 15- 29 years (according to the national definition of youth), the labour force statistics are even more troubling. Timor-Leste's youth labour force participation is among the lowest in the world, standing at around 17 percent and 10 percent among 15-29 age group of men and women respectively (see Table 5.3), relative to the corresponding global averages of 56 percent and 41 percent for the group aged between 15 and 24.

Table 5.3

Youth Labour Force Participation Rates (age 15-24 years), Timor-Leste and Selected Regions 2011

Region	Males	Females
World	56.3	40.7
Developed Economies & EU	49.7	45.6
East Asia	59	61.6
South-East Asia & Pacific	59.3	45.1
South Asia	57.6	23.4
Timor-Leste*	17.2	9.9
Sub Saharan Africa	55.9	51.4

*The percentages are given for the group aged between 15 and 29. Source: ILO, 2012; ILO et al., 2010

Although the unemployment rate is recorded as low as 3.1 percent for the working age population in 2010, it is argued that this statistic hints at large scale underemployment in both rural and urban sectors (World Bank, 2013a). For developing countries like Timor-Leste, the share of informal employment and vulnerable employment are more useful indicators representing the weakness of the

labour market rather than the size of the unemployed (World Bank, 2013a).¹² While Timor-Leste's informal employment is reported as 18 percent, its vulnerable employment is stated as a remarkably high rate of 70 percent in 2010 (World Bank, 2013a). Only 20 percent of the employment in Timor-Leste is wage-based as compared to 43 percent in Southeast Asia and the Pacific region. The inactivity rate for both sexes combined, on the other hand, was reported as 57.4 percent which reflects the remarkable weakness of Timor-Leste's labour market (World Bank, 2013a).

Despite the extremely weak labour market and limited job opportunities, the working age population of Timor-Leste is growing rapidly. In order to calculate the numbers of people that will require jobs in the near future, this thesis creates what could be a slightly optimistic scenario which has its basis in estimates that assume the labour force participation for both sexes will improve in the next two decades along with rural development projects, ongoing training programs, improved labour market governance, and improved government initiatives in support of a secure labour market environment. Despite many targeted employment and training programs and efforts invested into strengthening women's equality in the workforce however, the improvement in the rate of women's labour force participation is assumed to be much slower. This is due to the traditionally assigned roles and responsibilities that are likely to hinder women's full participation in the labour force by 2030. It is

¹² People in vulnerable employment are defined as those whose status in employment is defined as an own-account worker or contributing family member (ILO 2010). These people therefore are less likely to have formal work arrangements or access to benefits or social protection programs which make them more vulnerable to economic downturns (ILO 2010).

assumed that male labour force participation (15-64) will increase to 75 percent and women's participation to 45 percent by 2030.

Based on these assumptions, the size of the labour force is projected to increase from 261,281 people in 2010 to 404,977 people in 2020 and reach 610,757 people by 2030. With 10,000 to 25,000 projected new entrants into the labour market each year, the labour force will more than double with 134 percent increase in 20 years' time. This means that, on average, around 18,000 new jobs need to be created annually between 2010 and 2030. Due to the demographic composition of the population, the required number of new jobs is projected to increase from just below 10,000 jobs in 2010 to around 17,500, then stay around the same between 2020 and 2025, and continue to climb until it reaches 26,350 new jobs in 2030 (see Figure 5.6).



Figure 5.6. Projected Number of New Jobs Required for Timor-Leste, 2010-2030. Source: Prepared by the researcher based on population projections of this research

In a 2007 report by the World Bank, it was stated that with the exception of some recent and short-term projects, job creation in Timor is almost non-existent (World Bank, 2007). In 2008, it was indicated that only 400 formal jobs were being created each year (ILO, 2008). Although there are no accurate data on the total number of jobs created annually, it was reported that the formal sector employs around 37,000 paid workers (World Bank 2007). The ILO Decent Work Country Programme (2008-2013)

targeted the creation of 400,000 worker days per year in the rural sector, 40 percent of which will be performed by women. This target could be interpreted as 1,095 jobs per year. All of this indicates that there will be a tremendous shortage of jobs in the next two decades. Unless there is a substantial increase in investment to enable parallel growth in labour supply, the rates of unemployment and vulnerable employment are likely to expand further and Timor-Leste's demographic composition will become a true burden for socio-economic stability and sustainable development of the country.

The current new market entrants not only struggle with a shortage of jobs, but also face a mismatch between the supply of skills that they are able to offer and the demand for skills required by the employers. According to an ILO report (2008), only 4 out of 13 districts in the country have established government employment facilities. The expansion of these facilities and a rural transport system are in progress. However, finding skilled workers for new programs are real challenges. Around 40 percent of the working-age population has no formal educational attainment (ILO, AusAID, & Youth Employment Promotion, 2009). Most of the education infrastructure was destroyed and many teachers fled during the 1999 violent conflict leaving independent Timor-Leste without the basic resources of an education system. This has caused long-lasting impacts on school achievements where only about 50 percent of school-aged children complete primary schooling and it takes a child nearly 12 years to finish their primary education, presumably due to early childhood developmental disadvantages manifesting through a very high grade repetition rate. This rate was reported as 16 percent in 2008 (United Nations, 2008).

Although one of the first priorities towards building a skilled, domestic workforce for the future is to enable children to reach youth in good health and with adequate education, the current government spending of Timor-Leste in these two sectors is

quite disappointing with a much smaller share of budget allocation compared to many other developing countries (See Figure 5.7).

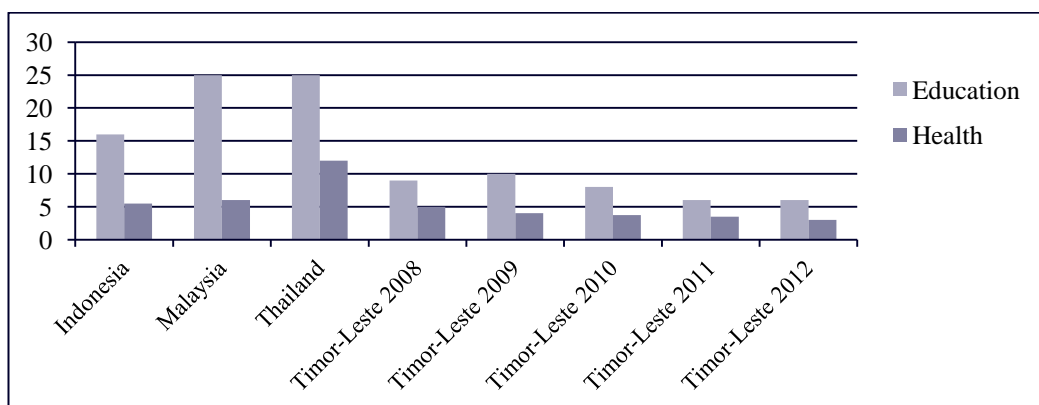


Figure 5.7. Budget Allocations for Education and Health (Percentage) Timor-Leste and Selected Countries. Source: World Bank, 2013a

Currently, the enormous disparity between available jobs and the number of people entering the labour force results in an extremely high waste of human potential and the cost of lost production. While this problem jeopardises the socio-economic development of this country, it also contributes to dysfunctional behaviours, rising levels of crime, violence and political extremism among young people (ILO, 2008). As discussed previously, vulnerable employment conditions and low incomes in rural areas lead to unsustainable trends of youth urban migration in the search for jobs. The unmet aspirations and building frustrations among these increasing numbers of youth due to lack of job opportunities are likely to constitute a threat to national security and may lead to re-emerging civil conflict in the country. The social and economic gains of involving young Timorese in productive and decent employment promise immense welfare benefits for the country's nation-building process, and also through keeping the youth away from engaging in violent activities (ILO et al., 2009). Therefore, urgent measures are needed to create productive jobs in Timor-Leste not only as a

means to achieve economic and social development but also to maintain peace and stability in the society.

Education is found to be positively associated with decreased risks of violent conflict. A recent study by Buhaug and Urdal (2013), using a data set that covers 55 major cities in Asia and Sub-Saharan Africa and spans over the 1960 and 2006 period, found that governments that invest in secondary education experience lower risks of violent conflict. Collier (2000) argues that educated men have better income-earning opportunities than the uneducated, and they would have more to lose and hence be less likely to join a rebellion. Rebel recruitment is thus more costly and rebellion less likely the higher the level of education in a society (Collier & Hoeffler, 2004). Hence, increased human capital is indeed a dividend for sustainable development, peace, and stability. Increasing access to and quality of education is an important channel to develop a fruitful labour force, improve economic development, reduce poverty and risks associated with conflict.

Widening the coverage and effectiveness of basic education can in fact have a powerfully preventive role in reducing human insecurity of nearly every kind ranging from basic deprivation to inequalities of political and economic participation and beyond (Sen, 2003). There is considerable evidence that fertility rates tend to go down sharply with greater empowerment of women through education and employment. For example, in a comparative study of the different districts within India, it is found that women's education and women's employment are the two most important influences in reducing fertility rates (Sen, 2003). In that extensive study, female education and employment are the only variables that have a statistically significant impact on explaining variations in fertility rates across more than three hundred districts that constitute India. Similarly, population control supported by

increased opportunities for women's education and employment can hence allow Timor-Leste to achieve a less youthful population structure by reducing youth dependency and demographic risks associated with conflict, and by creating a window of demographic opportunity for development if they are supported by enabling socio-economic policy environment.

5.3.2. Population Growth and Changing Demographic Trends: Implications for Poverty Reduction and Environmental Sustainability

From the second half of the 20th century, the growing literature on the linkages between population growth, poverty reduction and sustainable development has reached a broad consensus on two issues:

- 1- While policy and institutional settings are central in shaping the prospects of economic growth and poverty reduction, the rate of population growth also matters. As discussed in Chapter 2, there is considerable empirical evidence confirming three hypotheses: that age-structural transformations are responsible for a substantial portion of the recent poverty reduction in some countries due to demographic dividend; that small families are more likely to rise out of poverty; and that the elimination of unwanted fertility can reduce poverty in countries as much as their current anti-poverty programs (UNFPA, 2012).
- 2- The limited knowledge on the resilience and recovery of environment and increasing pressure on the common natural resources raise major concerns in regards to their sustainability. Empirical evidence suggests that context plays a major role in the way population growth impacts on the environment and the implications of population growth on the environmental resources are very much interlinked with other factors such as the socio-economic status of

populations, land tenure systems, capital markets, government regulations, and tax policies. Reduction of the rate of population growth can help gain time for structural, socio-political and economic adjustments to lower the pressure put on the environment and mitigate externalities born from its further degradation.

In the next two decades, Timor-Leste's fertility rate will continue to be very high compared with many other countries in the region and around the world. Total population size will expand rapidly and age structure will produce a continuing high youth dependency ratio. The average household size has been increasing in Timor-Leste between 2004 and 2010 and is expected to increase even further with the growing population. These conditions signal that Timor-Leste's poverty reduction efforts are going to be under considerable pressure with limited potential to benefit from a demographic dividend for capital accumulation and savings to be diverted for productive sectors of the economy.

This thesis projects that there is going to be an additional 760,000 people in Timor-Leste by 2030. The annual population growth rates above 2.5 percent will continue to be among the highest in the world and very close to the growth rates of fragile African nations. This means that Timor-Leste will need to meet increasing demands for food, shelter, water, air energy and so on at a much faster rate than that of its Southeast Asian neighbours. Timor-Leste's total population density will increase from 72 persons per square kilometre to 121 persons in 2030, while intensification of densities will be much higher when agricultural and arable land areas are considered. If it is assumed that arable and agricultural land size will remain constant, the number of persons per block of agricultural land will increase from 273 people per square kilometre to 469 in 2030, and number of persons per arable patch of land will

increase from 623 persons per square kilometre to 1071 persons in 2030. This is an enormous increase and a very threatening concern when Timor-Leste's contextual factors such as poor soils, heavily degraded environment and problematic land titles are considered.

Timor-Leste already has a heavily degraded environment due to centuries of colonial exploitation (the country's sandalwood reserves were depleted rapidly and primary forests were converted to coffee plantations for commercial purposes). This is also due to the mass environmental destruction that took place during the Indonesian occupation when much of the country's primary forests were logged or burned (World Bank, 2009d). With 19.4 percent loss of Timor-Leste's forest and woodland habitat between 1990 and 2005, this suggests that deforestation has already reached a critical pace (Mongabay, 2009), and that this pace is currently exacerbated by the local people's excessive use of firewood for their energy needs. Further loss of the remaining forests is coupled with the fact that over half of the land area of Timor-Leste is either at risk of soil erosion or degradation during heavy rainfall, partly because 44 percent of the island has a slope of 40 percent or more (Government of Timor-Leste, 2010a). When it comes to fertility of the land, the soil of Timor-Leste is stated to be derived from limestone and metamorphosed marine clays unlike many of its neighbouring islands whose soil is derived from volcanic rock (FAO, 2008). These clays are known to be much less fertile than soils derived from volcanic rock, which means that the island has relatively unproductive, poor and fragile soil. Since the island's numerous rivers and streams are prone to flooding (Dolcemascola, 2003), and annual strong winds, drought and pest infestations occur regularly, these combined environmental conditions contribute to poor agricultural productivity in the country, leaving the majority of the population chronically food insecure.

Recent reports suggest that over 50 percent of children under five years old are undernourished (FAO & WFP, 2007), and that rural food security has worsened over the recent years with 79 percent of the population suffering at least one month of low food consumption. This is compared to 51 percent of the urban population suffering such low food consumption (FAO & WFP, 2007). Both of these figures are concerning, particularly so for rural areas where 70 percent of the population of Timor-Leste lives, and the majority depends on the agricultural sector. In the context of heavy reliance on subsistence agriculture, the likely implications of climate change on food security and livelihoods of the Timorese are also a matter of great concern when coupled with poor productivity and low fertility of the agricultural land in Timor-Leste.

There is currently little information and analysis on the impacts of climate change in Timor-Leste, but Barnett et al. (2007) found that Timor-Leste is vulnerable to climate change and its climate is likely to become hotter and drier in the dry season and increasingly variable. Water, soil, and the coastal zones are all found to be vulnerable to changes in climate and sea level. A recent study predicts that the climate in Timor-Leste will become about 1.5 C warmer and about 10 percent wetter on average by 2050 (Molyneux, da Cruz, Williams, Andersen, & Turner, 2012). Moreover Kirono (2010) suggests that in the future the frequency of cyclones and extreme rainfall events are likely to decrease but the intensity of the cyclones (with high wind speeds) and extreme rainfall events will increase. An increase in variability of rainfall, a shift in the onset of the rainy season, and an increase in average temperatures are likely to cause greater challenges for farmers, agricultural production and food security in the country. The changing climatic conditions indeed may be reflected in the incidences of drought, water scarcities and rainfall.

The climatic and environmental challenges in the face of Timor-Leste's rapidly growing population are further exacerbated by weak institutional capacity, limited human resources and a nearly non-existing local economy. Poor performing domestic economy provides very limited employment opportunities in the non-agriculture sector. Poor education, poor health and limited skills development create a huge gap in available human resources needed for the country's reforming process which impacts back on the functioning of institutions. Lack of human resources and restricted human ingenuity means that limited innovation and technological advancement is generated and applied in the country and this further weakens the institutional capacity and capability. Weak and small pools of scientific and technical capacity are also coupled with small and understaffed organisations operating under significant financial constraints and weak governance frameworks with sub-performing or dysfunctional laws and regulations (FAO, 2008).

Timor-Leste's major policies in regards to peace building, poverty reduction and environmental sustainability are either ill-suited, incomplete, or there are major challenges in terms of their enforcement and monitoring. These will be further discussed in Chapter 8. For example, the UN (2009) states that current economic policies are not sustainable because they give insufficient attention to prioritising the productive non-oil sectors of the economy in order to reduce poverty improve livelihoods and create job opportunities. Land tenure arrangements are particularly problematic. Timor-Leste has a complex history of competing land claims, dispossessions, and different land titling systems that were created under Portuguese and Indonesian rule. The competing land claims between individuals and between individuals and the state are quite common and occasionally result in armed conflict (Piaskowy, 2013). The absence of a property rights legal framework to address land

matters and resolve historical and contemporary tensions is a major constraint for Timor-Leste's socio-economic and environmental development and peace building. The recently proposed land laws are largely criticised because they were found to favour corporatism over livelihoods and centred more on land ownership overlooking the social relations at work to shape local land access (Thua, 2012).

Lack of incentives, credit schemes and subsidies for sustainable farming, limited green alternatives provided for the most commonly used energy sources (that is, firewood), and poor market pricing for environmental products are also some other institutional weaknesses adding to the challenges discussed above. The socio-economic, institutional and environmental factors provide the conditions for the increasing human population to become a major cause for further environmental degradation and a threat for environmental sustainability in Timor-Leste. An expected resource scarcity and rivalry for limited natural resources, on the other hand, are potential factors that can cause social instability through distributional tensions and particularly the grievances that may arise from country's use of its oil and gas wealth in the near future.

Timor-Leste's future economic agendas are of crucial concern to the environment. A purely growth-oriented economic plan with tremendous hazards which undermines the environment would, indeed, cause a great deal of environmental degradation affecting the poor with inestimable costs. It is extremely important that Timor-Leste improves its governmental and organisational capacity, efficiency and accountability to manage the economy, particularly the non-renewable natural resources and related funds sustainably. The transparent spending and investment of the natural resource revenue within the productive and green sectors of the economy are of particular importance for sustainable development and these potential benefits need to be

shared equitably among men and women without undermining the livelihoods of the local people. Studies can be directed at exploring how long the petroleum fund can fuel a major human capital development project and whether it will be sufficient to offset the projected demand for jobs, if well-deployed.

It is clear that with increasing population pressure, a huge increase in productivity and efficiency will be needed to meet future demand for food, water, land, forests and beyond. It is important that awareness on this issue is secured and community is educated. This can be achieved by integrating population education (i.e. education about the effects of population growth on development, peace and environment) into schools and universities.

In meeting the demands of an increasing population, technology transfer from developed countries to Timor-Leste seems to be a viable option as countries with poor human development are unlikely to meet the need for innovation in the next 20 years. This is not to say that technological advancement can solely absorb the increased population pressure on the environment. It needs to be accompanied by structural adjustments and policy settings that provide clearly defined property rights, efficient labour and capital markets, both for the agriculture and non-agriculture sectors. These adjustments and settings should also offer incentives and measures for protection of natural systems, land improvement and soil conservation, as well as sustainable and green energy use. Reducing the rate of population growth and promoting smaller size families, supported by increased opportunities for women's employment and education, also need to be seriously considered as a way of lowering pressures on natural resources, and a means to allow Timor-Leste the time for structural, political and societal change to adjust to a populous country.

5.4. CHAPTER SUMMARY

This chapter has illustrated that demographic factors and rapid population growth alone would not hinder peace and sustainable development in Timor-Leste. Although demographic analysis can help planners and policy makers anticipate risks associated with civil conflict, increased poverty and resource scarcity, demography itself is not a determinative factor of economic, social, political, or environmental change. As discussed broadly in Chapter 2, the literature suggests that it is the contextual factors that can make population increase and demographic structure threats to sustainable development. This chapter has stated that if Timor-Leste's financial and governance capabilities do not allow the country to respond to its demographic challenges, then the country is likely to experience increased poverty, environmental degradation and risks of violent conflict.

Currently, the enormous disparity between available jobs and the number of people entering the labour force results in the extremely high waste of human potential and the cost of lost production. While this problem jeopardises the socio-economic development of Timor-Leste, it may also contribute to dysfunctional behaviours, rising levels of crime, violence, and political extremism among young people. It is equally significant to realize that the petroleum sector is unlikely to generate employment or business opportunities for the majority of Timor-Leste's workforce and private enterprises which need to be the underpinning strategies for future development plans. Continuing high youth dependency as projected in this chapter means that a demographic dividend will probably not occur within the next two decades for capital accumulation and savings unless a dramatic decline in fertility is achieved. Unless certain policy measures are adopted, future populations will also impose a great burden on natural resources and undermine their sustainability.

Population control and efforts to reduce fertility need to be supported by increased education and employment opportunities for women and they need to be considered as a part of a policy package to reduce poverty, environmental degradation and potential for conflict. Having suggested that, preparedness for a growing population and adaptation to future population prospects are necessities given that the future demographic scenario of Timor-Leste is not only the result of the present, but also of past demographic dynamics which cannot be altered by prospective policies.

CHAPTER 6: MEASURING POVERTY USING THE SUSTAINABLE LIVELIHOODS APPROACH IN TIMOR-LESTE

6.1. INTRODUCTION

Tackling the issue of poverty requires a knowledge of poverty concepts that lead to the formulation of a meaningful development hypothesis (Swiss Federal Institute of Technology [ETH], 2007), and a theoretical approach that can change and adapt in relation to the logical links and the outcomes desired to be achieved in the long-term. An adequate concept of poverty needs to encompass the causal links between its core dimensions while drawing upon the central importance of sustainable development (OECD, 2001a). This thesis does not draw on the predominating neo-liberal theory with its free trade-based productivity assumptions. Rather it puts forward an alternative approach that is more holistic, people-centred and non-ideological in its stand with a genuine interest in understanding poor people's lives.

The origins of the sustainable livelihoods approach (SLA), of which a recently modified version is adopted in this thesis, emerged from the paradigm shifts in rural development throughout the 1980s and 1990s and was much inspired by the work of Amartya Sen (1981) and Richard Chambers (1992) on capabilities and entitlements (De Haan, 2012). The approach has evolved from many decades of changing perspectives on poverty, and how the poor people construct their lives, particularly in the context of constraints and opportunities and how structural and institutional issues play an important role in shaping people's capabilities and activities in constructing their lives (Ashley & Carney 1999). The three major shifts that gave rise to the emergence of ideas that shaped the SLA for poverty analysis and poverty reduction strategies are the following:

- 1- The realisation that economic growth and poverty reduction do not have an automatic relationship and although economic growth may be essential for poverty reduction, the correlation between the two depends on the processes and structures that allow the poor to take advantage of expanding economic opportunities.
- 2- The realisation that poverty, as conceived by the poor themselves, is not just a question of low income, but also includes other dimensions such as social exclusion, lack of adequate sanitation and clean water, low education, poor housing conditions, a state of vulnerability and much more; and
- 3- The recognition that the poor themselves often know best their situation and their needs, and must, therefore, be involved in the exercise of poverty analysis and design of policies and projects intended to better their lot.

Integrating these three major shifts and moving beyond the conventional definitions of, and the narrow approaches to poverty, the SLA has structured itself primarily as a conceptual framework for analysing the causes of poverty, peoples' access to resources, their diverse livelihoods activities, and relationship between relevant factors at micro, intermediate, and macro level (Krantz, 2001). The approach allows a grasp of the complex nature of poverty while reducing the complexities in a systematic way, making it easier to analyse its core aspects. De Haan (2012) argues that the SLA has developed into a mature actor-oriented framework in development studies with sustainability and well-being at its mainstream. Since the 1990s, the SLA has increasingly become popular in development thinking and is used by a growing number of research and applied development organisations including the Department for International Development (DFID) of the United Kingdom, the United Nations Development

Program (UNDP), as well as non-government organisations such as CARE and Oxfam (Carney et al, 1999; De Haan, 2005; DFID, 1999a). There have been conceptual contributions on the approach also from research institutions such as the International Development Institute of Sussex (IDS), the Overseas Development Institute (ODI), and the Society for International Development (SID) (De Haan, 2012).

According to the generally accepted definition, a livelihood comprises the capabilities, assets and activities required for a means of living and is considered sustainable when it can cope with and recover from stresses and shocks, and it is able to maintain or enhance its capabilities and assets both now and in the future, without undermining the natural resource base (Carney et al, 1999). On the other hand, a livelihood is perceived vulnerable if it lacks the capacity and the capability to cope with forces and factors threatening its sustainable existence. Therefore, poverty arises from vulnerability and reflects the lack or loss of sustainable livelihood.

Within this framework, households are embedded in a specific context and the way their assets are accumulated, reinvested and used for a particular livelihood strategy to achieve a livelihood outcome is influenced and mediated by transforming institutions and processes (policy and cultural factors) operating at multiple levels as well as risks, vulnerabilities and opportunities (Ludi & Slater, 2007). What is also prominent in the SLA is the attention to poor people's agency, as is their capacity to integrate experiences into livelihood strategies and to look out for aspirations, ambitions and solutions to problems (Morse & McNamara, 2013).

Assets referred to as capitals in this framework are considered not only as resources from which poor people make a living, but also as the sources that give meaning to a

person's life, allow them to engage more fruitfully and meaningfully in the affairs of the world, and have the power and capability to be, to act, and ultimately bring about change (Morse & McNamara, 2013). Bebbington (1999), for example, suggests that the capitals take three distinct roles. These roles are: firstly being the vehicles for instrumental change (make a living); secondly providing hermeneutic action (making living meaningful); and thirdly, supporting emancipatory action (challenging the structures under which one makes a living). Assets in the SLA therefore, should not be understood only as things that allow survival, adaptation and poverty alleviation, but also as the basis for an agent's power to act and reproduce, challenge and change the rules that govern the control, use, and transformation of resources (Bebbington, 1999).

DFID (1999a) initially identified five types of assets, including financial, human, natural, physical and social capital, which form the core of livelihood resources and constitute the building blocks for livelihoods. An updated version of the livelihoods approach also adds political assets to the framework (ETH, 2007). These will be further explained in the remaining part of this chapter.

According to the SLA, a livelihood is considered to become truly vulnerable when it lacks adequate coping or adapting capacities and capabilities, or lacks livelihood choices. A household is considered poor on the other hand, when it is truly vulnerable due to a lack of, or loss of, building blocks of a livelihood restraining their capability and choices.

The UNDP (1990) states that broadening choices can be achieved by widening the capital base of the livelihoods. Krantz, (2001) on the other hand, argues that establishing an overview of the asset portfolio of a livelihood system generates

important information regarding the poverty status of a household. Combined with exploration of the mediating channels, the asset portfolio of a household also sheds light on the reasoning of adoption of a particular livelihood strategy, and can be considered a key step for livelihood strategy analysis (ETH, 2007). Some other strengths of the SLA, identified by ETH (2007) are as follows:

- 1- “The approach allows access to people’s visions of development and well-being because these are reflected in the livelihood strategies and livelihood outcomes they strive for. Unless people participate in conceiving and realising development, ‘development’ does not occur.”
- 2- “Poverty analysis within this approach goes beyond material well-being through taking the diversity of the livelihoods into account.”
- 3- “The approach promotes coherence between poverty reduction concepts and definitions of poverty. It suggests that capabilities are embedded in livelihood systems and they become functional in pursuing livelihood strategies.”
- 4- “The approach builds on strengths and potentials through an understanding of the contextual factors and forces affecting poverty, therefore it invites assessment of the extent to which the socio-economic, political and cultural context is conducive to poverty reduction.”
- 5- “The approach acknowledges the diversity of livelihood strategies and hence the multi-faceted rationalities in people’s decision-making. It focuses on the explicit and implicit rationalities that shape livelihood strategies pursued.”
- 6- “Livelihood approaches also help to integrate culture into development thinking and practise as an essential dimension. The holistic approach of a livelihood focus provides insights into ‘how culture matters’ without

promoting cultural determinism of development and calls for further understanding of cultural and spiritual aspects of sustainable livelihood.”

Given the merits of the sustainable livelihoods approach, this research focuses on the analysis of livelihood assets in the context of Timor-Leste and tries to capture poverty at the household level through an exploration of households’ asset portfolios. However, this research deals with only five of the six identified livelihood assets, as it is felt that assessment of political capital is a much harder task to handle at the household level,¹³ particularly in a country still recovering from the aftermath of a conflict where relevant information would be hidden in historical, socio-political, traditional, and economical structures. Therefore, political capital is not included in the poverty analysis of this research although it is acknowledged to be an important component of livelihood analysis. Another weakness of the poverty analysis undertaken in this chapter may be the neglect of gender-based power relations within a household which may have implications on decision-making when it comes to accumulation and re-investment of livelihood assets or adopting a livelihood strategy. Although results that will be presented below do not address these two components, the relevant discussion on these will be provided in remaining chapters of this thesis.

The present chapter provides a brief literature review of each of the five livelihood assets for their better understanding and introduces context-specific proxies to

¹³ Political capital is defined as the power and capacity to influence political decision-making through formal and informal participation and/or access to political processes. It includes the ability to represent oneself or others, the freedom and capacity to become collectively organised to claim rights and to negotiate access to resources and services.

measure them at the household level. The findings are presented both at the household level and village level. This chapter then maps out asset portfolios for each village included in this survey to demonstrate the differences, strengths and weaknesses of their livelihood building blocks. Finally, this research compiles the asset portfolio indicators into a household poverty analysis. It identifies poor households and explores significant relations between poverty, socio-demographic characteristics and livelihood assets.

6.2. EXPLORING LIVELIHOOD ASSETS IN THE CONTEXT OF TIMOR-LESTE

6.2.1 Economic Capital

One of the most common approaches to measuring poverty and defining a household's socio-economic position is linked to direct measures of their economic status which are related to the measurement of their income, expenditure and financial assets. In many poverty stricken developing countries like Timor-Leste however, the majority of people live on subsistence agriculture and lack a stable income or other forms of financial flows. Therefore, in the present case, direct income or expenditure measures for poverty analysis have their shortcomings. Two of these shortcomings are production of inadequate results that are unrepresentative of the real situation, and exclusion of real assets that households predominantly rely on during adverse events (Brandolini, Magri, & Smeeding, 2010).

In the absence of direct measures of income and financial assets, the measurement of real asset ownership (such as a house, a television, a car or a refrigerator) has gained increasing popularity in assessing a household's economic wealth (Po, Finlay, Brewster, & Canning, 2012). This was based on the justification that asset-based measures provide an outlook of a household's long-run economic status and do not

necessarily account for short-term fluctuations or economic shocks (Filmer & Pritchett, 2001).

Real assets are very important for the non-income poor people as they can act as insurance and maintain means of consumption when income and other financial flows are unstable (Brandolini et al., 2010). Real assets also involve goods used in production such as tools and equipment that enable people to function more productively (DFID, 1999b).

The literature suggests that economic wealth assessments based on asset ownership provide plausible and reliable results (Córdova, 2008). For example, Filmer and Pritchett (2001) have created a household welfare index based on asset ownership and household characteristics. The authors use the statistical method of principal component analysis (PCA), to identify the assets with respective weights so that the most important assets are chosen in the analysis. Having tested the reliability of asset based wealth analysis in Indian states, the authors conclude that the method of principal component analysis has internal coherence, robustness and comparability in measuring state-level poverty status in India (Po et al., 2012).

Although asset-based wealth measures are commonly used in national demographic health surveys and they are argued to produce sound evidence for economic wealth analysis, the weighing method based on principal component analysis is criticised for making it difficult to interpret the results with an economic meaning (Lee, 2014). For example, the asset weights are used to attain scores for each household to reflect their economic wealth but without much discussion on what this wealth is worth in monetary terms. Given the strengths of the asset-based wealth measures, and with the intention of providing an economic meaning of the households' economic wealth in

Timor-Leste, this research creates an economic capital index based on physical asset ownership and their relative weights reflected in their market prices.

6.2.1.1. Economic Capital Index

In creating an asset-based economic capital index, this research makes two assumptions:

- a- The economic contribution of a particular durable asset owned (regardless of its accessibility in the case of land) is captured by its local market price determined primarily by the supply side.
- b- All households face the same market price (economic value) for a particular asset given that it is based on a single survey in a single country and in a single year.

Table 6.1 gives a list of all real assets and their local market prices included in the measurement of economic capital index. These include ownership of a house, land and other durable goods like a car, tractor, and refrigerator among others. The market prices are identified through consultations and in-depth interviews conducted for this research. Differentiation is also made for land and house values in urban and rural areas. Table 6.1 also shows the percent ownership of each real asset in the total sample group.

Table 6.1

Indicators used in the Economic Capital Index and Percent Ownership of Real Assets

Real Assets	Local Market Price (US\$)	Household Ownership
House	\$3,000-5,000 (in rural areas) \$4,000-7,000 (in urban areas)	97%
Land	\$10-15 per square meter (in rural areas) \$20 per square metre (in urban areas)	94.7% 90% have access to land
Car	\$27,000	4.7%
Tractor	\$50,000	0.6%
Motorbike	\$1,500	26.5%
Bicycle	\$150	15.9%
Mobile Phone	\$30	90.6%
TV	\$150	44.1%
Radio	\$20	34.1%
Stove*	\$18 (Kerosene) \$150 (LPG)	13.5%
Refrigerator	\$2,000	4.1%
Chainsaw	\$3,000	1.8%
Machete	\$5	95.3%
Axe	\$5	84.1%
Solar Panel	\$50-250	1.2%
Water pump	\$100	4.7%
Generator	\$150	8.2%

* The small proportion of the households that own a stove reflects that the vast majority of the households rely on other means of cooking than a stove. This is an interesting finding given that Timor-Leste drives most of its GDP from oil and gas production. This research finds that there is excessive reliance on firewood for cooking and this will be discussed in Chapter 7. Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

6.2.1.2. Real Asset Ownership of Households

According to the analysis of this research, the most commonly owned assets in Timor-Leste are houses, land, mobile phones, machetes and axes (see Table 6.1). This research finds that 97 percent of the households own a house, followed by

land¹⁴ with 95 percent ownership. Out of 170 households, only five households do not own a house and nine do not own land. The heads of three households in the village of Ainaro, one in Iliomar and one in Manutasi stated that they do not own a house. In contrast, the heads of five households in the village of Comoro, two households in Ulmera and two households in Letefoho indicated that they do not own a land.

There is also an impressively high percentage of mobile phone ownership (91 percent). These common assets are followed by televisions (44 percent), radios (34 percent), and motor bikes (26.5 percent). A little less than a tenth of the households (8.2 percent) own generators. Tractors, solar panels, chainsaws, refrigerators, water pumps and cars are respectively the least frequently owned assets with less than 5 percent each.

Excluding the ownership of a house and land, this research finds that the economic wealth of a household ranges between \$10 and \$51,840 with a median of \$190. In other words, the total value of durable goods owned by half of the households included in this research does not exceed \$200. This research finds that the median for land ownership is two hectares (in other words 10,000 square metres) and the median value of a house is \$3,500. If the value of the house (ranging between \$3,000 and \$7,000) and the size of the land owned by a household are included (the maximum size of the land is found to be 20 hectares which is worth \$2,000,000), then this research finds that the total value of a household's economic wealth ranges between \$3,210 and \$2,028,810 with a median of \$205,190. Lack of a land and

¹⁴ The differentiation between land ownership and land access is made in the assessment of natural capital but not for the economic capital.

housing market however suggests that the added values are just indicative and do not represent the real economic wealth that can be attained by selling these assets. These figures are mainly used for identifying the economic wealth categories as explained below.

6.2.1.3. Levels of Economic Wealth of Households

In this research, economic wealth is categorised into three levels, namely poor, medium and high. A household is considered to have poor economic wealth if its house has a value worth less than \$3,500 (reflecting the poor housing conditions where walls and roof are made up of either grass, bamboo or mud), land size smaller than two hectares (20,000 square metres), and other assets totalling less than \$190. These figures are found to be the averages for all households included in the survey and, hence, are decided to be the borderline. Hence if the household's total economic capital is worth less than \$203,690 (an amount found by adding \$3,500 [house value] + 200,000 [value of two hectares of land in rural areas] + 190 [total value of other assets]), the household is considered to have poor economic capital.

A household is considered to have medium economic wealth if it owns two to three hectares of land, a house valued between \$3,500 and \$5,000 (better housing conditions with zinc or solid timber used in the walls and roof), and other physical assets worth between \$190 and \$370. Therefore, a household with an asset value totalling between \$203,690 and \$305,370 (an amount found by adding \$5000 (house value) + \$300,000 (value of three hectares of land in rural areas) + \$370 (total value of other assets- it is found that 71 percent of the households own durable assets worth less than or equivalent to \$370)), is considered to have a medium level of economic capital.

Finally, a household is considered to have high economic wealth if it owns a land size bigger than three hectares, a house valued at \$5,000 (house materials include tiles etc) or more, and physical assets worth more than \$370 (that is equalling to total economic values of \$305,370 and above) are defined to have high economic capital.

6.2.1.4. Findings

Following the definitions given above, the data collected and analysed in this research show that 44 percent of the households have poor economic wealth, 22 percent have medium economic wealth, and 34 percent have high economic wealth (Table 6.2). This indicates that a larger percentage of households have poor economic capital. Table 6.2 represents how economic wealth is distributed in each of the eight villages included in this research. An interesting finding of this exercise is that in the village Letefoho, 77 percent of the households have poor economic capital and only eight percent have high economic capital. In village Comoro on the other hand, 48 percent of the households have poor economic capital while 52 percent have high economic capital. This reflects that Letefoho is the poorest and Comoro is the richest village in terms of economic capital and the distribution of economic capital among households in these villages is much less even compared to other villages.

Table 6.2

Economic Wealth Distribution in Selected Villages (Household Economic Capital)

Village Name	Poor (Less than US\$203,690)	Medium (US\$203,690 - US\$305,369)	High (US\$305,370 and above)	Total (% and N)
Ainaro	33.3%	33.3%	33.3%	100.0% (N=15)
Comoro	48.4%	0.0%	51.6%	100.0% (N=31)
Fuat	42.1%	15.8%	42.1%	100.0% (N=19)
Holarua	57.1%	32.1%	10.7%	100.0% (N=28)
Iliomar	14.3%	38.1%	47.6%	100.0% (N=21)
Letefoho	76.9%	15.4%	7.7%	100.0% (N=13)
Manutasi	50.0%	20.8%	29.2%	100.0% (N=24)
Ulmera	33.3%	27.8%	38.9%	100.0% (N=18)
Total (% and N)	44.4% (N=75)	33.7% (N=37)	21.8% (N=57)	100.0% (N=169)

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

6.2.2. Human Capital

By definition, human capital is a complex concept and has many dimensions. The OECD (2001b) defines human capital as the knowledge, skills, competencies, and attributes embodied in individuals that facilitate the creation of personal, social, and economic well-being. An alternative definition of human capital is the ability and efficiency of people to transform raw materials and capital into goods and services, the consensus being that these skills can be acquired and learnt through the educational system (Son, 2012). Crawford (1991) argues that human capital has expandable, self-generating, transportable, and shareable characteristics. The expandable and self-generating characteristics of human capital are linked to the possibility that the stock of knowledge increases an individual's human capital in volume while the transportable and shareable characteristics of human capital allow

an individual to distribute and share their knowledge with others, expanding the range of human capital in their surroundings.

The emergence of the concept of human capital can be traced back to the 1950s when some economists discovered that the investment of human capital is the primary element to raise individuals' wages compared to other components such as land, financial capital, and labour force (Salamon, 1991). The empirical evidence from various studies shows that human capital has implications not only at the individual level but also at the societal and organisational level. At the individual level human capital increases an individual's income resulting from increasing productivity levels (Dae-Bong, 2009). This is based on the argument that through the investment of human capital, an individual's productivity would increase and with the improvement of their knowledge and skills, they will be able to transfer certain goods and services to valuable and practical ones. This also relates to the increasing possibility of a worker moving to higher earning positions in the internal market (Sicherman, 1991). Along with economic capital, several studies suggest that human capital also positively influences an individual's health, nutrition, fertility, upbringing of children and opportunity for self-fulfilment and enjoyment (Veenstra, Luginaah, Wakefield, Birch, & Elliott, 2005). At the societal level on the other hand, human capital increases the consciousness of social constituents within community, including democracy, human rights, and political stability (McMahon, 1999). This leads to the socio-political development of the nation as a community (Grubb & Lazerson, 2004; Sen, 1999). There is also evidence providing that human capital increases a nation's economic growth (Romer, 1989; Schultz, 1982).

Today the importance of "knowledge and human capital" in national and global economies, individual wealth and capabilities and also societal development has

attracted both academic and public interest; hence, the approaches to measure human capital have been increasing. Despite its clear definition, the measurement of human capital raises difficulties due to its multidimensional nature. Human resources refer to education and skills and also to health and nutrition, in other words, it refers to staying healthy to be able to undertake productive jobs. The most applied approaches to measure human capital include education-based and income-based approaches. While the former looks at indicators such as literacy, enrolment and years of schooling rates as well as the quality of schooling in terms of drop-out, repetition rates and test scores, the latter looks at one's expected productivity and earnings based on the cost of production.

In this research, an education-based approach is adopted to measure human capital in the context of Timor-Leste. The aspects related to health and nutrition are treated as equal across the households on the basis that there are no large variations in the health status of adults (reflected in life expectancies at birth) amongst different districts in Timor-Leste. Education-based approaches are particularly preferred on the basis that development of human capital is an end to itself and does not need to be assessed based on neo-liberal measures such as one's earnings, and also on the following three principles (Oxley, Le, & Gibson, 2008):

- i) Education is arguably the most important component of acquiring human capital
- ii) Educational output is closely related to the investment in formal education
- iii) Investment is a key element in human capital formation

Having adopted the educational approach to measuring human capital, this research recognises that education can enhance well-being not only by opening up broader economic opportunities and increased productivity, but also through non-market benefits such as improvements in individual and family health, reduction in fertility and child mortality, enhancement of one's capabilities for self-fulfilment and wellbeing (Haveman & Wolfe, 1984). The research also underlines that education is one of the major means of reducing poverty, inequality and discrimination (Birdsall, Ross, & Sabot, 1995), and is a driver for achieving the entire set of Millennium Development Goals and successful human development in any given country. Therefore, it needs to be incorporated into the poverty analysis.

6.2.2.1. Measuring Human Capital in the context of Timor-Leste

Approach

Several studies that adopt an educational approach to measuring human capital propose a number of proxy measures, including literacy rates (Azariadis & Drazen, 1990), school enrolment rates (Barro, 1991), test scores (Hanushek & Kimko, 2000), and years of schooling (Barro & Lee, 1996; Cohen & Soto, 2001). Among all of these measures, years of schooling is one of the most widely and commonly used proxies used in human capital studies for its sound theoretical grounds (see Figure 6.1), and reasonable availability of data (Oxley et al., 2008). The new method for measuring the Human Development Index in the post-2010 period for instance uses mean years of schooling as an indicator (UNDP, 2013b).

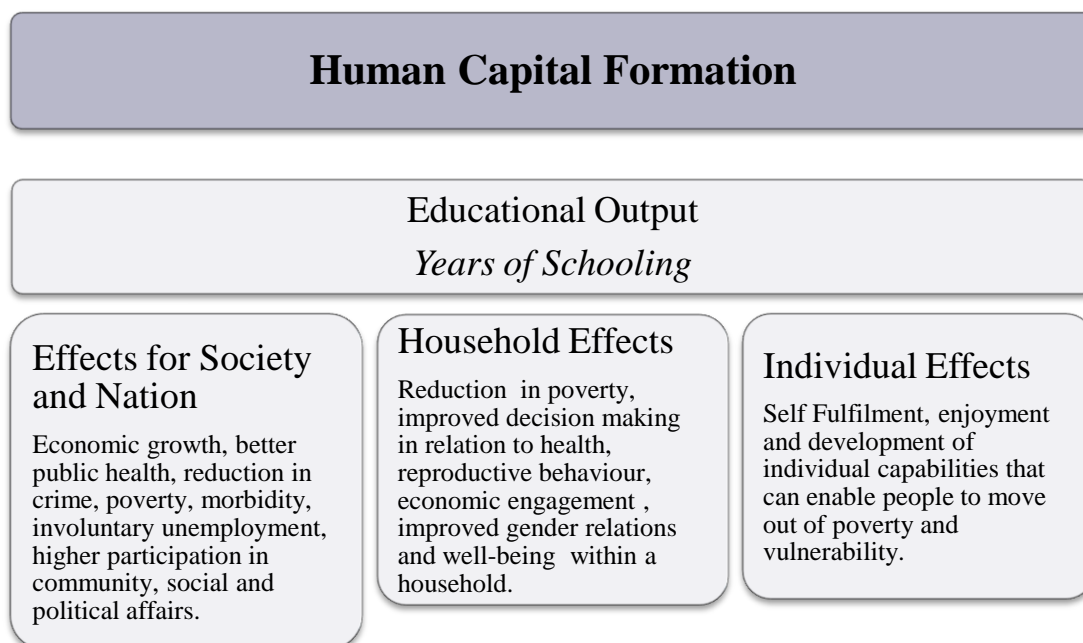


Figure 6.1. Human Capital Formation and Its Effects at the Individual, Household and National Levels. Source: Prepared by the researcher based on literature presented above

This research measures human capital at a household level on the basis of average years of formal schooling of its adult members aged 15 years and above. This proxy is thought to represent the average stock of knowledge, skills and competency (such as literacy and numeracy attainments) embedded in a household which are particularly important for productivity, income generation, self-fulfilment, improved capabilities and well-being.

Having adopted this proxy however, this researcher is aware that this approach has a few limitations for capturing the whole essence of human capital in Timor-Leste. These limitations include quality education, and the fact that years of schooling may not fully represent different kinds of skills and knowledge that can be acquired in other ways, for example, through social networks or informal training opportunities (Son, 2012). The assumption that the health and nutrition of all households are more or less the same is also a limitation of which this research is aware.

6.2.2.2. Constructing a Human Capital Index

The formal education system in Timor-Leste requires six years to complete primary school, three more years to complete pre-secondary, three additional years to complete secondary school, and 4 more years to complete university. According to the analysis of this research, no household head had a formal education in 33 percent of the households. Twenty one percent had completed primary school, 12 percent completed pre-secondary school, and 29 percent completed secondary school. University graduates on the other hand made up only five percent of the total.

When it comes to years of schooling among the youth and adult members of the households, 8.3 years is found to be the average which is just below completion of a pre-secondary level. This finding is 3 years below the expected years of schooling reported by The 2010 Global Human Development Report which is 11.2 years for Timor-Leste as compared with 12.7 years in Indonesia, 13.7 years in Tonga, and 16.8 years in South Korea (UNDP, 2010).

In this research, a household is assumed to have low human capital if the average years of schooling of the total number of adults is less than nine (below pre-secondary school); a medium level of human capital if the average years of schooling of the total number of adults is between 9 and 12 (below secondary school level); and high human capital if the average years of schooling of the total number of adults is 12 or more (secondary school level and above).

6.2.2.3. Findings

It has been found in this research that one half of the households (50.6 percent) have low human capital, nearly a quarter of the households (24.1 percent) have medium

level of human capital, and another quarter (25.3 percent) has high human capital (see Table 6.3).

Table 6.3

Human Capital at the Household Level

Level of Human Capital	Mean Years of Adult Schooling	Distribution of the Households
Low	Less than 9 years	50.6% (N=86)
Medium	9 to 12 years	24.1% (N=41)
High	12-16 years	25.3% (N=43)
Total percentage and N		100% (N=170)

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

When it comes to the distribution of human capital in the eight villages included in this research, Table 6.4 gives some interesting findings. The largest percentage of households with high human capital resides in Ainaro and Comoro, while Iliomar and Fuat accommodate the smallest percentage of households with high human capital. What is striking about this finding is that the villages Iliomar and Fuat are the most isolated villages in terms of their distance to the capital city Dili, whereas Comoro with one of the highest levels of human capital is located in Dili. Village Ainaro on the other hand is a considerably developed district capital despite being within six hours drive from Dili. This indicates that households in more urbanised towns have better access to education and perhaps have higher incentives to acquire formal schooling.

Table 6.4

Levels of Human Capital in Selected Villages

	Human Capital				
	Poor	Medium	High	Total % and N	
Village Names	Ainaro	26.7%	20.0%	53.3%	100.0% (N=15)
	Comoro	29.0%	19.4%	51.6%	100.0% (N=31)
	Fuat	68.4%	26.3%	5.3%	100.0% (N=19)
	Holarua	62.1%	17.2%	20.7%	100.0% (N=29)
	Iliomar	85.7%	9.5%	4.8%	100.0% (N=21)
	Letefoho	53.8%	23.1%	23.1%	100.0% (N=13)
	Manutasi	29.2%	45.8%	25.0%	100.0% (N=24)
	Ulmera	55.6%	33.3%	11.1%	100.0% (N=18)
	Total	50.6%	24.1%	25.3%	100.0% (N=170)

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

6.2.3. Social Capital

The definition of social capital varies among different schools of thought, contexts and organisations. However, the concept generally refers to both tangible relations such as membership of formal and informal groups and intangible relationships such as kinship, trust and reciprocal networks (Productivity Commission, 2003). Coleman (1988) argues that while economic capital is related to people's assets and savings and human capital is inside their heads, social capital is inherent in the structure of people's relationships and is not the private property of any person who benefits from it.

The origin of social capital goes back to the first half of the 20th century when Hanifan (1916) identified social capital as those tangible assets that count for most in the daily lives of people: namely goodwill, fellowship, sympathy, and social intercourse among the individuals and families who make up a social unit. In the past three decades, the definition and understanding of social capital has been heavily influenced by three names: (i) Pierre Bourdieu (1986), who produced a systematic

analysis of social capital and worked on the social theory through a social capital lens to explain the reproduction of social inequalities; (ii) James S. Coleman (1988), who highlighted the social context of education and pointed out the importance of the social capital resources for non-elites; and (iii) Robert Putnam (1993), who linked the concept to a number of major public policy concerns and played a pivotal role in the popularisation of social capital (Smith, 2007).

In his book, *Making democracy work*, Putnam (1993) defines social capital as the features of social organisations, such as trusts, norms and networks that can improve the efficiency of society by facilitating coordinated actions. Putnam strongly argues that there is a distinct link between levels of social capital and levels of well-being, health, education and prosperity at the household and societal level. Putnam makes a distinction between these two kinds of social capital. The author identifies the former as bonding social capital and defines it as the cohesion that exists between small groups of similar people, such as family members, close friends, colleagues and the members of ethnic or religious groups. According to many scholars, bonding social capital encourages reciprocity, mobilises solidarity, and provides social and psychological support to its needy members (Narayan, 2002; Putnam, 2000; Woolcock, 2001). The latter forms “bridging social capital”, and is defined as the heterogeneous networks established on a thin set of morals, such as tolerance to others which can be shared by individuals with diverse and even conflicting moral codes (Meadowcroft & Pennington, 2007).

Today, public policy initiatives in many developed countries incorporate efforts to strengthen social capital among communities with the acknowledgement that social capital is important for individual and societal wellbeing and poverty reduction. A range of studies suggests that well connected individuals are more likely to be

employed, healthy and happy (Narayan, 2002; Woolcock, 2001). Moreover, these individual benefits have spill-over effects on general society. Health and welfare systems, for instance, are expected to be relieved by the spill-over effect of positive outcomes of social capital. Some other valuable benefits of strong social capital include strong public participation, inclusion of the poor, poverty alleviation, capacity building, educational attainment, lower crime rates, improved health, governmental efficacy and improved economic performance (Productivity Commission, 2003). Optimism, satisfaction with life, perceptions of government institutions and political involvement, all stem from the fundamental dimensions of social capital (Narayan, 2002). Rothstein (2003) suggests that the importance of social capital lies in the fact that it brings social support, integration and social cohesion together. Social capital values the individual but at the same time, it narrows the self-interest of individuals. According to some studies, low social capital, in terms of lack of trust, social networks and feelings of social connections contributes to social exclusion, isolation and vulnerability (Pomagalska et al., 2009).

In this thesis, social capital is defined as the norms and social relations embedded in the social structures of the Timor-Leste society that enable its people to coordinate action and to achieve desired goals. Social capital is an undeniable asset of the poor and as such needs to be incorporated into multi-dimensional poverty assessment (OECD, 2001b; Woolcock & Narayan, 2000). In this thesis, the levels of social capital are treated as indicators of a household's capability to access trustworthy and effective social networks that allow them to cope with changes and shocks, and strengthen their livelihood strategies through community exchange, trust and participation.

6.2.3.1. Measuring Social Capital in the Context of Timor-Leste

Measurement of social capital is a difficult area and many different approaches have been applied to address its intangible components. Narayan (2002) points out several studies that have managed to identify appropriate proxies for measuring social capital by using different types and combinations of quantitative and qualitative research methodologies. In the present thesis, several proxies based on the qualitative and quantitative data collected from the household and village surveys are employed to measure social capital at the household level. These proxies include a household's community trust, perception of village safety, relations with the neighbours, community ties in relation to addressing their needs, access to credit to manage livelihood risks (in the form of getting help from the church/ civil society organisations or the government), the experience of a local conflict at the community level, and existence of a local structure in which people can participate to govern community resources and manage conflict. These are presented in Table 6.5 which points out the relevant questions and data that are used to measure each of these proxies and in constructing a social capital index discussed below.

Table 6.5

Proxies for Measuring Social Capital at the Household Level in Timor-Leste, 2012

Factors contributing to social capital	Informal institutions shaping these factors	Survey questions, the answers to which are used to measure the factors
Community Trust	Norms, values, interpersonal relations	Q1. Whether the household trusts the people in the village?
Village Safety and Security	Norms, neighbourhood relations	Q2. Whether the household thinks the village is a nice and safe place to live?
Neighbour and Community Connections	Ethnic groups, kin networks, friends, community groups	Q3. Whether the household thinks that they can get help from the community if they needed
Access to Credit Systems to Manage Livelihood Risks	Ethnic groups, kin networks, friends, money lender, revolving credit societies, civil society groups	Q4. Whether the household relied on community credit mechanisms (such as borrowing from family or friends, getting help from church or a civil society group, to deal with a shock that they have experienced during the previous year.
Experience of a Dispute at the Community Level	Family, extended kin, ethnic network, traditional council, church, community groups	Q5. Whether the village experienced a type of conflict such as a land or political dispute in the past year.
Existence of Local Systems/Groups for the Management of the Commons	Traditional governance systems based on social group norms, social sanctions, self-policing	Q6. Whether the village has a community driven governance system for managing the natural resources and deal with local issues including conflict.

Source: Prepared by the researcher based on literature presented above.

6.2.3.2. Preliminary Findings on Factors Contributing to Social Capital

Community Trust

Table 6.6 presents the geographic distribution of households with their ability to trust their community. Of the 168 households who answered the question, 93.5 percent indicated that they could trust the community, and 5.9 percent noted to some extent. While 10 households mentioned that they could trust the community somewhat (three households each in Holarua and Lotefoho, two households in Comoro and one household each in Ainaro and Manutasi), only one household (in Holarua) stated they had no trust in their village and neighbours. This suggests that the percentage of households that can absolutely trust the community varies between 77 percent for Letefoho to 100 percent in Fuat, Iliomar and Ulmera. The percentages presented

below, in fact, highlight a widely shared trust among local communities included in the survey.

Table 6.6

Household Responses to Community Trust among Eight Villages

Village	Number / Percentage of households that can trust the people in their village			No. and Total percentage
	Yes	Somewhat	No	
Ainaro	13 92.9%	1 7.1%	0 0%	14 100%
Comoro	29 93.5%	2 6.5%	0 0%	31 100%
Fuat	19 100%	0 0%	0 0%	19 100%
Holarua	24 85.7%	3 10.7%	1 3.6%	28 100%
Iliomar	21 100%	0 0%	0 0%	21 100%
Letefoho	10 76.9%	3 23.1%	0 0%	13 100%
Manutasi	23 95.8%	1 4.2%	0 0%	24 100%
Ulmera	18 100%	0 0%	0 0%	18 100%
Total	157 93.5%	10 5.9%	1 0.6%	168 100%

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

Village Safety and Security

In regards to people's perception of their village, 98.8 percent of the households indicated that they found their village a nice and safe place to live in. The only exception to this was one household in Holarua. Another household in Ainaro also suggested that they somewhat think that their village is nice and secure (see Table 6.7).

Table 6.7

Household Perceptions of Village Safety in Eight Villages of Timor-Leste

Village	Number/percentage of households that find their village a safe and nice place to live in			N and Total percentage
	Yes	No	So-so	
Ainaro	14 93.3%	0 0%	1 6.7%	15 100%
Comoro	31 100%	0 0%	0 0%	31 100%
Fuat	19 100%	0 0%	0 0%	19 100%
Holarua	27 96.4%	1 3.6%	0 0%	28 100%
Iliomar	21 100%	0 0%	0 0%	21 100%
Letefoho	13 100%	0 0%	0 0%	13 100%
Manutasi	24 100%	0 0.0%	0 0%	24 100%
Ulmera	18 100%	0 0%	0 0%	18 100%
Total	167 98.8%	1 0.6%	1 0.6%	169 100%

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

Neighbour and Community Connections

In relation to the household's perception of whether they can get help from their community if needed, 40 percent indicated that they could certainly get help. Another 40 percent said that they could sometimes get help but not always. Twenty percent of the households indicated that they could not get help from their community. Table 6.8 shows that a larger percentage of the people (43 to 44 percent) in villages such as Ulmera and Iliomar perceive that they would not be able to get help from the community if they needed. On the other hand, only seven to eight percent of the people in the villages of Ainaro, Holarua and Letefoho thought that they could not get help from the community, indicating that most of the people in

these villages perceive their communities as capable sources of support in needy situations. This reflects that the villages Ainaro, Holarua and Letefoho have higher social capital. In fact, with the exception of two villages (Iliomar and Ulmera), 79 to 93 percent of the households in all other villages indicated that in needy situations they could rely on community mechanisms of support to some extent (meaning always or sometimes). This again showcases high social capital among most of the villages in Timor-Leste.

Table 6.8

Whether Households Can Get Help from the Community in Eight Villages of Timor-Leste

	Percentage of households that can get help from the community			Total percentage and N
	Yes Always	Sometimes	No Never	
Ainaro	80.0	13.3	6.7	100.0 (N=15)
Comoro	3.2	80.6	16.1	100.0 (N=31)
Fuat	10.5	68.4	21.1	100.0 (N=19)
Holarua	68.0	25.0	7.0	100.0 (N=28)
Iliomar	14.0	43.0	43.0	100.0 (N=21)
Letefoho	77.0	15.0	8.0	100.0 (N=13)
Manutasi	54.0	29.0	17.0	100.0 (N=24)
Ulmera	39.0	17.0	44.0	100.0 (N=18)
Total	N=67	N=68	N=34	100.0 (N=169)

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012.

Access to Credit Systems to Manage Livelihood Risks

In addition to the perceptions about the availability of support from the community, it is important to ascertain the actual support received from the community in situations when people incur large expenditures or encounter unexpected ‘shocks’ due to unforeseen circumstances which may include death or sickness, a wedding or a traditional ceremony, crop failure or a natural disaster. Out of the households which stated to have experienced such extreme events in the past year, 13 percent said they only relied on their family and friends and borrowed money from them as one of

their coping mechanisms, while 2.7 percent said they only received support from the church, an NGO or the government. Others for example, with 21 percent only spent their savings, 14 percent only sold their animals, 6 percent only collected and sold forest products, and the rest applied a mix of these strategies. When the mix of strategies is considered, it is found that 36 percent used their savings, 33 percent sold their animals, 36 percent borrowed from family and friends, and 8 percent received support from the government, church or an NGO.

Table 6.9 shows the percentage of distribution of the coping strategies among the eight villages, some of which relate back to the stocks of social capital within communities. Among the households which experienced great expenditure or a vulnerable situation, the largest percentage of households who only relied on borrowing from their friends and family are in Comoro and Fuat. Comoro, also accommodates the largest percentage of households (46.2 percent) who spent only their savings to deal with unexpected situations. This suggests that in Comoro, households are perhaps better endowed with savings. Selling animals seems to be a viable option for a larger percentage of households in the eastern villages such as Fuat and Iliomar. Support from a church/NGO or the government however is small in all villages with the highest percentage in Holarua (8.7 percent).

Table 6.9

Household Responses to Community Credit Systems: Percentage of households in the eight villages adopting different coping mechanisms.

Village	Percentage of households						Total N who experienced a vulnerable situation
	Only Spent savings	Only Sold Animals	Only Borrowed from family and friends	Only Received support from the church, the government or an NGO	Only Collected and sold Forest Products	A mix of those	
Ainaro	25%	8.3%	0.0%	0.0%	0.0%	66.6%	100% (N=12)
Comoro	46.2%	7.7%	23.1%	0.0%	3.8%	19.2%	100% (N=26)
Fuat	5.6%	27.8%	22.2%	0.0%	5.6%	38.3%	100% (N=18)
Holarua	17.4%	0.0%	8.7%	8.7%	8.7%	56.2%	100% (N=23)
Iliomar	0.0%	47.4%	10.5%	5.3%	0.0%	36.8%	100% (N=19)
Letefoho	27.3%	9.1%	9.1%	0.0%	0.0%	54.5%	100% (N=11)
Manutasi	21.7%	4.3%	13.0%	4.3%	8.7%	48.2%	100% (N=23)
Ulmera	21.4%	7.1%	7.1%	0.0%	14.3%	50.1%	100% (N=14)
Total	21.2% N=31	13.7% N=20	13% N=19	2.7% N=4	5.5% N=8	43.9% N=64	100% (N=146)

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

Local Level Governance and Dispute Resolution

In relation to identifying the local structures of governance and dispute resolution in each individual village, the current practice of Timor-Leste's customary laws named 'Tara Bandu' is used as an indicator. Tara Bandu, which is further explored in Chapter 9 of this thesis, is a set of traditional laws used by communities to regulate relations between people as well as people and the environment. They are a group of verbally agreed procedures and methods to protect private property, regulate common natural resource use, and also to resolve conflict at the village level, including domestic violence or political disputes. It involves a ritual ceremony where community comes together to decide on the sanctions and connect with their ancestors. Tara Bandu is a participatory practice and builds social capital through

uniting the community to self-manage and monitor their natural resources and solve their local problems as a community (Carvalho, 2011). Hence, community ties are assumed to be stronger benefiting the individual's livelihoods and wellbeing when such practices are in place ensuring community peace, justice and equity. Out of the eight villages studied in this research, Tara Bandu is currently practiced in five villages (see Table 6.10). The reasons Tara Bandu is not practiced in some parts of the country are discussed in Chapter 9.

In relation to the conflicts experienced at the village level in the past year, all villages except two (Manutasi and Ulmera), have reported to have experienced land disputes, while Holarua village had to deal with a political dispute. Land ownership is a problematic issue in Timor-Leste as people were given different types of land titles in the past, issued by different regimes under Portuguese, Indonesian and Timorese rules respectively. This has caused a wide range of complexity which is beyond the capacity of the respective communities to resolve. These problems are exacerbated by a lack of current land law in the country, jeopardising the existing social capital within communities.

Table 6.10

Existence of a Local Level Governance and Dispute Resolution Mechanism (Tara Bandu) and Conflict Resolution with Tara Bandu in eight villages of Timor-Leste, 2012

	Practices Tara Bandu	Experienced land disputes	Experienced political disputes	The village could resolve the conflict with Tara Bandu
Ainaro	Yes	Yes	No	No
Comoro	No	Yes	No	No
Fuat	No	Yes	No	No
Holarua	Yes	Yes	Yes	Somewhat
Iliomar	Yes	Yes	No	No
Letefoho	No	Yes	No	No
Manutasi	Yes	No	No	N/A
Ulmera	Yes	No	No	N/A

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

In order to measure social capital at the household level, a household social capital index is constructed on the basis of the scoring scheme presented in Table 6.11. According to this scheme, higher scores represent higher social capital.

Table 6.11

Social Capital Scoring at the Household Level

Questions Measuring Social Capital	Response	Score	
Q1. Does the household trust the people in the village?	No	0	Household Score
	Somewhat	1	
Q2. Does the household think the village is a nice and safe place to live?	Yes	2	
Q3. Does the household think that they can get help from the community if they needed			
Q 4. Did the household borrow from family or friends or get help from church or a civil society group to deal with a shock that they have experienced during the previous year?	No	0	
	Yes	1	
Q5. Has the village experienced a local dispute in the past year?	No	0	All households in that village is assigned the same score
	Yes	1	
Q6. Does the village practice Tara Bandu?			

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

Based on the scoring presented above, the maximum score a household can attain is nine. In this research, the social capital of a household is categorised according to the following scores presented in Table 6.12:

Table 6.12

Scoring To Define Level of Household Social Capital, Timor-Leste 2012

Score	Level of household social capital
Less than 4	Low
4 or 5	Medium
More than 5	High

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

6.2.3.3. Findings

Based on the above scoring, it is found that only 12 percent of the households have low social capital. Fifty seven percent of the households have a high level of social capital, and a slightly smaller percentage of households with 31 percent, have medium levels of social capital. These findings show that the majority of Timorese households can enjoy close social networks and community support in times of need to support their livelihoods. Table 6.13 shows how households' social capital is distributed in each of the eight villages. Comoro village, which is based in the capital district Dili, stands out with the lowest percentage of the group of households with high social capital. This may be due to the fact that Dili receives most of migrants from other districts and accommodates a larger percentage of people who are not born in the same village. The migration factor may restrict people to establish high levels of social capital in one place within their life course. A large percentage of the households living in Ainaro, Letefoho and Manutasi villages (77 to 96 percentages), on the other hand, enjoy high social capital. Interestingly, these villages are in close proximity to each other. The households with the poorest social capital are concentrated more in Iliomar and Holarua villages.

Table 6.13

Levels of Social Capital in Eight Villages of Timor-Leste, 2012

Village	Social Capital			
	Low	Medium	High	Total percentage and the number of households (N)
Ainaro	7.1%	14.3%	78.6%	100.0% (N=14)
Comoro	12.9%	67.7%	19.4%	100.0% (N=31)
Fuat	10.5%	47.4%	42.1%	100.0% (N=19)
Holarua	17.9%	17.9%	64.3%	100.0% (N=28)
Iliomar	28.6%	28.6%	42.9%	100.0% (N=21)
Letefoho	15.4%	7.7%	76.9%	100.0% (N=13)
Manutasi	0%	4.2%	95.8%	100.0% (N=24)
Ulmera	0%	41.2%	58.8%	100.0% (N=17)
Total % and (N)	12.0% (N=20)	31.1% (N=52)	56.9% (N=95)	100.0% (N=167)

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

6.2.4. Physical Capital

Physical capital is generally described as the basic infrastructure that is needed to support livelihoods (DFID, 1999b). Infrastructure can be described as changes to the physical environment that help people to meet their basic needs, be more productive, and increase their capabilities. Some of the most essential components of basic infrastructure¹⁵ include accessible health services, markets, roads and transportation, electricity, improved piped water and sanitation. Many participatory and inclusive poverty assessments have found that a lack of certain types of infrastructure is a core dimension of poverty (DFID, 1999b). There is a large amount of empirical evidence suggesting that poor access to water, clean energy, health services and markets can

¹⁵ The housing conditions of a household such as walls and roof are essential components of basic infrastructure. However these indicators are not included in the assessment of a household's physical capital to avoid duplication as these are already included in the assessment of a household's economic capital.

cause deterioration of human capabilities, health, well-being, productivity and wealth (MEA, 2005). Poor infrastructure can contribute to preclusion of education, political participation and access to information. It can cause people to spend long periods of time in economically non-productive activities such as getting to the markets, collecting water or firewood (DFID, 1999b). Poor infrastructure can also lead to increased transport costs, impeded economic growth while negatively affecting regional agriculture and industrial development. For example, poor transport infrastructure can cause a shortage or wasting of agricultural yields due to disturbances in effective fertiliser distribution, lack of storage or high costs, and difficulty in accessing markets (DFID, 1999b).

Timor-Leste faces great challenges in rebuilding its infrastructure after 70 percent of its existing infrastructure was destroyed in late 1999 by Indonesian troops and anti-independence militias (Government of Timor-Leste, 2012). Following the mass destruction, substantial reconstruction in both urban and rural areas was carried out in the following years by international partners of Timor-Leste. However, the infrastructure still remains poor. Around 90 percent of national roads are in either poor or very poor condition, and the state of the remaining 10 percent can only be regarded as fair (Government of Timor-Leste, 2010a). The maintenance and construction of roads in Timor-Leste is particularly challenging because of the mountainous terrain and high levels of mud and water. Moreover, many parts of the country become isolated when the roads and bridges that connect them are rendered impassable due to landslides and floods, thus, restricting the ability of people to move and transport goods (Government of Timor-Leste, 2010a). This, in turn, exacerbates the limitations of an already poor infrastructure and further constrains regional development. Access to clean water and sanitation is also limited in Timor-

Leste. Poor access to these essential needs is one of the most significant causes of infant and child mortality in the country and imposes many other incalculable social and economic costs (Health Alliance International, 2008). Access to electricity on the other hand, is still restricted to one third of the population and generally, lasts for only six hours per day (Mercy Corps, 2009). Following the widespread destruction of infrastructure that took place in 1999, the basic means of producing electricity remained inadequate and run down up until 2010 when the government of Timor-Leste undertook the largest ever infrastructure program and started developing the National Electricity Grid to provide electricity for all (Government of Timor-Leste, 2010a). Despite improvements with the partial completion of this infrastructure development, a continuing lack of access to electricity in off-grid areas remains an obstacle to improving health and education outcomes and quality of life. This situation also restricts the economic development of the country by imposing limitations on the production of goods and services.

This thesis argues that one of crucial components of a multi-dimensional poverty analysis is the availability of physical capital at the household level (ETH, 2007). On the basis of the assumption that households in a particular village enjoy more or less similar benefits from the available infrastructure of that village, this thesis initially measures physical capital at the village level. Then, all households within a village are assigned the same score of that village (assuming that, if there is a health centre or a usable road in one village, then all households in the same village will have equal access to them).

6.2.4.1. Measuring Physical Capital in the context of Timor-Leste

To construct a physical capital index, this thesis focuses on the basic infrastructure advantages with which villages are equipped. These advantages, which become the

indicators of physical capital, include the availability of a usable road during all seasons, availability of a health centre in the village, proximity to the district capital and the national capital, Dili, and access to clean water, sanitation and electricity. It is assumed that all the households within a village have equal access to these facilities and enjoy their benefits to improve livelihood outcomes. Table 6.14 presents the indicators and scoring scheme employed in measuring physical capital at the village level. The index of physical capital is measured by the sum of the scores a village has according to Table 6.14. In measuring the overall physical capital of a village, the contribution of each indicator is given equal weight. Thus, the score for the physical capital of a village can range from 0 to 12.

Table 6.14

Scoring Scheme Used to Measure Physical Capital at the Village Level

Indicators of Physical Capital	Answer (Yes or No)	Score
The village has a usable road during wet and dry season	Yes	1
	No	0
The village has a health centre	Yes	1
	No	0
Distance of the village from the capital of the district where the village is located.	<5 kms	2
	5-20 kms	1
	>20 kms	0
Distance of the village from the national capital Dili.	<25 kms	2
	100-200 kms	1
	>200 kms	0
The percentage of households using electricity for lighting in the village.	>80%	2
	40-80%	1
	<40%	0
The percentage of households having access to improved sanitation in the village.	>80%	2
	40-80%	1
	<40%	0
The percentage of households having access to improved water in the village.	>80%	2
	40-80%	1
	<40%	0

Source: Prepared by the researcher.

Data collected during the fieldwork for this study show that two out of the eight villages included in this research, namely Holarua and Manufahi, do not have access to a usable road during all seasons, and four villages do not have a health centre. The distance to the capital of the district in which villages are located is generally within 10 kilometres with the exception of Fuat and Iliomar, each of which is 45 km away. The district of Lautem (where Fuat and Iliomar villages are located), is the farthest from the national capital, Dili with a distance of 215 kms. Liquica district on the other hand (where Ulmera village is located) is closest to Dili (see Table 6.15). While on average more than 60 percent of the villages have access to water, much

lower proportions of the villages have access to improved sanitation and to electricity. Based on all the indicators combined, the highest physical capital score is that of Comoro village, located in the national capital district Dili, while Fuat and Iliomar have the lowest scores. These two villages are the most isolated and farthest away from the centre of urban development that is taking place in and around Dili. The scores for each indicator and the total physical capital scores of the eight villages are presented in Table 6.15.

Table 6.15

Physical Capital Scores of the Eight Villages, Timor-Leste, 2012

Village	Has usable road during wet season	Has a health centre in the village	Distance to the nearest district capital	Distance to the national capital, Dili	Households using electricity for lighting	Households have access to improved sanitation	Households have access to Improved water	TOTAL Physical capital score
Ainaro	Yes	Yes	0 km	110 km	60-80%	40-60%	80-100%	9
Comoro	Yes	No	0 km	0 km	80-100%	80-100%	80-100%	11
Fuat	Yes	No	40 km	210 km	0-20%	20-40%	80-100%	3
Holarua	No	Yes	5 km	110 km	20-40%	0-20%	60-80%	5
Iliomar	Yes	No	45 km	215 km	40-60%	20-40%	0-20%	2
Letefoho	Yes	Yes	0 km	115 km	80-100%	40-60%	80-100%	10
Manutasi	No	No	5 km	105 km	20-40%	20-40%	60-80%	4
Ulmera	Yes	Yes	8 km	25 km	40-60%	20-40%	60-80%	7

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012 and Timor-Leste's census 2010

In this research, a household is identified as having poor physical capital if it is located in a village that has a total physical score less than five. A household is identified to have medium physical capital if it is located in a village with a score between five and eight. Finally, a household is identified to have high physical capital if it is located in a village with a score of more than eight.

It is found in this research that 38 percent of the households have low physical capital, 28 percent have medium physical capital, and 35 percent have high physical capital. The high physical capital is concentrated in villages Ainaro, Comoro and Letefoho; medium physical capital in Holarua and Ulmera; and low physical capital in Manutasi, Iliomar and Fuat.

6.2.5. Natural Capital

Natural capital is generally the term used for the natural resource stocks from which resource flows and services useful for livelihoods are derived (DFID, 1999b). Some examples of natural resource stock can be listed as land, forests, marine resources, water, air quality, erosion protection, storm protection, and biodiversity (Angelsen, Larsen, Lund, Smith-Hall, & Wunder, 2011). Table 6.16 presents nine types of key assets of natural capital identified by the Natural Capital Committee (2013) and includes a brief description of each key asset.

Table 6.16

List of Key Natural Capital Assets

- | |
|---|
| <ol style="list-style-type: none"> 1. Soil: Its role in primary production, decomposition, nutrient cycling, bioremediation and other processes. 2. Water: Surface and ground water quantity and quality 3. Carbon: Stocks below and above ground 4. Energy: Including coal, oil, natural gas, as well as energy crops, wind power, hydro-electric dams 5. Minerals: Stock of metallic and non-metallic minerals 6. Air quality: With a view to accessing human health as well as impacts on habitat and wild species 7. Wild foods and fisheries: Fish stocks and other edible species 8. Agriculture, aqua-culture and forestry: including agricultural output, timber, fuel, fibre, kelp, farmed fish 9. Wild Species and Habitat: including land asset classes, habitats for rare species, coastal margins, protected areas, invasive and native species |
|---|

Source: Natural Capital Committee, 2013.

As the list suggests, natural capital assets are a significant portion of humanity's wealth (England, 1998). Fundamental linkages among organisms and their physical

and biological environment constitute an interacting and ever-changing system that is known as an ecosystem where humans constitute an important part of it (MEA, 2005). Human beings continuously depend upon the functioning of these complex ecosystems for their health and well-being (Costanza et al., 1997). They benefit from many of the numerous ecosystem services which include for instance provision of food and water, regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling, that maintain the conditions for life on Earth (Costanza et al., 1997).

It is clear that the relationship of ecosystems and their services to human well-being is complex, and may change over time (Butler & Oluoch-Kosura, 2006). UNEP (2012) states that ecosystem goods and services provide trillions of US\$ worth of manufactured and financial capital in addition to their aesthetic, spiritual, psychological, and other non-material benefits that are obtained by humans through contact with ecosystems. Despite being fundamental to the human wellbeing however, the daily use of these ecosystems remain almost undetected within the predominant economic system and are often undervalued until the adverse effects of disturbing them become apparent (DFID, 1999b; UNEP, 2012). Hence, it is critical that the changes in natural capital and the likely distribution of its benefits and costs are accounted for poverty reduction strategies and public policy making. This view is also supported by many scholars partly due to the characteristics of the natural capital assets. Dasgupta (2008) argues that the ecosystems and natural capital assets differ from reproducible capital assets in three ways. Firstly, the author argues that depreciation of natural capital is frequently irreversible (or at best, the systems take a long time to recover); secondly, the author argues that except in a very limited sense,

it is not possible to replace a depleted or degraded ecosystem with a new one; and finally, the author points that ecosystems can collapse abruptly, without much prior warning. Hence, the careful inspection of the notion of natural capital is very important in order to better appreciate its numerous facets for human well-being (England, 1998), and have a proper accounting of the changes to feed into policy making for their sustainability.

Angelsen et al. (2011) suggest that abundance, accessibility and quality of natural resources influence a household's livelihood strategy and hence are linked to livelihood outcomes. Within the reach of the collected data set, natural capital assessment in this research is undertaken on the basis of abundance, accessibility and quality of only two types of the key natural resources, and these include agricultural land (plantation) and forests. Other types of natural capital such as water, marine resources, and minerals are excluded from the natural capital assessment of this research.

A natural capital index is constructed according to some of the selected indicators and each household is assigned a score on the basis of the indicators identified. The rationale and the scoring scheme for natural capital assessment is presented in Table 6.17 which presents the indicators applied in measuring natural capital of the eight villages studied in this research, the scores used in these measurements, and the assumptions made in constructing the scoring scheme. Higher access, quality and abundance of agricultural land and forests lead to higher scores, and higher scores represent higher natural capital at the household level. The relevant discussion and findings regarding the natural capital at the household level are provided following Table 6.17.

Table 6.17

Scoring Scheme for Natural Capital Assessment at the Household Level

Chapter 6	Assessment	Indicator	Assumption	Scoring
LAND (Agricultural Land/Plantation)	Access	Whether the household has access to agricultural land	N/A	Score 0, if the household has no access to agricultural land Score 1, if household has access to agricultural land
	Abundance	Size of the agricultural land owned	With ownership of land, natural capital is assumed to increase relative to the size owned	Score 0, if household has no ownership of agricultural land or no access to agricultural land Score 1, if household has agricultural land size less than 3 hectares and has access to it Score 2, if household has agricultural land sized 3 hectares or more and has access to it
	Quality of Land (Condition)	Experience of water shortages, flooding, wild wire or plant disease at the village level.	Experience of situations such as water shortage, flooding, wild fire or plant disease is assumed to decline the quality and productivity of land	Score each household 0, if the village of that household has experienced three or more of the mentioned situations in the past year (or household has no access to land). Score each household 1, if the village of that household has experienced two of the situations listed above. Score each household 2, if the village of that household has experienced none or only one of the situations listed above.
FORESTS	Access	Time spent to access nearest forest	Forests are generally open to public use hence distance identifies their accessibility	Score a household 0, if forests can be accessed in more than 1 hour. Score a household 1, if forests can be accessed in 30-60 minutes. Score a household 2, if forests are reachable within 30 minutes.
	Abundance <i>A mean score of the two indicators are included in the assessment</i>	1-Household's ownership of forest and size owned.	Private ownership of forest increases a household's natural capital	Score a household 0 if it does not own any forest land or has no access to the forest owned Score a household 1, if it owns up to 3 hectares of forest and has access to it Score a household 2, if it owns more than 3 hectares of forest and has access to it
		2-Areal maps of forest cover	Abundance of forests at the village level increases a household's natural capital given that the majority of forests are community owned	Assess village level forest cover based on Google maps images and assign a score between 0 and 2 to households accordingly. (Based on Google images, Comoro Holarua and Ulmera villages are scored 0, Ainaro, Letefoho and Manutasi are scored 1, finally Fuat and Iliomar are scored 2)
	Quality of Forests (Condition) <i>A mean score of the two indicators are included in the assessment</i>	1-Perceived change in the availability of firewood	The households did not change their residence in the past 5 years	Score 0 if household thinks availability of firewood is less compared to 5 years ago. Score 1 if household thinks availability of firewood is the same compared to 5 years ago Score 2 if household thinks availability of firewood is more compared to 5 years ago
2-Perceived change in the accessibility of firewood		The households did not change their residence in the past 5 years	Score 0 if household thinks they have to walk further away to collect firewood compared to 5 years ago. Score 1 if household thinks they have to walk same distance to collect firewood compared to 5 years ago. Score 2 if household thinks they have to walk shorter distance to collect firewood compared to 5 years ago.	

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012.

6.2.5.1. Measuring Natural Capital in the Context of Timor-Leste

Before this research moves onto overall natural capital assessment, it provides some important findings in relation to land and forests at the household and village levels. Land ownership as discussed previously is a problematic area in Timor-Leste. The concept of land ownership is culturally, politically and historically highly complex entailing many different layers and levels of access. Fitzpatrick, McWilliam and Barnes (2013) suggest that simply asking people if they ‘own’ land is problematic; hence, recognition of security of access is much more relevant in the context of Timor-Leste. This research considers the relevant criticism and the limitation of such an approach; however it rather focuses on people’s own perception of land ownership and access and, therefore, reports both indicators despite the perceived simplicity in its approach.

According to the research analysis, 90 percent of the households have access to land and 95 percent own land. This indicates that the majority of the households perceive themselves as having both ownership and access to land with a small number stating that they do not have access to the land they own. Having explored where these households are located (presented in Table 6.18), it is found that the majority live in Comoro in the district of Dili. In fact, 45 percent of the households in Dili stated that they own land but have no access. This is not very surprising as Dili attracts many migrants who may own a land in their home villages but are unable to access it for various reasons. It may also be due to possible land disputes where households claim to own the land, yet their access is not guaranteed.

Table 6.18

Village Level Land Ownership

	Ownership of Land (N)			
	No		Yes	
	Access to Land		Access to Land	
	No	Yes	No	Yes
Ainaro	0	0	0	15
Comoro	4	1	10	16
Fuat	0	0	0	19
Holarua	0	0	0	29
Iliomar	0	0	1	20
Letefoho	1	1	0	11
Manutasi	0	0	0	24
Ulmera	1	1	0	16
Total	6	3	11	150

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

In this research, a distinction is made between ownership of agricultural land (or plantation) and ownership of natural forest land. In the areas included in this research, the plantations were observed to be predominantly coffee and teakwood plantations as well as sources for agricultural crops, firewood, fruit and vegetables. An analysis of data collected in this research shows that 85 percent of the households own a plantation with an average size of 2.1 hectares. These plantations are generally located in very close proximity to people's houses, making them easily accessible. Natural forest ownership on the other hand is much lower (16 percent). However, the average size of forests owned is found to be slightly bigger with 4.1 hectares. The average time spent gaining access to a forest was found to be 40 minutes. The percentage of distribution of natural forest land ownership and plantation land ownership in eight villages in Timor-Leste is presented in Table 6.19.

Table 6.19

Agricultural Land and Natural Forest Ownership

	Percentage of households that own	
	Natural forest land	Agricultural land/plantation
Ainaro	27% (N=4)	93% (N=14)
Comoro	10% (N=3)	74% (N=23)
Fuat	53% (N=10)	68% (N=13)
Holarua	3% (N=1)	100% (N=29)
Iliomar	10% (N=2)	91% (N=19)
Letefoho	8% (N=1)	77% (N=10)
Manutasi	8% (N=2)	96% (N=23)
Ulmera	22% (N=4)	72% (N=13)

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

In this research, the quality of agricultural land or plantation is assessed on the basis of incidences such as water shortage, flooding, drought, wild fire, pests and plant diseases experienced at the village level in the past year. It is assumed that the experience of such incidences negatively impacts on the quality and productivity of land (including the soil fertility) of all households within that village if these households have access to land.

Current literature suggests that the quality of land in Timor-Leste is generally poor (Democratic Republic of Timor-Leste, 2011; World Bank, 2009d). This is mainly because the soil is derived from limestone and metamorphosed marine clay which are both fragile and low in fertility (FAO, 2008). The steep slopes are often covered with thin soils which have low organic matter and water holding capacity. Hence, infrequent and torrential rainfall often washes away topsoil in flash floods, leaving much of the sloping land (over 40 percent of the country has extremely steep slopes

of 40 percent) susceptible to erosion and making them unsustainable for cultivation (FAO, 2008).

Secondly, deforestation is one of the most prominent land problems in Timor-Leste, allowing soil erosion and adversely affecting watersheds (FAO, 2008). Loss of forest cover exposes the soil to direct impacts of rain and hence, flooding and drought. While firewood and timber are reduced, ground water sources are also negatively affected as a result of reduced water penetration and lower water holding capacity of the soils. Although most of the deforestation has occurred in Timor-Leste during the logging operations of the colonist powers for export purposes (these including tree species such as teak, redwood, sandalwood and mahogany), the use of firewood as the primary energy source by both the urban and rural households has continued to add to the extent of the problem of forest cover loss with implications for the quality of land (FAO, 2008). Several studies reported that an overcutting of natural forest and woodlands over the period of 1972 and 1999 has caused a decline of primary forests from 25 to 16 percent, and secondary forests from 26 to 19 percent (Sundland et al., 2001).

Frequent forest clearing and deforestation are also followed by invasion of weeds (such as Siam weed) in agricultural and pastoral lands in Timor-Leste, which is known to be harmful for crop and animal production (Democratic Republic of Timor-Leste, 2011). The spread of weeds poses other environmental risks including wildfire as this weed spreads among a large land area, reduces the ground vegetation and increases the potential of drying out very quickly in the dry season making wildfires easy to spread. Forest fires in Timor-Leste are often aggravated by climatic conditions, however shifting agriculture, animal farming, and hunting lead locals to burn forests, agriculture or grazing lands (Democratic Republic of Timor-Leste,

2011). Recurring wildfires, overgrazing, and other unsustainable farming and hunting practices often lead to soil erosion, and loss of soil fertility due to lack of ground cover causing land quality to deteriorate further.

Another aspect of land quality and productivity is linked to water scarcities which affect agricultural production. Although there are many rivers in Timor-Leste, only around ten of them flow all year round (FAO, 2008). Water is in surplus in the wet season but supplies are unreliable in the dry season with this reliability varies according to topography and location. The perennial rivers including Loes, Laclo and Clere are the most significant hydrological units that currently provide water for domestic use and irrigation (FAO, 2008). Due to a lack of water infrastructure and water storage techniques however, water shortages are experienced all over the country during the dry season. Although small scale water harvesting for domestic use is generally found adequate and widely possible, water harvesting for agriculture remains as a major constraint in reducing food insecurity and poverty.

The current environmental state in Timor-Leste may also be threatened by the impact of climate change. Although there is limited information and analysis on the issue, Barnett et al. (2007) argues that Timor-Leste is vulnerable to climate change and its climate may become hotter and drier in the dry season and increasingly variable. Water, soil, and the coastal zones are all found to be vulnerable to changes in climate and sea level which would indeed affect agriculture, production, food security, and human habitat in the coastal cities including Dili. A recent study predicts that the climate in Timor-Leste will become about 1.5 C warmer and about 10 percent wetter on average by 2050 (Molyneux, da Cruz, Williams, Andersen, & Turner, 2012). Moreover Kirono (2010) suggests that, in the future, the frequency of cyclones and extreme rainfall events are likely to decrease but the intensity of the cyclones (with

high wind speeds) and extreme rainfall events will increase due to climate change. An increase in variability of rainfall, a shift in the onset of the rainy season, and an increase in average temperatures are likely to cause greater challenges for farmers and food security in the country. The changing climatic conditions indeed may be reflected back in the scale and frequency of incidence of drought, water scarcities and rainfall.

According to the village level interviews of this research, five out of eight villages experienced water shortages in the past year; three villages experienced flooding, drought, wildfire; and two experienced widespread pests or crop disease. Table 6.20 shows the experience of these incidences in the past year for all of the villages included in this research.

Table 6.20

Incidences of Natural Disasters Experienced at the Village Level

	Whether the village experienced the following incidences in the year proceeding to the survey					Number of different incidences experienced by the village which degrade land quality*
	Water shortage	Flooding	Drought	Wildfire	Widespread pest/ crop disease	
Ainaro	No	No	No	No	No	0
Comoro	Yes	No	No	No	Yes	2
Fuat	Yes	No	Yes	No	Yes	3
Holarua	Yes	Yes	Yes	Yes	No	4
Iliomar	Yes	No	No	No	No	1
Letefoho	No	Yes	No	No	No	1
Manutasi	No	No	No	Yes	No	1
Ulmera	Yes	Yes	Yes	Yes	No	4

*The numbers do not indicate how often the incidences were experienced. It is assumed that villages experienced these incidences only once in the year proceeding to the survey. Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012.

The villages Holarua and Ulmera appear to be the most vulnerable to have experienced four of the five forms of the vulnerabilities caused by natural events. On the other hand, the village, Ainaro, has experienced none of these situations. The experience of such incidences can certainly increase the likelihood of reduced yield production, reduced income, food insecurity, malnutrition, and deterioration of community wellbeing, which might also be followed by a serious of socio-economic impacts such as poor health, school drop-outs, and increased youth crimes. In this respect Ulmera, Fuat and Holarua villages appear to be the most vulnerable among all.

To assess the quality (condition) of village forests, this research treats the changes in the firewood availability and accessibility (as perceived by the people) as an indicator. An analysis of data collected in this research indicates that the majority of people are well aware of the deterioration of their surrounding natural forests. Forty

seven percent of the households perceive that there is less firewood available compared to five years ago. Eighty seven percent of the households indicate that they have to walk farther to collect firewood, while 50 percent argue that they spend more time engaged in firewood collection (see Table 6.21).

Table 6.21

Perceptions Regarding the Accessibility and Abundance of Firewood

	Percentage of households think (compared to 5 years earlier)	
	Less firewood available	Have to walk far to collect firewood
Ainaro	42	80
Comoro	95	100
Fuat	32	75
Holarua	19	80
Iliomar	33	60
Letefoho	46	80
Manutasi	29	86
Ulmera	94	100

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

The perceived degradation is highest in places like Comoro and Ulmera. For instance, members of every household in Comoro and Ulmera indicated that they had to walk farther to collect firewood, and around 95 percent thought that there was less firewood available compared to five years ago.

Defining Levels of Natural Capital

According to the scoring scheme described in Table 6.17, the maximum score a household can attain in terms of their level of natural capital is 11. It is found that the mean score for natural capital among all households is six and the maximum score is 9.5. In this research, natural capital is defined as low if the total natural capital score

of a household is equal to, or less than 4.5; medium if the household score is between five and six inclusive; and high if the household score is more than six.

Analysis

According to the defined scoring, 34.7 percent of the households have low natural capital; 30 percent have medium natural capital; and 35.3 percent have high natural capital. Table 6.22 represents the geographic distribution of the households according to the level of their natural capital assets.

Table 6.22

Distribution of the Levels of Natural Capital in Eight Villages, Timor-Leste 2012

		Natural Capital			
		Low	Medium	High	Total
Village Names	Ainaro	6.7%	6.7%	86.7%	100.0% (N=15)
	Comoro	61.3%	38.7%	0.0%	100.0% (N=31)
	Fuat	21.1%	63.2%	15.8%	100.0% (N=19)
	Holarua	72.4%	27.6%	0.0%	100.0% (N=29)
	Iliomar	4.8%	0.0%	95.2%	100.0% (N=21)
	Letefoho	7.7%	30.8%	61.5%	100.0% (N=13)
	Manutasi	0.0%	33.3%	66.7%	100.0% (N=24)
	Ulmera	66.7%	33.3%	0.0%	100.0% (N=18)
	Total	34.7% (N=59)	30% (N=51)	35.3% (N=60)	100% (N=170)

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

Very large percentages of households in Ainaro and Iliomar have high natural capital whereas this situation is reverse for Comoro, Holarua and Ulmera. Ulmera and Comoro are coastal villages where forests and land are very much deteriorated due to human activities. In Ulmera village for example, salt production is taking place where firewood is collected and then used heavily for drying the salt out, an activity which has deteriorated the natural capital assets in the surrounding areas. Comoro, on

the other hand, is a densely populated urban village with limited land and degraded forests. Better market opportunities in Comoro also lead local people to overexploit their environment for financial gain such as overharvesting firewood to sell in the markets. In both of the villages, there was great deterioration of the environment which could be observed during the field visits. Holarua is yet a surprising finding because the village is located in close proximity to dense forest cover; however, the findings suggest that the villagers are not endowed with rich and quality land and forests.

6.3. EXPLORING TIMOR-LESTE'S ASSET PORTFOLIO

After examining each of the five capital assets at the household level, this section presents an overall asset portfolio of the study areas included in this research. It identifies the overall livelihood asset portfolio based on the strengths, that is, the percentages, of the households with high economic, human, social, physical and natural capital. Illustrated in Figure 6.2, the strength of Timor-Leste's overall livelihood is predominantly driven by high social capital enjoyed by a large percentage (48%) of households. The weakest building block of Timor-Leste's livelihood portfolio on the other hand, is human capital where high levels are only shared by 25 percent of the households. High levels of the rest of the livelihood assets are more or less shared by 35 percent of the households.

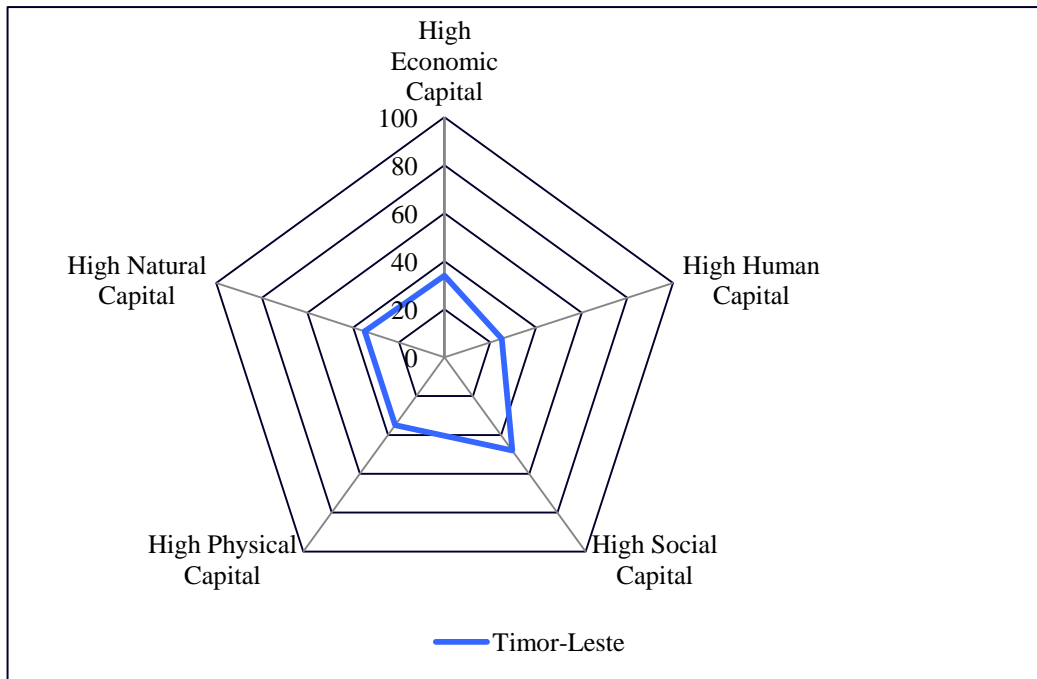


Figure 6.2. Timor-Leste's Livelihood Asset Portfolio. Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

Although the livelihood portfolio of Timor-Leste as reflected in Figure 6.2 might seem to suggest interventions and efforts to strengthen all of the five pillars of livelihood assets to reduce multi-dimensional poverty in the country, this research suggests that the efforts need to be tailored at the micro level.

Despite the generally accepted assumptions of homogeneity and similarity of communities in close proximity, it is found in this research that villages selected from the same districts, let alone the ones from neighbouring districts are equipped with very different livelihood portfolios. Illustrations of asset portfolios for each of the eight villages (paired according to the districts in which they are located) are presented in Appendix 5. Figure 6.3 below shows a comparative image of the village

level asset portfolios which demonstrates the wide differences in the composition of different types of livelihood assets in the eight villages in Timor-Leste.¹⁶

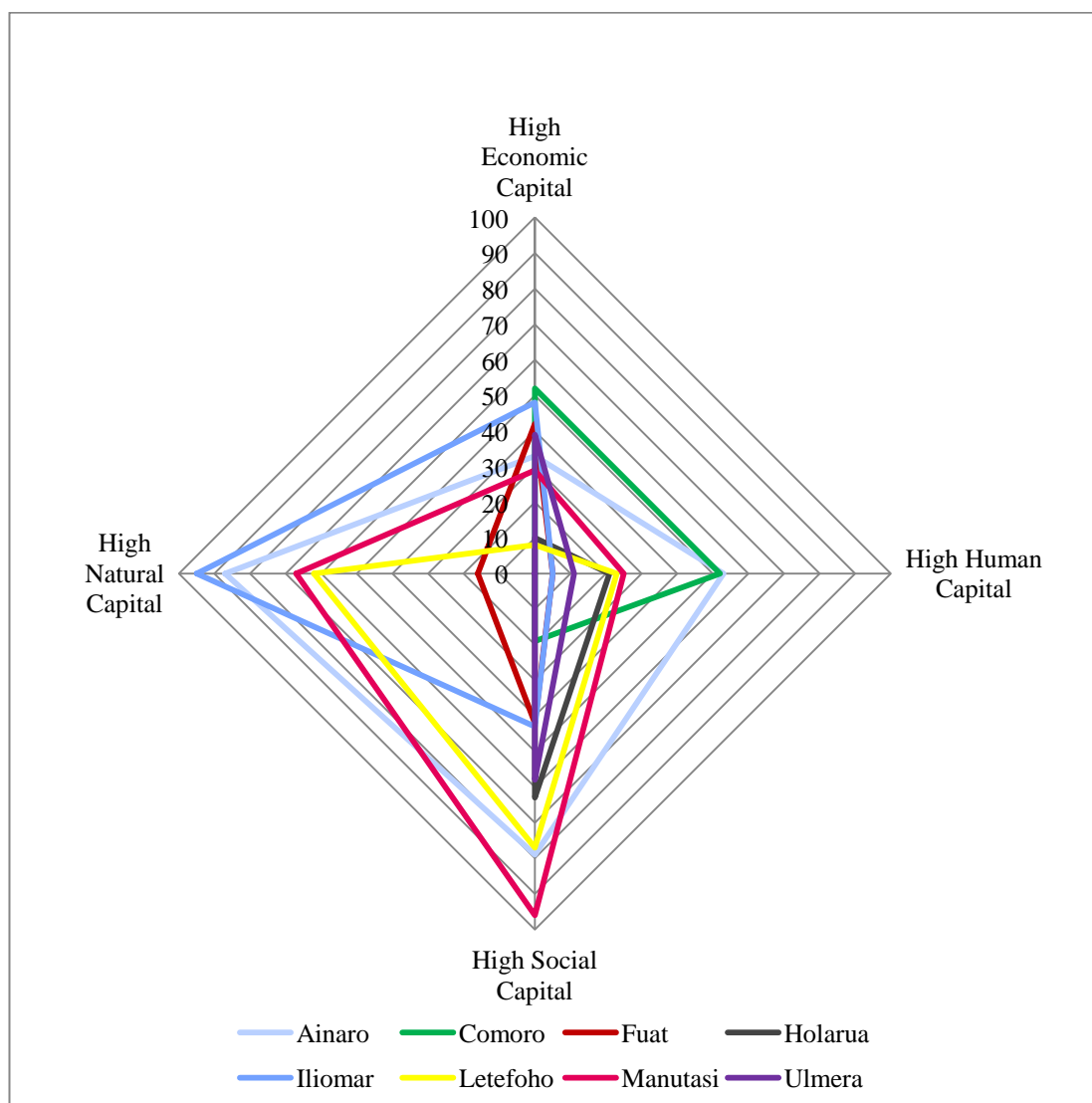


Figure 6.3. Livelihoods Asset Portfolio Mapping in Eight Villages of Timor-Leste, 2012. Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

Having explored the differences in the strength of villages on their asset portfolios at the village level, Table 6.23 below shows the weaknesses of the villages and the

¹⁶ As described earlier, physical capital is assumed to be evenly distributed among all households within a village, hence, the village portfolio maps do not include physical capital.

country according to their asset portfolios. Low human capital is shared by 50 percent of the households included in this research. This is followed by low economic capital shared by 44 percent; low physical capital by 38 percent; and natural capital by 35 percent.

Table 6.23

Asset Poor in Eight of the Villages

	Percentage of Households that have Low				
	Economic Capital	Human Capital	Social Capital	Natural Capital	Physical Capital
Village Names	Ainaro	33%	27%	7%	7%
	Comoro	48%	29%	13%	61%
	Fuat	42%	68%	11%	21%
	Holarua	57%	62%	18%	72%
	Iliomar	14%	86%	29%	5%
	Letefoho	77%	54%	15%	8%
	Manutasi	50%	29%	0%	0%
	Ulmera	33%	56%	0%	67%
	Timor-Leste	44%	50%	1%	35%

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

The asset portfolio mapping helps identify the strengths and weaknesses of each village according to asset portfolios. The information generated is particularly valuable as it can be used to shape micro level interventions and tailor them accordingly for sustainable capital accumulation and re-investment.

6.4. MEASURING POVERTY: DEFINING THE ASSET POOR

Communities do not represent homogeneous collective social units as assumed by most development projects or programs (Agrawal & Gibson, 1999). This is also the case in Timor-Leste, as shown in the differences in the village level livelihood assets.

Poverty is rarely uniformly distributed even within a small area such as a village. Even if the socio-economic differences are not clear to an outsider, in every community there are some households better off than others and the poor households live side-by-side the more affluent ones. The aim of this research is to identify the asset poor and asset rich households within each village and in the whole sample set in order to understand its dynamics in the context of Timor-Leste, and its links to forest reliance as a livelihood strategy. This is discussed in the next chapter.

A household asset portfolio represents the nature of the building blocks of the household members' livelihood. In this research, the household asset portfolios are used for identifying the multi-dimensional poverty of households. Focusing on five particular household assets and weighing them evenly in terms of their contribution to livelihoods, a household is defined as poor if it scores low in three of the five assets. On the other hand, a household is defined as better off if it scores high in three of the five assets. In all other cases, the households are defined as being average.

Based on the categorisation mentioned above, it is found in this research that 25 percent of the total number of households included in the sample is poor (that is, 42 households - 40 male headed and 2 female headed); 46 percent is average (that is 76 households - 70 male headed and 6 female headed); and 29 percent is better off (that is 48 households - 45 male headed and 3 female headed).

Exploring some of the characteristics of the poor and better-off households, it is found that the percentage of land ownership and access are high among the poor households, with only seven percent indicating that they do not have either access to, or ownership of, land. In the group of better off households on the other hand, lack of land ownership declines to two percent, however when it comes to access, 12 percent

indicate that they do not have access to the land they own. This is an interesting finding which reveals that some better-off households own land in places where they do not currently reside and, hence, do not have access to it; in other words, they may have migrated from the place where they were born but still invested in or accumulated economic wealth in the form of land. This also makes sense as most of the land titles are customary and are linked to a person's ancestral ties.

In terms of place of origin (place of birth), 86 percent of the household heads in the group of poor households indicated that they were born in the villages where they lived. This percentage declines to 69 for the group of better-off households. In other words 31 percent of the better-off household heads are life-time migrants, such that they were born at a place which is different from the place they currently live. This finding is also in-line with the percentages found for land ownership and access. It is clear that migration offers some opportunities in terms of acquiring livelihood assets and moving out of poverty.

Considering the number of children the households have in each category, no striking difference was found between the poor and the better-off households. It is clear however that in the group of poor households a larger percentage have 6 or more children as compared with households in the group of average and better-off. In the group of poor households 41 percent had three or fewer children, 26 percent had four to six children and 33 percent had seven or more children. In the group of better of households these percentages were 42, 33 and 25 percent respectively (see Table 6.24).

Table 6.24

Association between a Household's Poverty Level and Number of Children

		Percentage of households having children			
		3 or fewer	4 or 5	6 or more	Total percentage and sample size (N)
Poverty Level	Poor	40.5	26.2	33.3	100.0% (N=42)
	Average	31.6	46.1	22.4	100.0% (N=76)
	Better-off	41.7	33.3	25	100.0% (N=48)
	Total	36.7	37.3	25.9	100.0% (N=166)

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

With respect to self-perceived wealth of the households, it is found that in each category (poor, average and better-off), more than 80 percent of the households thought that their wealth was the same as that of their neighbours. This reflects that, in a given locality, the majority of the households consider themselves just as wealthy as their neighbours. In other words, there is large self-perceived equity in Timor-Leste reflecting an egalitarian system. This is interesting as it may justify or fuel the high social capital in Timorese communities. It may also have implications for communities' perception of their right and need to use environmental resources for their livelihoods.

When asked how well-off the households were now compared to five years ago, 12 percent of the poor households indicated that they were worse off; 50 percent said that they were more or less the same; and 38 percent suggested that their wealth had improved. The percentage of other households who thought their wealth had improved in the past five years were 22 percent for the group of average households, and 29 percent for the group of better-off households. Overall, nine percent of all households thought they were worse off compared to five years ago; 63 percent were

the same; and 28 percent perceived improvements in wealth. This means that the largest percentage of perceived improvement in wealth belongs to the group of poor households. This is a promising finding as it reflects that the development efforts in the past five years in Timor-Leste have helped the poorest to improve their livelihoods the most.

In relation to some of the vulnerable situations experienced by the households in the past year, this research found that a significant relationship exists between the death of a family member and household poverty ($p=0.040$, Cramer's $V=0.197$). Among the group of poor households, almost three in 10 experienced a death of a member of the household. This is in accordance with other research findings suggesting that health shocks such as sickness, disease and death are the most powerful forces in pushing people below the poverty threshold (Krishna, 2006). In the group of poor households, 29 percent reported that somebody in their family had passed away in the previous year. This percentage declines to 12 for the average households and 27 percent for the better-off households. For all households combined, 26 percent of the time, the deceased was an infant aged one year and below; 10 percent of the time it was a person aged between one and five years' 36 percent of the time it was a person aged between 15 and 64 years; and 28 percent of the time it was a much older family member. Twenty six percent in the group of poor households indicated that the household head got sick and was not able to work for an extended period. This rate declined to 15 and 18 percent for the average and better-off households respectively.

Experience of a bad harvest was not unique to only poor households. Between 35 and 43 percent of households in each category reported to have experienced bad harvest in the past year where this rate was recorded as 38 percent among the poor households. This is not very surprising as a bad harvest affects the entire population,

the well-off, and the poor alike. Bad harvests in Timor-Leste are often linked to the rain patterns: the lack of it causing droughts; or too much of it leading to floods. There are also issues with pests and strong winds coupled with poor soil fertility. The high percentages of bad harvests among all households are quite concerning given the food security situation in the country where 64 percent are reported as being food insecure.

One striking finding of the study is the large percentage of households in each category that have reported considerable out of pocket spending for traditional ceremonies (such as a wedding, funeral, construction of a sacred house). Seventy one percent of the poor households, 63 percent of the average and 75 percent of the better-off households reported to have spent between \$5 and \$5,000 for cultural ceremonies in the past year. This reflects a very wide range when it comes to the amount spent: however, for 47 percent of the time, the amount was \$100 and below; 30 percent of the time it was between \$100 and \$500; 14 percent of the time it was between \$500 and \$1,000; and for nine percent of the time, the amount was above \$1,000. It is apparent that when it comes to traditional duties, families take the burden of making external payments for cultural events regardless of their poverty level.

In the group of poor households, it is found in this research that 95 percent have poor human capital, 81 percent have poor economic capital, 52 percent have poor physical capital, 48 percent have poor natural capital, and 40 percent have poor social capital. In the group of households that are better-off on the other hand, 83 percent has high social capital, 69 percent has high natural and physical capital, 58 percent has high economic capital, and 52 percent has high human capital. Illustrated in Table 6.25 is the percentage share of the poor within a village which is the largest in Iliomar and

Holarua villages, whereas the better-off households make up a larger percentage of the total number of households in Ainaro and Letefoho.

Table 6.25

Percentages of Asset Poor in the Eight Villages Studied in this Research According Overall Livelihood Assets Portfolio

Village	Wealth status			Total % and N
	Poor	Average	Better-off	
Ainaro	0.0%	7.1%	92.9%	100.0% (N=14)
Comoro	12.9%	51.6%	35.5%	100.0% (N=31)
Fuat	36.8%	63.2%	0.0%	100.0% (N=19)
Holarua	40.7%	55.6%	3.7%	100.0% (N=27)
Iliomar	42.9%	38.1%	19.0%	100.0% (N=21)
Letefoho	15.4%	15.4%	69.2%	100.0% (N=13)
Manutasi	25.0%	37.5%	37.5%	100.0% (N=24)
Ulmera	17.6%	76.5%	5.9%	100.0% (N=17)
Total % and N	25.3% N=42	45.8% N=76	28.9% N=48	100% (N= 166)

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

6.4.1. Relations between Poverty Socio-Demographic Factors and Livelihood Assets

In this research, no statistically significant association is found between poverty and demographic factors such as age and sex of the household head, household size or the number of children within a household. However, there are statistically significant associations between poverty and level of education and between poverty and type of employment of the household head. For example, it is found from survey data for this thesis that in 88 percent of the poor households, the household head is employed in the agricultural sector, and in five percent, the household head was employed in fisheries or in a casual labouring capacity. Further, in 60 percent of the poor households, the household head had no formal education (see Table 6.26). This reflects that as much as poverty is hidden within the agricultural sector, it is also very

closely linked with lack of formal education. With the increased education level of the household head, poverty dramatically declines. This is particularly true for 46 percent of the better-off households, where the household head had secondary school education.

Table 6.26

Association between Household Poverty and Education of the Household Head

Poverty level	Percentage of household heads according to completed educational category					
	No education	Primary School	Pre-Secondary School	Secondary School	University	Total % and (N)
Poor	59.5	26.2	7.1	7.1	0.0	100% (N=42)
Average	23.7	23.7	15.8	30.3	6.6	100% (N=76)
Better-off	20.8	14.6	12.5	45.8	6.3	100% (N=48)
Total % and N	31.9 (N=53)	21.7 (N=36)	12.7 (N=21)	29.8 (N=48)	4.8 (N=8)	100% (N=166)

	Value	Approx. Sig.	Strength of the Association
Cramer's V ¹⁷	0.306	0.000	High

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012.

Some other interesting associations have also been identified in this research. These associations include those between certain types of livelihood assets, age of the household head, and the number of children in a house. These associations, the

¹⁷ Due to a considerably small sample size, Cramer's V test is used to report significance and strength of the associations. For values >0.30, the strength of the association is assigned as high, for values between 0.20 and 0.29 the strength is assigned as moderate and for values between 0.1 and 0.19, the strength is assigned as low (See Botsch, 2011; Gravetter & Wallnau, 2004).

direction of the association, and their strength are presented in Table 6.27 and will be further discussed below.

Table 6.27

Significant Correlations between Livelihood Capitals and Demographic Characteristics of a Household

Variables between which the associations that are found to be significant (p<0.05)	Direction of the association (positive or negative)	Strength of the relationship	Cramer's V¹⁸	Approx Significance (p)
Natural Capital and Physical Capital	-	High	.417	.000
Physical Capital and Human Capital	+	Moderate	.248	.000
Social Capital and Age	+	Moderate	.222	.003
Social Capital and Human Capital	+	Low	.194	.013
Social Capital and Natural Capital	+	Low	.188	.019
Natural Capital and Human Capital	-	Low	.171	.042
Natural Capital and Number of Children	+	Low	.169	.046

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

According to Table 6.27 the most significant association with a high level of strength is found between natural and physical capital. This association is a negative one, suggesting that households with low levels of physical capital tend to have more of natural capital. For example, in the group of households with low physical capital the majority with 61 percent has high natural capital. This rate however declines to 36 percent for the households in the high physical capital group (see Table 6.28). The finding can be interpreted in many ways, however this research argues that high physical capital (in the form of better access to infrastructure and public services) may have led to declining levels of natural capital mainly because Western modes of

¹⁸ Gravetter & Wallnau, 2004.

development have undermined natural resources and give way to a form of urbanisation and infrastructure development that hinders natural capital (that is, the accessibility, abundance and quality of land and forests). This research also suggests that increased physical capital may have led households to divert their livelihood strategies to acquire types of assets other than natural capital such as human capital or economic capital that can be translated into sustainable livelihood outcomes. It is still possible to argue that households with higher levels of natural capital tend to have lower levels of physical capital, because their higher natural capital obviates their need to add physical capital.

Table 6.28

Bivariate Distribution of Physical Capital and Natural Capital

	Natural Capital				
	Low	Medium	High	Total	
Physical Capital	Low	7.8%	31.3%	60.9%	100% (N=64)
	Medium	70.2%	29.8%	0.0%	100% (N=47)
	High	35.6%	28.8%	35.6%	100% (N=59)
	Total	34.7% (N=59)	30.0% (N=51)	35.3% (N=60)	100% (N=170)

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

The second significant association, with a moderate strength of association, is found between physical and human capital. It is found that 59 percent among the group of households that have low physical (infrastructure) capital actually also have low human capital. In the group of households with low physical capital only 13 percent manage to achieve high human capital. On the other hand, 46 percent in the group of households with high physical capital also have high human capital (see Table 6.29).

This reflects a positive relationship between physical and human capital where improved infrastructure development and market access increase the opportunities for increased human capital. It is also possible to argue that increased human capital leads people to invest in physical capital, so the relationship is a mutually enforcing one.

Table 6.29

Bivariate Distribution of Physical Capital and Human Capital

	Human Capital				
	Low	Medium	High	Total	
Physical Capital	Low	59.4%	28.1%	12.5%	100% (N=64)
	Medium	59.6%	23.4%	17.0%	100% (N=47)
	High	33.9%	20.3%	45.8%	100% (N=59)
	Total	50.6% (N=86)	24.1% (N=41)	25.30% (N=43)	100% (N=170)

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

The third positive association, which also has a moderate strength, is between the level of social capital and the age of the household head. Within this relation, the level of social capital augments with the increasing age of the household head. For example, in the group of households with a household head aged above 55, the majority (76 percent) have high social capital. This percentage declines to 34 percent in the group of households whose head is aged below 35 (see Table 6.30). This is again an interesting yet expected relationship. With increased age, households are more likely to have established trust and social links and have invested in cultural ties allowing them to benefit from high social capital. There is also other empirical evidence which show that the political participation and social capital accumulation

tend to increase with age, but eventually level off among older respondents (McDonald & Mair, 2010).

Table 6.30

Bivariate Distribution of Social Capital and Age of the Household Head

		Social Capital			
		Low	Medium	High	Total percentage and sample size (N)
Age of the Household head (years)	<35	18.4%	47.4%	34.2%	100.0% (N=38)
	35-55	9.2%	33.3%	57.5%	100.0% (N=87)
	>55	11.9%	11.9%	76.2%	100.0% (N=42)
	Total	12% (N=20)	31.1% (N=52)	56.9% (N=95)	100.0% (N=167)

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

The rest of the relations that are statistically significant but with low strength of association include firstly, the positive association between social capital and human capital, where 85 percent of the households with low social capital also have low levels of human capital (see Table 6.31). Hence, households with poor social capital are likely to have poor human capital also. In a society where only 12 percent of the households belong to the poor social capital category, it appears that these households with poor social and human capital belong to the most socially excluded and vulnerable segment of the population.

Table 6.31

Bivariate Distribution of Social Capital and Human Capital

	Human Capital				
	Low	Medium	High	Total	
Social Capital	Low	85.0%	5.0%	10.0%	100% (N=20)
	Medium	44.2%	23.1%	32.7%	100% (N=52)
	High	46.3%	29.5%	24.2%	100% (N=95)
	Total	50.3% (N=84)	24.6% (N=41)	25.1% (N=42)	100% (N=167)

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

The second moderate strength positive association is identified between natural capital and social capital. It is found that as the percentage of households with natural capital increases, so does the percentage of households with social capital. For example, in the group of households with low natural capital, 47 percent have high social capital. In the group of households with high natural capital, this rate increases to 71 percent (see Table 6.32). This may indicate that in places where natural capital is high and physical capital is low (in other words, villages are isolated with limited infrastructure development and have rich natural resources) community ties and reciprocal relationships remain strong hence social capital is shared by a larger group of people.

Table 6.32

Bivariate Distribution between Social Capital and Natural Capital

		Social Capital			
		Low	Medium	High	Total percentage and sample size (N)
Natural Capital	Low	13.8%	39.7%	46.6%	100.0% (N=58)
	Medium	8.0%	40.0%	52.0%	100.0% (N=50)
	High	13.6%	15.3%	71.2%	100.0% (N=59)
	Total	12% (N=20)	31.1% (N=52)	56.9% (N=95)	100% (N=167)

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

Thirdly, a significant and negative relationship is found between natural capital and human capital. Human capital is higher among the households with poor natural capital. For example, in the group of households with poor natural capital, 37.3 percent have high human capital. In the group with high natural capital however, this rate declines to 25 percent (see Table 6.33). This is also an anticipated result as poor natural capital is also linked to high physical capital (improved infrastructure services and better market access); hence, this research argues that in places where infrastructure development has taken place (although mostly with negative implications on natural capital), the likelihood of the members of the household attaining formal education increases leading to higher human capital. It is also possible to assume that in places where natural capital is high, there is less need, incentive, and opportunity for human capital development.

Table 6.33

Bivariate Distribution between Human Capital and Natural Capital

	Human Capital				
	Low	Medium	High	Total	
Natural Capital	Low	42.4%	20.3%	37.3%	100% (N=59)
	Medium	56.9%	31.4%	11.8%	100% (N=51)
	High	53.3%	21.7%	25.0%	100% (N=60)
	Total	50.6% (N=86)	21.4% (N=41)	25.3% (N=43)	100% (N=170)

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

Finally, a positive association is found between the level of natural capital and the number of children within a household. Within this relationship, poor natural capital is linked to the smaller number of children within a household. For instance, in the group of households with low natural capital, 51 percent have three or fewer children (see Table 6.34). This may be linked to a number of things: For example, households that are poor in natural capital may think that they do not need as many children to have sufficient labour in the field and support farm work. Or households that are poor in natural capital but rich in physical capital may invest in other types of capitals (such as human or economic capital) for improved livelihood outcomes. These investments may be costly for the households restricting the desired number of children and keeping numbers below the national averages.

Table 6.34

Bivariate Distribution between Natural Capital and Number of Children

	Number of children within a household				
	<4	4-5	>5	Total	
Natural Capital	Low	50.8%	27.1%	22.0%	100% (N=59)
	Medium	23.5%	43.1%	33.3%	100% (N=51)
	High	33.3%	41.7%	25.0%	100% (N=60)
	Total	36.5% (N=62)	37.1% (N=63)	26.5% (N=45)	100% (N=170)

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

6.5. CHAPTER SUMMARY

This chapter, using sustainable livelihoods as a guiding framework, has identified the constituents of five distinct livelihood assets in the context of Timor-Leste. A measurement scheme has been constructed for each of the livelihood assets with assumptions to define the levels of the assets (poor, medium and high) for every household. The chapter presented the findings of five livelihood assets in order to analyse the contribution of these individual livelihood assets to poverty in Timor-Leste. Finally, it analysed the livelihood asset portfolios at household level for a multi-dimensional assessment of poverty in the country.

It has been demonstrated in this chapter that poor human capital stands out the most as a factor shared by the largest percentage (51 percent) of households. This shows that more than one half of the sample of population studied in this research have a stock of formal education of less than nine years (equivalent to less than secondary education). The second striking finding of this chapter is the poor economic capital shared by 44 percent of households. This means that almost half of the households

had a block of land smaller than two hectares (which was found to be an average size for land ownership for the majority of the Timorese population), lived in a house predominantly made of forest products, and had only a few durable goods worth less than \$190 (a figure which is also found to be average).

The third outstanding finding of this chapter is that the majority of the Timorese enjoy medium to high levels of social capital, with only 12 percent of households having poor social capital. This indicates that within communities, there is moderate to high levels of social trust, people generally have close ties with neighbours, they feel safe and secure to live in their village, and finally, they have access to and can participate in a local structure, of sorts, to manage regional natural resources and conflicts.

This chapter also showed that low physical capital (linked to low access to basic infrastructure such as electricity, roads, improved water and sanitation services and market access), and low natural capital (linked to poor accessibility and abundance of quality land and forests), are shared by just over one third of the households. Based on these findings, this chapter has demonstrated that whilst low human and economic capitals downgrade the majority of the households' livelihood asset portfolio significantly, largely shared high social capital on the other hand provides a counteracting advantage.

Having compiled all the livelihood assets, this chapter has identified that 25 percent of the households are poorer¹⁹ than others, while 46 percent are average and 29

¹⁹ It was assumed that if the household scores poor (or high) in three of the five livelihood assets, then the household is poor (or better-off).

percent are better off. In the group of poor households, a large majority (95 percent) have poor human capital and 81 percent have poor economic capital. This reflects that the multi-dimensional poverty in Timor-Leste is predominantly driven by poor stocks of education and economic assets within households. In this group of poor households, this chapter also highlighted that 52 percent have poor physical capital, 48 percent have poor natural capital, and 40 percent have poor social capital. This chapter has also identified that poverty is significantly linked to a household head's education level and type of employment. Sixty percent of the poor households had a household head without any former education, and more than 80 percent were engaged with agriculture.

Having explored the relations between livelihood assets, this chapter has identified that in remote areas where physical capital is restricted (meaning that there is limited road and market access and poor basic infrastructure), the quality abundance and access to forests and land are much higher. In these areas social capital seems to remain high and intact, however households attain lower stocks of formal education and have more children than the average. This is an interesting yet expected finding. In remote rural areas, if infrastructure has not developed and market opportunities are limited, then families are not provided with the means and incentives to acquire formal education. They also enjoy high levels of social and natural capital which may indicate that they are engaged in livelihood activities that require more human labour and better social networking opportunities. Heavy reliance on natural capital for livelihoods under circumstance of poor infrastructure and low education also leads families to produce more children.

In contrasting circumstances, where communities are better equipped with infrastructure development, they also tend to have better educational attainment,

however their natural capital significantly suffers. In this respect, it can be concluded that despite some of the positive spill-over effects on increased human capital, infrastructure development and increased market access opportunities in Timor-Leste's past have been at the expense of declining natural capital for households, particularly in urban areas.

One important message to be underlined in this chapter is that there is a significant need to support accumulation of people's economic and human capital for poverty reduction in Timor-Leste, principally in areas with poor infrastructure development. Evidence suggests that infrastructure development such as increased access to roads and market opportunities, increased electricity, water and sanitation services increase the likelihood of families being more educated and also having fewer children. In this respect, physical capital accumulation can well be instrumental in accumulation of other capital assets nevertheless, it is important that future development strategies are not shaped at the expense of declining natural capital in these areas. And lastly, efforts to increase human and economic capital can also be well facilitated through and built upon the advantages of these remote areas such as high levels of social and natural capital.

CHAPTER 7: DEPENDENCE ON FOREST AS A LIVELIHOOD STRATEGY: EXPLORING ITS LINKS WITH HOUSEHOLD DEMOGRAPHIC CHARACTERISTICS AND MULTI-DIMENSIONAL POVERTY

7.1. INTRODUCTION

Forest environmental resources provide substantial contributions to the wellbeing of many rural dwellers (Babulo, Muys, Nega, Tollens, & Nyssen, 2008). Overall, close to 1.6 billion people -more than 25 percent of the world's population- rely on forest resources for their livelihoods, and around 1.2 billion of these people use agro-forestry farming systems to generate food and cash income (Mayers & Vermeulen, 2002). The International Fund for Agricultural Development (International Fund for Agriculture Development [IFAD], 2004) stated that 80 percent of the population in developing countries use forest products on a daily basis and about 75 percent of the poor people that live in rural areas depend on forests for subsistence. Forests provide home to 300 million people around the world and account for a third of wood and non-wood products (McAlpine, 2012). Industries depend on forests for raw materials and forest-based industries such as the sawmill, carpentry and handicraft industries; for example, provide employment for 60 million people worldwide (World Bank, 2006b).

Many countries in the developing world use fuel wood to meet as much as 90 percent of their energy needs (FAO, 2011). For millions of people, particularly those living in developing countries, forest resources also function as safety nets in times of crises or emergencies, for example, when crops fail, owing to prolonged drought, or when one can no longer engage in productive activities because of HIV/AIDS or other devastating diseases (FAO, 2011). Forests are also vital for people's spiritual

well-being. They bear a deep significance and offer cultural, spiritual and existential values through inspiring affection and respect and reinforcing cultural identity in many parts of the world (Grazia, 2011). Forests are a cornerstone of the entire landscape, including wetlands, agriculture, mountains, dry lands, rivers, biodiversity and people. From mitigating climate change to providing medicine, homes, raw materials employment and ensuring the livelihoods and wellbeing of billions of people around the world, forests are indeed at the centre of human beings' existence (McAlpine, 2012).

Although historically, conventional belief dictated that natural resources made relatively minor contributions to the income of most rural and coastal communities and, at best, constituted a safety net -a means of last resort to be drawn on in times of hardship, several studies now challenge this belief. According to the International Union for Conservation of Nature, natural resources provide at least 25 percent of the household income of the rural and coastal communities (International Union for Conservation of Nature [IUCN], 2012). A comparative analysis of environmental income from approximately 8000 households in 24 developing countries shows that environmental income accounts for 28 percent of total household income, 77 percent of which comes from natural forests (Angelsen et al., 2014).

Where the economic, spiritual and physical health of all seven billion humans being tied to forests, it is suggested that forests also play an important role in achieving the Millennium Development Goal of halving the proportion of poor people (FAO, 2005). When sustainably managed and utilised, forests can contribute to alleviating poverty and improving livelihoods significantly (McAlpine, 2012; Yemiru et al., 2010). A study conducted by Fisher (2004) in rural Malawi for instance finds that

forests prevent poverty by supplementing income, and also help improve the living standards of households that are able to enter into high-return forest occupations.

The understanding of the extent to which forests contribute to rural livelihoods, national development and poverty reduction is constantly being renewed. This is, in fact, vital at a time when growth-oriented economic policies and poor governance at the expense of forest loss are leading to a decline in healthy ecosystems and consequently, to a decline in people's livelihood assets (Nath, 2001). The international agenda suggests that no sustainable development approach can be successfully implemented without understanding people's dependence on the environment for their well-being (Hedge & Enters, 2000; Masozera & Alavalapati, 2004). There has been increasing evidence suggesting that both conservation and development-targeted policies require the understanding of the importance of forests in providing food, shelter, medicine and other critical aspects of livelihoods (Wollenberg & Nawir, 1998).

Hence, dependence on forests and the factors that condition a household's reliance on forest resources are increasingly being studied by many scholars, decision makers as well as international funding agencies supporting sustainable development policies and programs (Brown, 1998). Although the evidence base is continuously growing, Tieguhong and Zwolinski (2008) state that in many developing and cash constrained countries there is still little known about the role of forests in providing for immediate or long-term needs of the people and in supporting the well-being of poverty-stricken households. This is also the case for Timor-Leste where little is known about the use of forest resources for livelihoods.

Recent studies also suggest that the forest resource use behaviour of general households is quite diverse both within and across communities (Babulo et al., 2008; Browder, 1992; Coomes & Barham, 1997). The factors that condition a household's reliance on forest resources may vary depending on their poverty, livelihood assets (asset portfolio), demographic characteristics, and also exogenous factors such as markets, prices and technologies mediated through institutions and processes (Babulo et al., 2008).

Angelsen et al. (2014) in their global comparative analysis find that the poorest have higher environmental income shares, but absolute income is much higher for the non-poor; environmental income reduces income inequality and environmental income is particularly important for male-headed and younger households. Sunderlin et al. (2008) ask the question whether forests are important for the poor not only because of the kinds of goods and services they provide, but also because they tend to be located where the poor are. Exploring data from seven countries, the authors find a significant positive correlation between high natural forest cover and high poverty rate (the percentage of the population that is poor) and between high forest cover and low poverty density (the number of poor per unit area) (Sunderlin et al., 2008). A study conducted in China by Hogarth et al. (2013) show that while forest-related income is important to households at all income levels, lower income households are more dependent due to a lack of other sources. Fisher (2004) on the other hand shows that asset-poor households in Malawi are more reliant on forest activities compared with the better off while reliance on high-return activities is conditioned by availability of adult male labor and location.

With the aim of highlighting the role of forests in supporting local livelihoods in Timor-Leste and exploring the significant factors that condition a household's forest

reliance as a livelihood strategy, this chapter initially explores six distinct uses of forest resources at the household level (see Figure 7.1)²⁰.

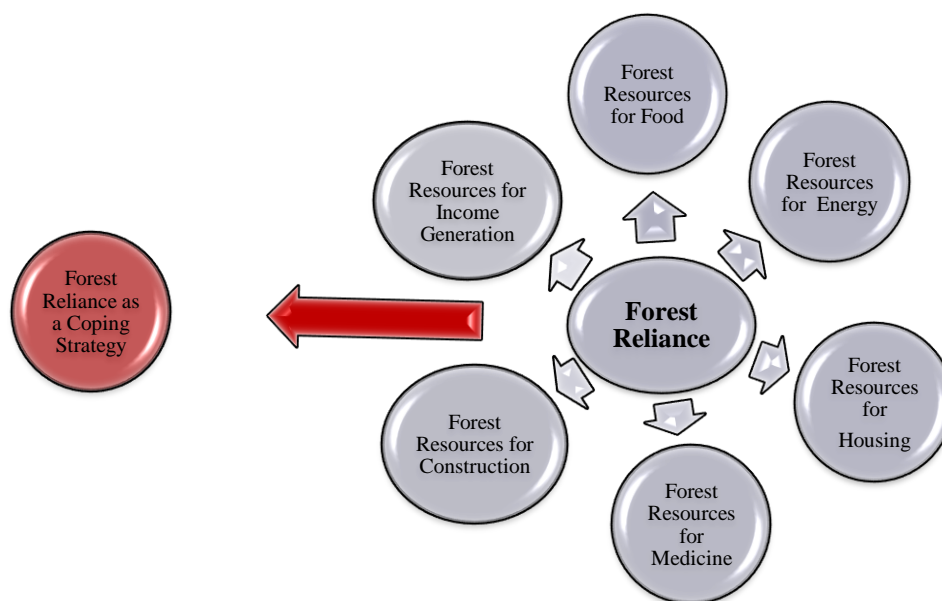


Figure 7.1. Constituents of Forest Reliance: A livelihood strategy. Source: Prepared by the researcher based on available literature on forest dependence

These strategies include the collection and use of forest products for housing, food, energy, construction, and medicinal purposes and finally, for income generation. In addition, forest reliance as a coping mechanism with extreme events is discussed. The findings of each of these strategies are then compiled into one forest reliance index at the household level to identify the degree to which a household depends on a variety of forest-based livelihood activities to achieve livelihood outcomes. Finally, this chapter explores some of the factors related to a household's demographic characteristics, livelihood assets and level of poverty (as measured in the previous chapter on the basis of a household's asset portfolio), that may condition a household's level of forest reliance. Other mediating factors such as institutions and policies will be discussed in Chapter 8.

²⁰ Culture is assumed to be embedded in all of these strategies.

7.2. EXAMINING FOREST RELIANCE IN TIMOR-LESTE: THE CONTEXT

The agrarian image of Timor-Leste is often thought to comprise a harsh drought-ridden landscape that has been cleared, cultivated and eventually degraded by the actions of humans (Pannell, 2011). The local subsistence systems linked with voracious slash and burn agriculture regime with low agrarian production (McWilliam, 2002), has been identified as one of the major contributing factors to Timor-Leste's environmental problems. While historically, local people might have pursued more diverse subsistence practices, Pannell (2011) argues that population pressure and the exploitation of the amount of land under intensive cultivation have effectively served to narrow local livelihood options. The impacts of 400 years of colonization by Portugal, and 25 years of occupation by Indonesia (Anderson & Deutsch, 2001; McWilliam, 2003), have also been widely acknowledged in the process of ecological degradation and changes in the local subsistence practices. Soares (2001) for instance, points out in the Indonesian occupation, napalm bombing and forced resettlement practices by the military saw a mass destruction of the environment and resulted in widespread famine. FAO (2010) stated that under Indonesian rule, timber was unsustainably harvested as an export commodity, and conflict in the late 1990s heavily damaged forests, turning many areas into degraded scrubland. Based on available data on forest cover, it has been estimated that 114,000 ha of dense forest were lost, and 78,000 ha of sparse forest was destroyed between 1992 and 1999 (FAO, 2010).

Dunn (1983), on the other hand, comments upon the rapacious exploitation of sandalwood and other forest-based resources which the Timorese were traditionally dependent on for their livelihood. During the occupation years, as a result of population movements and a greater emphasis upon rice and commercial crops such

as coffee, several references are made in relation to the severely eroded traditional identities that were constructed around particular modes of livelihood (Fox, 2000; Soares, 2001). Furthering on the traditional identities, the environment in Timor-Leste is considered a cultural issue inherited from ancestors (Miyazawa, 2010). It is not only perceived in terms of land, forests or natural resources, but is linked with people's cosmology and ancestral worship (Babo-Soares, 2001), reflecting a unique relationship between people and the environment on productive, cultural, and spiritual levels.

Despite disruptions taking place during the occupation, McWilliam (2003) draws attention to the extensive tracks of primary rainforest, montane cloud forest and swatches of secondary vegetative growth that are watered by the double monsoon, experienced in Timor-Leste and other neighbouring islands of Indonesia. Many of these forests are said to persist into the present because of the 'lulic' or sacred status accorded to them by the custodial community (Glover, 1986; King, 1963; McWilliam, 2001; Metzner, 1977; Ormeling, 1956; Therik, 2000). In 2005, it was estimated that Timor-Leste had a forest cover of 798,000 ha, that is almost 50 per cent of the total land area. The forest loss was estimated to be about 1.1 percent per year between 1972 and 1999 (UNDP, 2006), and the Ministry of Agriculture, Forestry and Fisheries (2007) reports the same figure for 2000-2005. This means the deforestation rate has been about four times the global average (World Bank, 2009d).

The National Directorate of Forestry and Water Resources (NDFWR) (2004) suggests a very simplified grouping of the current natural forest types in Timor-Leste: the savannah formations dominated by white eucalyptus (*Eucalyptus alba*); and tamarind trees (*Tamarindus indicus*) located mainly in the northern part of the country; open or moderately dense forest dominated by black eucalyptus (*Eucalyptus*

urophylla) associated with several other species such as ferns located in the mountainous areas; and tropical monsoon forest carrying a mixture of species, some with timber production potential, of which the most important are sandalwood (*Santalum album*), Ai Kiar (*Canarium reidentalia*), red cedar (*Toona sureni*), redwood (*Ptedocarpus indicus*) and teak (*Tectonia grandis*) located in the eastern and southern part of the country. The primary designated functions of forests are listed as production with 17 percent, protection with 59 percent, and conservation with 24 percent (Mangobay, 2005). Sixty seven percent of the forested land is stated to be privately owned, and 33 percent publically owned in 2005 (Mangobay, 2005). As explained previously in Chapter 6, land ownership claims may be troublesome because of a range of factors such as inheritance, recent use, investments made (such as house building, planting trees for example), and customary and government challenges. Implications of these are probably reflected in the high percentage of private land ownership in the country.

7.3. CONSTITUENTS OF FOREST RELIANCE

Although the anthropological and economic literature depicts shifting cultivation as the sole means of subsistence or as the prominent 'life paradigm' for the people of Timor-Leste, the adaptive nature of these people and the variety of livelihood strategies such as hunting and gathering in local forests and woodlands or inshore marine areas, are somewhat understated. It is found in this thesis that gathering of forest products by communities in Timor-Leste is still a complimentary part of subsistence, traditional and spiritual living, and a considerable source of household income. Ninety three percent of the households surveyed indicated to have collected forest products for food, construction, selling, medicine or firewood in the past year of the survey.

This research has found that 60 percent of the households live close to the forests with an average distance of 1.5 kilometres. Despite forest access being more or less dependent on proximity to the forests, natural forest ownership is not very common, and only 16 percent of the sample of households (27 households out of 170) reported that they owned forests with an average size of 4.1 hectares. Out of these households that own forests, 85 percent indicated that they had access to them, while 15 percent mentioned (three households in Comoro and one in Iliomar village) that they did not have access. Other key findings are presented below under each category of forest-based livelihood strategies.

7.3.1 Forest Reliance for Shelter

Forest resources comprise a large component of the materials used in the construction of a local house, making them a major source of shelter for the Timorese people. Results from the 2001 World Bank housing strategy survey indicated that of the estimated 170,000 housing units in Timor-Leste, approximately 88 percent were owner occupied and self-built (Bugalski, 2010). This indicates that the majority of local houses in Timor-Leste are handled and built by the local community predominantly using local products. According to the analysis of this research, 77 percent of households live in a house that consists of forest products. Of these, 23 percent live in a house where the entire roof and walls are constructed of forest products. Bundles named as *Bebak* in the local language, a slatted panel made from the base of palm fronds and *Piku*, another prefabricated panel made of palm leaf are used for shelter in addition to other commonly used forest resources like straw, grass, leaves, bamboo and wooden boards (see Figure 7.2 for relevant photos).



Figure 7.2. Images of some houses in Timor-Leste (images above are from Manatuto and below are from Liquica district). Source: Photos taken by the researcher



Community discussions held during the survey of this research revealed that the ideal house size in rural areas is advised by the village chief as 30 square metres (six metres by five metres), and the households are allowed to extract three cubic metres of wood from the forest to build their houses. Although the Timorese government, with the intention of reducing the burden on forest resources, has lowered the volume of wood extraction from five cubic metres (which was allowed during the Indonesian period) to three, it was argued during the discussions that there is no mechanism to

monitor compliance with this rule. With increasing population pressure, the demand on forest products for shelter is indeed going to be much higher than at present.

Table 7.1 shows the extent of use of forest products by the poor, medium and well-off households. The extent of use of forest products in the building of houses is inversely associated with the poverty level of households, i.e., the poorer the household, the more extensive is the use of forest products used in the building. For example, it is found that 98 percent of the poor²¹ live in a house that consists of forest resources while this percentage declines to 65 for the group of households that are better-off.²² The association is statistically significant.

²¹ This research has measured poverty based on a household's asset portfolio including five different livelihood capitals. These are human, social, economic, physical, and natural capital. A household is defined poor if three of the five livelihood capitals they had in their asset portfolio were low.

²² A household is defined better-off if three of the five livelihood capitals they had in their asset portfolio were high.

Table 7.1

Relationship between Poverty and the Extent Use of Forest Products for Housing

	Extent of Use of Forest Products For Housing (Walls and Roof)				
	None	Partially	Completely	Total % and N	
Poverty Level of the household	Poor	2.4%	61.9%	35.7%	100.0% (N=42)
	Medium	26.3%	50.0%	23.7%	100.0% (N=42)
	Well-off	35.4%	54.2%	10.4%	100.0% (N=42)
	Total % and N	22.9% (N=38)	54.2% (N=90)	22.9% (N=38)	100% (N=166)
Value		Approx. Sig.			
Cramer's V	0.235	0.001			

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

7.3.2. Forest Reliance for Construction

This study shows that 53 percent of the households collected forest products for construction purposes in the past year. These purposes may be related to maintenance of a house, making furniture or construction of a sacred house.²³ Most collected construction materials comprise bamboo and teak, followed by mangroves, gum, sauce tree (*Albizia* tree), coconut leaves, palm stems, and rattan. The construction of a sacred house in the communities with ancestral ties is particularly unique in the context of Timor-Leste as it is closely linked to people's well-being. While the intangible and spiritual side of a sacred house includes ceremonies and rituals as well as people's beliefs symbolising the building as a protective house where people from the same descent can worship and communicate with their ancestors, the material aspect is related to its construction (Carvalho, 2011). Being built entirely with forest

²³ The Timorese people place a great value on their sacred houses, *uma lulik*, which are generally located in the village and symbolise social groups.

products such as timber, bamboo, wooden planks, twine and fibre ropes, the construction of a sacred house establishes a positive and more of a spiritual or cultural link between people and forests beyond just the links of forest reliance for construction purposes (see Figure 7.3 for images). However, with increasing population pressure, the need for building new houses (be it for sacred purposes or for dwelling) will continue to exert an increased demand on forest resources for construction purposes.



Figure 7.3. Images of sacred houses (above) and images of construction of a sacred house in Lautem and collection of palm stems nearby. Source: Photos taken by the researcher.



With reference to population pressure, it is found in this study that there is a significant and positive association between the use of forest products for construction purposes and the number of children within a household. In the group of households with three or fewer children, the percentage of households that do not collect forest products for construction is 58 percent. This percent declines dramatically to 29 for households with six or more children. On the contrary, the

percentage of households that collect two or more types of forest products for construction increases from eight percent for the small size families to 22 percent for large size families (see Table 7.2). This may well indicate that the households with larger man power are more capable of collecting forest resources for construction purposes. This can also relate to the fact that with increasing numbers of children, the size of the household needs to increase.

Table 7.2

Bivariate Distribution between Number of Children and Collection of Forest Products for Construction

	Collects Forest Products for Construction				
	No	1 type of Product	2 or more types of products	Total % and N	
Total Number of Children	< 4	58.1%	33.9%	8.1%	100% (N=62)
	=4 or 5	49.2%	38.1%	12.7%	100% (N=63)
	>5	28.9%	48.9%	22.2%	100% (N=45)
	Total % and N	100%	100%	100%	100%(N=170)
		Value	Approx. Sig.		
Cramer's V		0.174	0.036		

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

7.3.3. Forest Reliance for Energy

The government of Timor-Leste is committed to providing full electrification and access to affordable energy for all by 2020, ensuring that the country benefits fully from its natural energy resources (both fossil and renewable resources) (Government of Timor-Leste, 2010a). However, currently Timor-Leste is still an energy poor country. Only 36 percent of the households have access to electricity, where the

majority of this access is concentrated in urban areas (World Bank, 2010). The World Bank (2010) reports that in fact less than 10 percent of the rural households have access to electricity. The renewable energy industry in Timor-Leste is in its infancy with unsustainable attempts to implement diverse renewable energy technologies including solar energy, fuel efficient stoves, and biogas plants (Mercy Corps, 2009). Due to the lack of clean energy alternatives and poverty, the energy poor households heavily rely on fire wood to meet their energy needs.

It is argued that the demand for firewood has particularly increased in the recent years, partly also as a consequence of the removal of kerosene subsidies available during the Indonesian administration (Lundahl & Sjöholm, 2012). The increased demand for firewood has been putting pressure on the forests and contributing to land erosion, especially in areas close to towns and major villages.

FAO (2010) estimates that 93 per cent of the energy consumed by households in Timor-Leste, comes from wood. A recent World Bank (2010) study, on the other hand, reports that 98.6 percent of both rural and urban communities in Timor-Leste rely on fire wood as their main source for cooking. Fire wood is argued to be the cheapest available cooking fuel in Timor-Leste, compared with liquefied petroleum gas (LPG), kerosene and electricity, even after accounting for efficiencies of different cooking equipment (Mercy Corps, 2011). Traditionally, cooking in Timor-Leste is done on some strategically placed rocks and fuelled by wood in the centre of a dwelling named *ume kububu* that is adjacent to the house (see Figure 7.4 for images).



Figure 7.4. Images of typical Timorese kitchens and traditional way of cooking. Source: Painet, unknown

Generally, this dwelling is a highly insulated area with poor ventilation and a very thick thatch on the ground (unknown, 2006). A study undertaken by Mercy Corps reveals that women spend on average 3.5 hours per day for cooking where they are highly exposed to indoor air pollution (Mercy Corps, 2011). According to the World Bank, open fires cause 300 deaths and respiratory diseases in some 125,000 people per year reflecting major health problems borne due to the use of firewood in Timor-Leste (World Bank, 2010). A World Bank Country Environmental Analysis for Timor-Leste (2009d) estimates that the mean annual morbidity and mortality cost of health effects associated with the use of solid fuels is between \$5 and \$20 million, that is equivalent to about 1.4 percent of Timor-Leste's gross national income, or 3.5 percent of GDP in 2006.

It is found in this study that all of the households used firewood for their energy needs in the past year. Seventy percent of the households obtained firewood by collection while 23 percent relied on purchasing from the market. Seven percent, in contrast, both collected and purchased firewood. The types of wood used for energy

are presented in Table 7.3 below. Although relevant information is not available in the stocks of the identified types of firewood resources, it would be useful to explore whether any of these species are in fact scarce in their localities so as to target measures to conserve them accordingly.

Table 7.3

Common Types of Wood (timber-based forest products) Used for Energy in Timor-Leste

Trees names known in English	Scientific name	Name known in local language	Districts in which they are widely used
Casuarina or Coffee Shade Tree	Paraserianthes falcataria	Ai Kakeu/ Ai Osoho	Ainaro, Manufahi, Lautem, Liquica (not common in Dili)
White Gum	Eucalyptus alba	Ai Bubur	Ainaro, Manufahi Dili (widely sold on the streets)
Albizia tree, white lead tree, or sauce tree	Leucaena leucocephala	Ai Samtuku	Ainaro
Accacia	Leucaena	Ai Kafe/ Ai Lomtoro	Ainaro, Manufahi
Not Known	Not Known	Ai Denuk	Ainaro
Teak	Tectona grandis	Ai Teka	Manufahi
Ceylon oak	Sheleichera oleasa	Ai Kaidawa/ Ai dak	Lautem, Liquica
A type of tree which turns a red colour when it matures	Not known	Ai Laran Katimu (in Bahasa)	Lautem, Liquica
Mangrove	Rhizophora mangle	Ai Parapa	Liquica
Desert apple	<u>Ziziphus mauritiana</u>	Ai Lok	Liquica
Timor mountain gum	Eucalyptus urophylla	Ai Ru	Dili
Not known	Not known	Ai Dadak	Dili (This type is found to be a good type as it produces little smoke, however the problem is identified as the bundles sold at the market are usually a mixture of many.

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

It is also found in this research that besides timber products, coffee shells too are used by a few households for cooking and heating purposes in Timor-Leste but

candle nut is not preferred despite its potential.²⁴ The use of firewood is by far the most preferred energy source almost among all households and a variety of tree species are used regardless of their efficiency or quality. The mixed bundling of firewood species means that efficient and less smoky types are mixed with others.

Exploring the choices of buying or collecting firewood, a negative relation is found between purchasing of firewood and the total number of children in a household. A larger percentage of families with fewer children, that is fewer than four, were found to have bought firewood from the market (42 percent), compared to families with six or more children (11 percent). To start with, this may indicate that the firewood needs of large families are greater than they can afford to buy from the market (the larger size households are poorer than smaller size families), hence they predominantly meet their needs by collection. Moreover having more children facilitates the firewood collection. It may also be linked with larger families residing closer to the dense forests and hence having more access to firewood within their surroundings.

²⁴ Candle nut oil is used in many countries as a source of bio-energy.

Table 7.4

Bivariate Distribution between Number of Children and Buying Of Firewood

	Buys Firewood from the market			
	No	Yes	Total and N	
Total Number of Children	< 4	58.1%	41.9%	100% (N=62)
	= 4 or 5	69.8%	30.2%	100% (N=63)
	>5	88.9%	11.1%	100% (N=45)
		Value	Approx. Sig.	
Cramer's V		0.265	0.003	

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

Firewood collection is generally a demanding task, requiring the time and labour of members of the household. In the group of families who collect firewood, 54 percent of the households stated that everyone in the family is involved in the firewood collection activity. Twenty three percent mentioned that only adults collect firewood, while 15 percent indicated that the job is handled by women and children. In terms of time, the analysis showed that an average size family (four to five people) spends around four to eight hours per week. For the group of households that purchase firewood from the market, this research found that the households spend about five dollars per week. Generally a four to five piece bundle of fire wood is sold for ten cents. Considering almost half of the population lives on less than one dollar a day, the cost of firewood as well as time and labour spent in its collection put a great burden on people's livelihoods.

The heavy reliance on firewood for energy needs exerts great pressure on forests and their sustainability. According to the findings of this research, the majority of people are well aware of the deterioration of their local environment. Forty seven percent of

the households perceive that there is less firewood available compared to five years ago. Eighty seven percent of the households indicate that they have to walk further away to collect firewood while 50 percent argue that they spend more time in firewood collection (see Table 7.5).

Table 7.5

Perceptions of the Firewood Availability and Access (percentage)

Percentage of people that think	
there is less firewood available compared to 5 years ago	47
the availability of firewood is the same compared to 5 years ago	47
there is more firewood available compared to 5 years ago	6
they walk further away to collect firewood compared to 5 years ago	87
more time is required for firewood collection compared to 5 years ago	47
same time is required for firewood collection compared to 5 years ago	25
less time is required for firewood collection compared to 5 years ago	28

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

With increasing population pressure, the demand for firewood for energy purposes will no doubt increase putting the sustainability of forests under fundamental stress unless alternatives are provided for those who lack other livelihood choices. Hence, it is extremely important that people are provided with clean, affordable, accessible and sustainable alternatives of energy sources.

7.3.4. Forest Reliance for Food

In many parts of the developing world, forest products support food security and provide essential food and nutrients that would otherwise be unavailable to the poor (Arnold et al., 2011; Mayers & Vermeulen, 2002). The Centre for International Forestry Research (CIFOR, 2012) identifies forests as natural supermarkets

complementing agricultural crops and feeding one billion of the world's poorest people. This is also the case in Timor-Leste where forest food and bush meat contribute to food security in the country (McWilliam, 2001).

The analysis of this research shows that 39 percent of the households in Timor-Leste collected forest products for food purposes in the past year. The most commonly collected forest products include jackfruit, coffee, taro, two types of root crops locally named as *kontas* and *tali*, betel nut, candle nut and also palm for wine production in the order of priority²⁵. When it comes to bush meat the focus group discussions revealed that the hunting of deer, monkey, boar, squirrel, frog, possum, wild bird, wild cat, mouse and snake is very common.

In the focus group discussions, population pressures and excessive hunting were raised as emerging problems. The following quote from a participant indicates the increasing human threat on forest animals which are closely linked to food security in the country.

We used to find monkeys everywhere. It was easy to hunt them but now it is very hard... They caught a lot of monkeys. First only for their families but then they started to sell them. We need to walk much longer into the forest to find monkeys snakes, and deer these days (A participant, fieldwork survey 2011-12).

²⁵ While household surveys are the main source of information behind mostly collected forest food, this research relied on focus group discussions to highlight on the most common types of bush meat as this did not come clearly out of the household interviews.

A household with a better economic capital may be more able to afford purchasing food from the market than a household with low economic capital. Hence the economically richer households should have a lower propensity to collect forest food than poorer households. However, this is not borne out by the data collected in this study (see Table 7.6). Thus, contrary to what is expected, a positive correlation was found between a household's economic capital²⁶ and collection of forest products as food. For example, 71 percent of the households with low economic capital did not collect any forest food, 59.5 percent of the medium economic capital households did not collect forest food and just over 51 percent of the high economic capital households did not do so. Conversely, the percentage of households collecting forest food (all types combined) increases from 29 to 49 between low economic capital households and high economic capital households. This apparently unexpected finding may be explained by the fact that households that collect forest food generally sell these products in the local market (this will be further explored in this chapter) and generate income to attain higher economic capital. This research has found that 61 percent of the families interviewed that sold forest products in the market also collected forest food. The relation between collection of forest food and selling of forest products is significantly associated. This suggests that forest food collection (and consequently selling these in the market) may be helping Timorese families to accumulate higher economic capital and improve their asset portfolio. However, due to the substantial economic benefits of collecting forest food, it can be argued that there is a potential for their over-use. If this is not carefully regulated (such as over-harvesting of bush meat), this could lead to some severe environmental

²⁶ Economic capital of a household is measured based on their ownership of a house, land and durable goods such as a cars, televisions, and mobile phones for example.

consequences in the future. Moreover this research has found that 14 percent of the households did not have enough food to survive in the past year, and 79 percent had only barely enough. In such circumstances, further loss of forest food species can worsen the situation of food security in the country.

Table 7.6

Bivariate Distribution between a Household's Economic Capital and Collection of Forest Products for Food

	Collects forest products for food				
	No	1 type of product	2 or more types of products	Total % and N	
Level of Economic Capital	Low	70.7%	28.0%	1.3%	100.0% (N=75)
	Medium	59.5%	40.5%	0.0%	100.0% (N=37)
	High	50.9%	36.8%	12.3%	100.0% (N=57)
	Total	61.5%	33.7%	4.7%	100% (N=169)
Value		Approx.			
-----		Sig.			
Cramer's V	0.203	0.007			

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

7.3.5. Forest Reliance for Medicine

The use of forest products for medicinal purposes is widely acknowledged in many parts of the world. However, their value is simply undermined by external agencies. In communities where modern medicine and effective health provision is lacking, traditional knowledge and use of forest products for medicinal purposes is in fact even more valuable.

In Timor-Leste, the local knowledge of producing medicine from plants is held by a few wise men and women with special talents named *matan-do'ok* (matan: eye,

do'ok: far) (Carvalho 2011). The special talents of these ritual practitioners are linked with prognostication, capacity to analyse problematic situations with some degree of shrewdness, and an esoteric knowledge of medicines (Hicks, 2004). The focus group discussions revealed that this knowledge is usually kept secret among few people to ensure the sustainability of the medicinal products (plants or animals). This is also discussed as being part of the tradition.

Research findings show that only four percent of the households, that is seven households in total (six male headed and one female headed with household heads aged 40 and above), collected forest products for medicinal purposes in the past year. This small percentage may reflect a few things. Firstly, as discussed previously it may be due to the fact that the knowledge of making medicine is kept strictly among a limited number of people with special talents. Secondly, the numbers of traditional healers may remain very low due to the cultural disruptions that took place during the occupation which prevented the culture from being passed on. It may also be due to the fact that the sources of the medicine are heavily exploited, making them hard to find. Finally, increased health services at the community level may have caused a decline in the use of forest products for medicinal purposes.

According to the community discussions, the medicinal forest products are used to cure diseases such as cold, 'flu, malaria, to heal cuts and scars, and to ease child labour. For example, in the district of Ainaro, the forest product *Ai kulit-manas* is used to cure sneezing, fever and malaria whereas *Ai bou* is used to ease child birth. In the district of Liquisa, the participants indicated that they use forest products to make medicine to treat headaches and coughing amongst others. Table 7.7 presents the local and scientific names of the forest products and includes a brief example from literature of their medicinal use. Although the percentage of households that collect

forest products for medicinal purposes is small, it is important that these species are valued as complementary to modern medicine and treated as an integral part of the Timorese tradition. Given the increasing population pressure, necessary measures need to be undertaken to avoid their overharvesting and exploitation.

Table 7.7

List of Forest Products Used for Medicinal Purposes in Timor-Leste

Local Name	English or Scientific Name	Medicinal Use and Some Literature
Malu-Maluhu	Wild betel/ Wild pepper/ Wild chilli	In Timor-Leste the leaves of this medicine are used to treat headache.
Rounu	Lantana Camara	These scrubs are said to be very common between Dili and Liquica districts in Timor-Leste. It is principally used to cure small cuts. Some literature suggests that the plant is traditionally used in Brazil and the leaves can be used as an antipyretic, a carminative, and in the treatment of respiratory system infections as well as healing gastric ulcers.
Due-due or Ai Badu	Jatropha (common name is physic nut and is similar to candle nut)	The exact purpose of use is not identified in Timor-Leste however they are told to be found between Dili and Liquica districts. Literature suggests that the plant is generally used to produce light along with its medicinal benefits. The oil extracted from its leaves is used to treat babies with swollen throat or white tongue. In 2007, Goldman Sachs cited <i>Jatropha curcas</i> as one of the best candidates for future biodiesel production. The plant is resistant to drought and pests, and produces seeds containing 34 percent oil on average. Besides its medicinal benefits, jatropha seeds are therefore a source of biodiesel production and after oil extraction they can be burnt for energy production.
Suaha or Fukira (Tetum) Or Kadamba	Anthocephalus indicus	In Timor-Leste the green part of the bark is usually crushed into pieces and dried to cure cuts. Literature suggests that the leaves are good for pain, swelling and better healing of wounds. The bark is also argued to be a remedy for diarrhoea, dysentery and colitis.
Vehu or Ai Hanek or Ai Doti	Apocynaceae, commonly called Blackboard tree, Indian devil tree, Ditabark, Milkwood pine, White cheesewood	It is known to be a big tree of which leaves and bark are used for Malaria. This type is not used for firewood as when it is burnt it causes itchiness. Literature suggests that in India the bark of <i>Alstonia scholaris</i> is used solely for medicinal purposes, ranging from malaria and epilepsy to skin conditions and asthma. Other purposes include treating diarrhoea, skin disorders, malarial fever, chronic dysentery, snake bite, ulcer.
Aikulit manas or Konela or Kayu Moui	Cinnamon Bark	The use of cinnamon for medicinal purpose in Timor-Leste context is not clear however other studies argue that the essential oil from the leaves of cinnamon tree has antiviral properties specifically against oral and genital herpes. It is also suggested that cinnamon improves glucose and lipids of with Type 2 diabetes.
Ninu or Mankudu or Nenuk	Not known	In Timor-Leste this plant is used for many purposes including treatment of high blood pressure, fever, TB, cancer.
Pailalaha or Gaharu	Not known	This small shrub type plant is said to be boiled to treat diarrhoea among children in Timor-Leste
Ai Dik	Flame Tree or Golden Rain Tree or Koelreuteria	Literature suggests that the flowers of this plant are ophthalmic and can be used to treat complications related to anatomy, physiology or eyes.
Mauimi watu	Not known	Putu is known to be the local name of the medicine produced.
Ipu-dudu	Not known	N/A
Ai-bokur	Gum Tree	N/A
Memaja	Not known	N/A

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

7.3.6. Forest Reliance for Income Generation

Timber and non-timber based forest products (NTFPs) can provide tradable goods that can be sold to generate income in addition to supporting subsistence communities. In some areas, this income may be a major source of cash allowing households to pay school fees, buy medicines, purchase equipment and supplies, or simply buy food that cannot be grown (FAO 2011). The contribution of forests in income generation however is generally overlooked particularly when it comes to NTFPs. The sector is poorly regulated by many governments throughout the world. This may have led to overexploitation of certain species, or generation of new forms of inequality where the share is distributed unevenly between the producer/collector and the industry (Kleinn, Yang, Weyerhäuser, & Stark, 2006). Despite the imperfections associated with the sector, forest-based income can be a critical part of rural livelihoods and hence, constitutes an important part of forest reliance.

This research finds that 42 percent of households interviewed collected forest products to sell in the past year. The most commonly sold forest products included jackfruit, wild coffee, candle nut, palm stems and leaves, coconut leaves, teak, bamboo, palm wine, betel nut, coconut, taro, vanilla, and mahogany in the order of priority.²⁷ The majority of forest products are sold to locals and visitors to the village. Coffee, palm leaves and stems, teak and vanilla are generally sold to different parties such as cooperatives, non-government organisations, the

²⁷ Although it was observed that honey is sold by local people in Dili, surprisingly the data collected for this research did not identify honey as a popular forest product collected and sold by locals in Timor-Leste.

government, or private entities. Table 7.8 provides information on the unit prices of the forest products that were collected and sold in the past year.

Table 7.83

List of Forest Products Collected and Sold and their Market Price

Name	Unit	Market Price in US\$
Bamboo	1 piece	\$2.5-3 (depending on length)
Coconut leaves	1 bundle	\$2.5
Palm stems	1 bundle	\$2.5
Palm leaves	1 bundle	\$2.5
Teak	m ³	More than \$500 (About \$10 per tree 10-15 diameters)
Firewood	1 bundle	10 cents
Candle nut	1 kilo	80 cents if separated from the shell 40 cents if not separated from the shell
Betel nut	Stick or Leaves	A stick is 5 cents, leaves are 25 cents. (1 stick is enough for 2-3 days and people on average spend 1\$ spent per week on all parts)
Palm Wine	1.5 Litre Bottle	\$4 if processed 1.5\$ if not processed (Generally 5 litres is \$10)
Jackfruit	1 Piece	\$2.5 depending on size. There is a type only used for vegetables and that is 25 cents per piece.
Coffee	1 kilogram	50 cents (beans) \$2 (powder)
Taro	2-3 pieces a bundle	50 cent to \$1 depending on the size
Mahagoni	m ³	More than \$300
Vanilla	Not known	Not known
Rattan	Not known	Not known

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

A 2011 Timor-Leste Household Income and Expenditure Survey shows income from livestock, forestry and fishing is on average \$69.37 per month per household where the total household income is \$377.73 (National Statistics Directorate & Ministry of Finance Timor-Leste, 2011). Although it is hard to estimate the sole contribution of the forest income to total household income, the overall share of income from livestock, forestry and fishing constitutes 18.4 percent of the total household income.

The FAO (2010) also reported that some rural families earn an annual income of US\$900 from the sale of wood.

This research finds a distinct positive relation between each of a household's economic²⁸ and physical capital²⁹, and the collection of forest products for income generation (see Table 7.9 and 7.10). For example, in the group of households that sold no forest products, only 25.5 percent had high economic capital. The percentage of households with high economic capital increased to 40.7 percent in the group of household that sold one type of forest product, and to 66.7 percent in the group that sold two or more types of forest products. It is possible to argue that households accumulate economic capital by engaging in income generating activities using forest products. This association between household economic capital and collection of forest products to sell is, however weak, as indicated by the value of Cramer's V of 0.190 in Table 7.9.

²⁸ Economic capital of a household is measured based on their ownership of a house, land and durable goods such as a cars, televisions, and mobile phones for example.

²⁹ Physical capital in this researched is assessed on the basis of a household's access to infrastructure development such as access to improved water and sanitation, electricity, and a usable road in all seasons and markets.

Table 7.9

Bivariate Distribution between a Household's Economic Capital and Collection of Forest Products for Income Generation

	Level of Economic Capital				Total % and N
	Low	Medium	High		
Collects forest products for Income Generation (Selling)	No	53.1%	21.4%	25.5%	100.0% (N=98)
	1 type of product	33.9%	25.4%	40.7%	100.0% (N=59)
	2 or more types of products	25.0%	8.3%	66.7%	100.0% (N=12)
	Total	44.4%	21.9%	33.7%	100% (N=169)
		Value	Approx. Sig.		
Cramer's V		0.190	0.016		

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

The collection of forest products for selling is also linked to some extent, to physical capital of a household as determined by better infrastructure opportunities, market access and hence, high physical capital. In this case the relationship may be regarded as inverse if we only consider collection and no collection of forest products to sell. For instance, the percentage of households collecting any amount of forest product (one or more types) declines by small amounts from 43.8 percent for households with a low physical capital, to 40.7 percent for households with a high physical capital. However, if we only consider the collection of two or more items of forest products to sell, then a positive association appears to emerge, with zero percent collection for households with low physical capital to 15.3 percent for households with a high physical capital. The association, though statistically significant, is weak as indicated by the value of Cramer's V of 0.197. High levels of physical capital seem to encourage households to diversify the types of forest product that they

collect and sell for income generation. This finding indicates that better access to infrastructure development and markets have the potential to allow households to sell a variety of forest products and generate income to accumulate economic capital and improve their asset base to lift themselves out of poverty.

Table 7.4

Bivariate Distribution between a Household's Physical Capital and Collection of Forest Products for Income Generation

	Collects forest products for Income Generation (Selling)				
	No	1 type of product	2 or more types of products	Total % and N	
Level of Physical Capital	Low	56.3%	43.8%	0.0%	100.0% (N=64)
	Medium	59.6%	34.0%	6.4%	100.0% (N=47)
	High	59.3%	25.4%	15.3%	100.0% (N=59)
	Total	58.2%	34.7%	7.1%	100% (N=170)

	Value	Approx. Sig.
Cramer's V	0.197	0.010

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

on

7.3.7. Forest Reliance as a Coping Mechanism

An important aspect of forest reliance also includes the collection and use of forest products as a coping strategy when households are faced with great or unexpected expenditure or events. According to the analysis of the field data, 146 households out of 170 (86 percent of the households) have experienced a minimum of one form of vulnerable situation in the past year. The situations which have placed an unexpected burden on the households include having to face large spending caused by a traditional ceremony (67 percent), having a bad harvest (40 percent), getting sick and not being able to work (20 percent), experiencing the death of a household member

(20 percent), and experiencing a natural disaster such as flooding or a land slide (4 percent). As discussed in the previous chapter, this research has identified that out-of-pocket spending for traditional ceremonies (such as weddings, funerals or construction of a sacred house) is quite large given the economic status of the Timorese people. These traditional duties can cost families hundreds of dollars and for some, as high as \$5,000. The ADB (2012), referring to unexpected health related events, reports that the out-of-pocket spending is low in Timor-Leste. This is mainly because most families in rural areas lack access to medical facilities despite the fact that the public sector service is free for most patients. Therefore, they rarely face a situation where they have to make payments to private providers.

When asked how the households have dealt with the vulnerable incidents they experienced, 14 percent indicated that they relied on forest resources to cope with the situation. It is clear that forest resources still serve as safety nets during unexpected situations or large expenses allowing households to deal with such incidents.

7.4. CONSTRUCTING A FOREST RELIANCE INDEX: IDENTIFYING LEVELS OF DEPENDENCE AND DEMOGRAPHIC CHARACTERISTICS OF FOREST RELIANT HOUSEHOLDS

In order to better assess the demographic characteristics of forest-reliant households and understand the conditions that affect a household's choice to adopt a number of forest-based activities, it is attempted in this section of the thesis to construct a forest reliance index and measure the degree of a household's reliance on forest resources. The degree of reliance in this research is identified on the basis of the number of purposes for which a household collects or uses forest products and the variety of forest products collected for each purpose. A scoring scheme as described in Table

7.11 is applied to measure forest reliance at the household level where higher scores represent higher reliance on forests.

Table 7.51

Scoring for Forest Reliance Index

		Scores assigned for each purpose		
		0	1	2
The household used forest product for	1.Housing	If the roof and the walls of the house		
		Do not contain forest products.	Partially contain forest products	Only contain forest products
The household collected forest products for	2.Construction	Do not collect	Collects one type of product	Collects two or more types of products
	3.Food			
	4.Firewood			
	5.Medicine			
	6.Selling			
	7.As a coping mechanism	Since the coping component will be reflected in one of the above categories, it is not incorporated in the scoring scheme. It is assumed that families that have relied on forest resources due to an unexpected situation, have used the collected resources the purposes mentioned above.		

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

Implicit in the scoring system shown in Table 7.11 are two assumptions given below:

1. The forest resources extracted for any purpose contribute equally to a household's livelihood.
2. The quantity of a particular forest product extracted by the households is more or less the same.

According to the above scoring scheme, a household can have a minimum score of 0, meaning it does not use any forest resources for any of the purposes mentioned above, and a maximum score of 12 if it has used only forest products for housing and used two or more types of forest product for every purpose from numbers two through six shown in the second column of Table 11. This research suggest that

dependence on forests for less than any three of the six purposes above may be regarded as low dependence; dependence on forests for any three purposes may be regarded as medium dependence and dependence on forests for more than three purposes may be regarded as high dependence. The households are assigned to these categories and shown in Table 7.12.

Table 7.12

Measures Applied to Identify the Level of Forest Reliance

Level of Forest Reliance	If the total score of a household's forest reliance is	Meaning
Low	<3	The household collects/uses forest products for less than any three of the six purposes.
Medium	=3	The household collects/uses forest products for any three of the six purposes.
High	>3	The household collects and uses forest products for four or more of the six purposes

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

Having applied the conditions stated above, this research finds that 17.8 percent of the households have low levels of forest reliance; 26.6 percent of the households have medium; and 55.6 percent of the households have high forest reliance. This demonstrates that forest resources are crucial for the livelihoods of 82 percent of the households, where more than half are heavily dependent on them.

The heavy reliance on forests can also be understood as one of the factors contributing to the deteriorating condition of the forest ecology (McWilliam, 2001). Increasing population pressure and limited livelihood options signal that if heavy

reliance on forest resources continues there is a huge potential for the identified forest resources to be used unsustainably and become exploited.

7.4.1 Gender and Forest Reliance

The analysis of this research shows a significant relationship between the level of forest reliance of a household and the gender of the household head. According to Table 7.13, only 8.3 percent of the female-headed households have low forest reliance. This percentage increases to 18.5 percent for the male-headed households. This suggests that a higher percentage of female-headed households have medium to high levels of forest dependence, suggesting that these households use forest resources more for their livelihoods.

Among the total number of 12 female-headed households³⁰, the majority belongs to the group of households with medium level forest reliance. Among 157 male-headed households on the other hand, 29 have low forest reliance, 38 have medium, and 90 have high forest reliance. These results indicate that while forest reliance of the female-headed households is concentrated more on the medium level, the majority of male-headed households have high levels of forest reliance. This may reflect a higher ability of male-headed households to utilise forest resources as a livelihood strategy than the female-headed ones. This result also aligns with the findings of a recent study by Sunderland et al (2014) which suggests that men play a much more important and diverse role in the contribution of forest products to rural livelihoods than previously reported. However it should be noted that women are still members

³⁰ In the entire population of Timor-Leste only 12 percent of the households are female-headed. This small percentage is hence reflected in the small numbers of female-headed households in the sample population of this research.

of the households, use and process products collected by men. Therefore their role in post-harvesting of forest products should not be overlooked (Sunderland et al., 2014)

Table 7.13

Bivariate Distribution between Gender of the Household Head and Level of Forest Reliance

		Level of Forest Reliance			
		Low	Medium	High	Total % and N
Gender of the Household Head	Female	8.3% (N=1)	58.3% (N=7)	33.3% (N=4)	100% (N=12)
	Male	18.5% (N=29)	24.2% (N=38)	57.3% (N=90)	100% (N=157)
	Total	17.8% (N=30)	26.6% (N=45)	55.6% (N=94)	100% (N=169)
		Value	Approx. Sig.		
Cramer's V		0.199	0.036		

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

7.4.2. Number of Children and Forest Reliance

This research also finds that the composition of the household size does make a difference in the level of forest reliance where a higher number of children within a household is positively correlated with higher levels of forest dependence. Within the group of households who have six or more children, 71 percent have high forest reliance. Within the same group, only four percent have low forest reliance. This reflects the fact that an increased number of children within a household increases the need to adopt varied forest-based livelihood strategies. It also reflects that a higher number of children within a household increases the availability of free labour that can be utilised in forest-based livelihood activities.

Table 7.14

Bivariate Distribution between Number of Children in a Household and Level of Forest Reliance

		Level of Forest Reliance			
		Low	Medium	High	Total and N
Number of Children within a household	<4	18.0 %	29.5%	52.5%	100% (N=61)
	=4 or 5	27.0%	25.4%	47.6%	100% (N=63)
	>5	4.4%	24.4%	71.1%	100% (N=45)
	Total	17.8%	26.6%	55.6%	100% (N=169)
		Value	Approx. Sig.		
		-----	-----		
		Cramer's V	0.177	0.031	

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

7.5. EXPLORING SIGNIFICANT RELATIONS: LINKS BETWEEN FOREST RELIANCE, POVERTY AND LIVELIHOOD ASSETS

Although a household's capability of adopting particular livelihood strategies is mediated by institutions, policies and processes, the livelihood approach suggests that the types of activities undertaken by a household are also functions of a household's assets at its disposal (Barrett, Bezuneh, Clay, & Reardon, 2005; Brown, Stephens, Ouma, Murithi, & Barrett, 2006). Hence in this section, this research explores the correlations between a household's livelihood assets and the level of forest reliance as measured previously.

To begin with, this research finds a negative correlation between a household's level of forest reliance and their human capital. This relationship indicates that as human

capital increases,³¹ households' reliance on the forests declines. For example, in the group of households with low levels of human capital, 67 percent rely heavily on forests. For the households with medium levels of human capital, this rate is 51 percent, while it declines to 37 percent for the households with high human capital. This may be due to the fact that households with higher human capital can adopt other livelihood strategies that generate better livelihood outcomes.

Table 7.15

Bivariate Distribution between a Household's Human Capital and its Level of Forest Reliance

	Level of Forest Reliance				
	Low	Medium	High	Total % and N	
Household's Level of Human Capital	Low	10.6 %	22.4%	67.1%	100% (N=85)
	Medium	12.2%	36.6%	51.2%	100% (N=41)
	High	37.2%	25.6%	37.2%	100% (N=43)
	Total and N	17.8%	26.6%	55.6%	100% (N=169)
Value		Approx. Sig.			
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Cramer's V	0.239	0.001			

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

Another significant yet negative relationship is found between a household's level of forest reliance and physical capital. The relationship indicates that forest reliance declines when physical capital (increased access to infrastructure development and markets) increases. For example, 80 percent of households in the category of low

³¹ A household's level of human capital is assessed on the basis of average years of formal schooling of its youth and adult members aged 15 and above.

physical capital have high forest reliance. This percentage declines to 36 percent for the group with high physical capital. This can again be explained by infrastructure development and improved market opportunities allowing households to adopt other livelihood strategies with better livelihood outcomes.

Table 7.166

Bivariate Distribution between a Household's Physical Capital and Level of Forest Reliance

		Level of Forest Reliance			
		Low	Medium	High	Total % and N
Household's Level of Physical Capital	Low	4.7%	15.6%	79.7%	100% (N=64)
	Medium	10.9%	41.3%	47.8%	100% (N=46)
	High	37.3%	27.1%	35.6%	100% (N=59)
	Total % and N	17.8%	26.6%	55.6%	100% (N=169)
		Value	Approx. Sig.		
Cramer's V		0.336	0.000		

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

One other significant and positive relationship is found between a household's forest reliance and their natural capital.³² This research finds that with increased natural capital (linked to better access to private agricultural and forest land, geographical closeness to abundant community forests which are not perceived to be too degraded), a household's reliance on forest resources increases. This, indeed, suggests that households which are geographically located close to an abundant

³² A household's natural capital is assessed on the basis of its access to quality and abundant agricultural land and forests. This is linked to access to private agricultural and forest land, geographical closeness to abundant community forests, and soil quality.

community or government-owned forests, or have private ownership of quality of land and forests within reach, rely more on forest resources as a livelihood strategy. Provided the significant positive relationship between the number of children and a household's natural capital, this research points out that in areas where natural resources in the form of land and forests are rich, the population growth will be higher and that will translate into more and more people relying on forest resources as a livelihood strategy hence threatening the sustainability of forests in the country.

Table 7.17

Bivariate Distribution between Household's Natural Capital and Level of Forest Reliance

		Level of Forest Reliance			
		Low	Medium	High	Total and N
Household's Level of Natural Capital	Low	20.7%	39.7%	39.7%	100% (N=58)
	Medium	9.8%	15.7%	74.5%	100% (N=51)
	High	21.7%	23.3%	55.0%	100% (N=60)
	Total and N	17.8%	26.6%	55.6%	100% (N=169)
		Value	Approx. Sig.		
Cramer's V		0.209	0.005		

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

This research does not find a significant association between a household's poverty level (as assessed in the previous chapter) and their level of forest reliance. This means that in the context of Timor-Leste, forest reliance does not increase with poverty. Instead, it is generally widespread among male-headed households with six or more children, with poor human capital, poor physical capital, and high natural capital. Hence, it is not correct to just blame the poor for increased pressure on forest resources. Measures need to be directed at addressing poor human and physical

capital among male-headed households that have many children and are located in areas where natural capital is rich.

McWilliam (2001) argues that swidden cultivation continues to draw heavily on the existing diminishing forest resources. Clearing of forest land into agricultural land has been largely discussed as one of the major environmental problems of Timor-Leste (Government of Timor-Leste, 2012). This research found that 43 percent of the households burnt forest land in the past year. The size of the forest burnt ranged between 0.5 hectare and 4 hectares (with an average size of 1.24 hectares) while the land was generally accessible within seven kilometres. The majority (89 percent) of the land burnt were plantations (secondary vegetation), while eleven percent of the households indicated to have burnt natural (primary) forests. The main reasons behind forest-clearing are identified as cropping (51 percent), followed by tree plantation (9.4 percent), and use of land for pasture (7.5 percent). Twenty three percent of the households on the other hand indicated that they clear forests because of a combination of these three reasons. With increasing population pressures, the demand for land clearing, particularly for cropping, will be huge unless a dramatic increase in agricultural productivity takes place. A growing population in rural areas would also lead to an increased need for pasture lands having implications for further bio-diversity loss partly due, also, to the traditional free grazing methods.

This research finds a positive and significant association between a household's poverty level and clearing of forest land. Among the poorer households, the percentage of forest-clearing is higher with 48 percent compared with 25 percent among the better-off households (see Table 7.18). A higher percentage of forest-clearing is also common among households with higher forest reliance, poor human and physical capital (see Table 7.19).

Table 7.18

Bivariate Distribution between a Household's level of Poverty and Forest-clearing

	Household Cleared Forest Land in the past year			
	No	Yes	Total % and N	
Poverty Level of the Household	Poor	52.4%	47.6%	100% (N=42)
	Average	46.1%	53.9%	100% (N=76)
	Better-off	75.0%	25.0%	100% (N=48)
	Total	56.0%	44%	100% (N=166)
Value		Approx. Sig.		
Cramer's V	0.249	0.006		

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

Table 7.19

Significant Relations Linked to Forest-clearing

Associations that are found to be significant ($p < 0.05$)	Sign of the Relationship	Strength of the relationship	Cramer's V^{33}	Approx Significance (p)
Forest-clearing and Natural Capital	+	High	0.349	0.000
Forest-clearing and Forest Reliance	+	Moderate	0.259	0.004
Forest-clearing and Human Capital	-	Moderate	0.259	0.003
Forest-clearing and Physical Capital	-	Low	0.196	0.039

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

An interpretation of the table above suggests forest-clearing is more common in areas where natural capital and forest reliance are also high. Forest-clearing is

³³ Due to a considerably small sample size, Cramer's V test is used to report significance and strength of the associations. For values >0.30 , the strength of the association is assigned as high; for values between 0.20 and 0.29, the strength is assigned as moderate; and for values between 0.1 and 0.19, the strength is assigned as low (see Botsch, 2011; Gravetter & Wallnau, 2004).

negatively associated with human capital, suggesting that with increasing education levels in a household forest-clearing decline. In areas where human capital is higher, access to markets and infrastructure development is more advanced, forest-clearing declines considerably.

In the light of the relations described above, this research argues that in areas with abundant forests, improving formal education attainments, advancing infrastructure development and market access, and also promoting smaller size families through improved reproductive health and family planning services need to be considered as part of a policy package to lower the pressure put on forest resources and to improve sustainable livelihoods in Timor-Leste.

In relation to regeneration of forests, 54 percent of households indicated that they have planted trees in their or somebody else's land in the past three years. The reasons for tree-planting were to increase the value of the land and fertilise the soil (as well as provide shade for the coffee) (95 percent), to have wood for construction needs (61 percent), to sell firewood (23 percent), to meet firewood needs of the family (14 percent), to protect land from erosion or land slide (9 percent), and finally, to sell construction wood or leaves (seven percent).

It is evident that tree-planting is mostly done to increase the value of the land and meet construction needs which are both optimistic; however, only a small percentage of households do the same to meet their firewood needs or to protect land from erosion. This signals the need to direct households to regenerate forests in order to conserve the existing stocks. This research finds that tree-planting increases with higher natural capital and higher economic capital (see Table 7.20).

Table 7.7

Significant Associations Linked to Tree-planting

Associations that are found to be significant (p<0.05)	Sign of the relationship	Strength of the relationship	Cramer's V³⁴	Approx. significance (p)
Tree-planting and Economic Capital	+	High	0.320	0.000
Tree-planting and Physical Capital	-	Moderate	0.261	0.003
Tree-planting and Natural Capital	+	Moderate	0.254	0.004

This may reflect that households with higher economic capital have the capability or means to plant trees in order to achieve livelihood outcomes, whereas poorer households lack that ability, means or support.

It was also found that in the presence of external support, a larger percentage of households planted trees in the past three years preceding to the survey. For example in the group of households who did not receive any support either from the government, NGOs or donors, only 48 percent of households planted trees. In the group of households who received money or training this percentage increased to 67 and 63 percent respectively. What is striking is that when households were provided with products (such as seedlings or seeds), all of the households indicated that they have planted them (see Table 7.21). This positively-correlated relationship suggests tree-planting increases when it is externally supported and, in particular, when the support is provided in the form of products. Therefore, it can be concluded that external support, with few exceptions, creates a supportive environment for forest

³⁴ Due to a considerably small sample size, Cramer's V test is used to report significance and strength of the associations. For values >0.30, the strength of the association is assigned as high; for values between 0.20 and 0.29, the strength is assigned as moderate; and for values between 0.1 and 0.19, the strength is assigned as low (see Botsch, 2011; Gravetter & Wallnau, 2004).

regeneration when local people are allowed direct control and are empowered to build upon the cultural and spiritual value of forests.

Table 7.81

Bivariate Distribution between Types of Support Provided and Tree-planting

	Household has planted			
	No	Yes	Total	
Percentage of households that were provided the	No Support	52.2%	47.8%	100% (N=134)
	Money	30.3%	66.7%	100% (N=3)
	Product	0.0%	100%	100% (N=16)
	Training	37.5%	62.5%	100% (N=16)
	Total	45.6%	54.4%	100% (N=169)
Value		Approx. Sig.		
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Cramer's V	0.312	0.001		

Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

7.6. CHAPTER SUMMARY

This chapter provided important information related to forest reliance in Timor-Leste at the household level. The research has found that the gathering of forest products by communities in Timor-Leste is still a complementary part of subsistence, traditional and cultural living, and a supplement source of household income with 93 percent of the households interviewed indicating having collected and used forest products in the past year. Hence, it is reasonable to suggest that the sustainability of forests in Timor-Leste cannot be ensured unless conservation-targeted policies address people's diverse dependence on forest resources for their well-being. Moreover, it is important to acknowledge that the burden of losing the forest resource base and the knowledge of its traditional use would not only fall on the communities themselves but also on the government.

With 77 percent of the households collecting firewood (and the remaining 23 percent buying firewood from the market), the heaviest reliance on forest resources was found for energy (cooking and heating) needs. This was followed by reliance for construction purposes (53 percent), for income generation (42 percent), for food (39 percent) and finally, for medicine (one percent). Heavy reliance on forests for energy, construction and income generation is likely to be exacerbated by a growing population and may lead to further loss of forest resources unless alternatives are provided. It is therefore very urgent to provide people clean, affordable, accessible and sustainable alternatives of energy sources and encourage them to regenerate forest stocks to meet the increased demand for construction materials. In this aspect, provision of external support was found to make a considerable impact on the percentages of people planting trees. However, support provided in the form of products (such as seedlings or seeds) was found to be slightly more successful than training or cash transfers in providing the incentive for people to plant trees.

In a parallel way, environmental governance mechanisms need to acknowledge that there are substantial economic benefits of collecting and selling forest food. It is found that families tend to acquire economic capital by engaging in these activities. However if things like harvesting of bush meat or other sources of forest food are not regulated and managed well, it could have severe environmental consequences in the future and also impact negatively on the food security situation in the country. Therefore it is important that technology and market opportunities aid the production, harvesting and processing of forest resources within sustainable limits and where benefits can be shared equitably. Targeted measures also need to consider the most forest dependent households whose livelihood strategies are dominated by forest resource extraction in order to lower the pressure put on forests, and also to

protect these households from risks that may be caused by further loss or degradation of forests.

The most forest-dependent households are found to be male-headed households with six or more children, with poor human and physical capital, and high natural capital. This research however does not find a significant association between a household's poverty level and their level of forest reliance. Therefore, the poor should not be blamed for the heavy reliance on forests, rather measures need to be directed at improving poor human and physical capital in places with rich natural capital and also encouraging households to have fewer children. In this regard, family planning and reproductive health programs also need to be strengthened to lower the population pressure and be able to invest more in physical and human development in these areas to allow communities to adopt alternative yet sustainable livelihood strategies.

CHAPTER 8: MANAGING THE DEMOGRAPHIC SITUATION IN TIMOR-LESTE: POLICIES, PROCESSES AND FUTURE DIRECTIONS

8.1. INTRODUCTION

It has been argued in previous chapters of this thesis that rapid population growth and changing demographic trends in Timor-Leste, particularly due to its high fertility, are posing a threat to the nation's peace building, poverty reduction, and sustainable development efforts. Therefore, efforts to reduce population growth, mainly through a reduction in fertility, need to be considered as a part of a policy package to lower pressures on natural resources, reduce poverty and the demographic risks associated with civil conflict. Slower population growth can also allow Timor-Leste the time for structural, political and societal change and the transfer of technology to adjust to its growing population.

Although the root causes of high fertility lie in the socio-economic, cultural and political structures of a country's past and present, they are also shaped by the institutional factors that are closely associated with the country's policies and programs. The most direct measures aimed at managing demographic challenges in Timor-Leste are the reproductive health (RH) and family planning (FP) policies and programs. A quality RH and FP program need to be grounded on the basis of a human rights perspective (UN, 1995) and implemented on a broad scale in order to directly address Timor-Leste's demographic challenges. On the basis of available literature and findings from the consultations and in-depth interviews conducted for this research, this chapter identifies the challenges and opportunities that lie in the policy framework and programming of RH and FP. This is aimed at developing a typology of adoptive responses guiding Timor-Leste to achieve a resourceful and

healthy population which can become the driver for the country's peace and sustainable development rather than a threat to its stability and future.

This chapter starts by providing a review of the current policy framework related to Timor-Leste's RH and FP programs. These include the National Reproductive Health Strategy (2004-2015), the National Family Planning Policy (2004), Behaviour Change Communication (BCC) and the Sex Education Strategy. Having explored how these strategies and policies are implemented on the ground, this chapter provides a discussion on barriers, challenges and opportunities for their effective implementation based on consultations of this research. This chapter then concludes by identifying pathways to cope with the demographic change which cannot be altered by the current RH and FP initiatives. It highlights areas for sound policy making which need to accompany Timor-Leste's efforts to slow down its population growth to achieve a resourceful and healthy nation of people.

8.2. CURRENT STATUS OF REPRODUCTIVE HEALTH AND FAMILY PLANNING INITIATIVES IN TIMOR-LESTE

Following the policy recommendations of the 2003 Timor-Leste Demographic and Health Survey (2003 TL-DHS), the government of Timor-Leste established its first National Reproductive Health Strategy (NRHS) in 2004 to provide a roadmap of action for the period 2004-2015. Reproductive health is defined as a state of complete physical, mental and social well-being in all matters relating to the reproductive system and to its functions and processes (UNFPA, 2012). It implies that people are able to have i) a responsible, satisfying and safe sex life, ii) have the capability of reproducing, and iii) the freedom to decide if, when and how often to do so. Implicit in this definition are:

- The right of men and women to be informed of and to have to safe, effective, affordable and acceptable methods of fertility regulation of their choice, and
- the right of access to appropriate health care services that will enable women to go safely through pregnancy and childbirth and provide couples with the best chance of having a healthy infant.

Developed by the Ministry of Health (MoH), the NRHS 2004-2015 ensures that reproductive health is integrated into the basic health service delivery system. It aims at improving the quality of reproductive health services across Timor-Leste (Ministry of Health, 2004). The specific objectives of this strategy include:

- 1- To increase the level of knowledge about sexuality and reproductive health across the population,
- 2- To promote family planning in order to stabilise the population growth rate and reduce incidences of unintended, unwanted, and mis-timed pregnancies,
- 3- To ensure that all women and men have access to reproductive health care services and information,
- 4- To reduce the level of maternal and child mortality and morbidity,
- 5- To reduce the burden of sexually transmitted diseases and HIV, and
- 6- To meet the changing reproductive health needs over the life cycle and improve the health status of reproductive age people

Although not specified in the primary objectives, the strategy promotes strengthening of partnerships and coordination, advocating for resources, building political will and designing national standards, protocols and guidelines.

Addressing one of the main priorities of the NRHS, the government of Timor-Leste approved the National Family Planning Policy (NFPP) in 2004 (Government of

Timor-Leste, 2013a). The rationale for the policy rests in Timor-Leste's Constitution which states that: "everyone has the right to health and medical care and the duty to protect and promote them" (Government of Timor-Leste, 2002). The NFPP was drafted after significant consultations with various stakeholders in 2003. Given the very high level of the total fertility rate of 7.8 at the time, the majority of the people and, to some extent, the leaders of the Catholic Church expressed their support for the implementation of a family planning program (Hayes, 2010).

The support from the Catholic Church however was not straightforward or easy gained. Following 2002, although FP was well recognised³⁵ as a public health issue by the MoH planners and health workers, attempts at introducing birth spacing and limiting the size of families were strongly opposed by the Catholic Church (Murray, 2004). The Bishop at the time, Bishop Belo, in his public letter to the MoH strongly condemned family planning (A copy of this letter can be found in Appendix 6). This resulted in the halting of all attempts at introducing any form of family planning (Murray, 2004). The Church began to have a strong influence on public opinion by virtue of its 400 year existence, and progressively strengthening functions through successive political regimes, particularly during the turbulent years of the Indonesian occupation. Those influenced by the Church included the political decision makers of the new nation. Thus it was confirmed by the Ministry of Health (MoH) (2004), that the government was unable to provide family planning services prior to the approval by the country's religious leaders.

³⁵ It was recognised that a large number of newborns had significant implications on the health of mothers. See (UNICEF, 2002)

On the retirement of Bishop Belo, an agreement on the provision of family planning was finally reached with the new Bishop and the Catholic Church. The policy was deliberately designed so as not to offend the teachings of the Roman Catholic Church (Hayes, 2010). Some of the significant aspects of population policy which are constrained due to the Church's influence will be discussed later in this chapter.

In line with the principles of the Cairo Programme of Action (UN, 1995), Timor-Leste's NFPP states that all couples and individuals need to be provided with the means and information needed to allow them to make informed and free choices about the number and spacing of their children. It acknowledges that the government is responsible for providing access to family planning, information and counselling services at all levels of the public health system with technical and financial support from the international community if necessary (Ministry of Health, 2004). The policy promotes "responsible parenthood" as the guiding principle to planning a family (Hayes, 2010), and highlights the importance of reducing high fertility rates and birth spacing in order to alleviate poverty, reduce maternal and child mortality, and improve the health of women and children (Government of Timor-Leste, 2013a). The particular policy makes explicit references to the International Conference on Population and Development (ICPD), and to the principles of the Cairo Programme of Action where a human rights perspective is emphasised to achieve universal access to a full range of safe and reliable family planning methods and RH services (United Nations, 1995).

The ICPD suggests that reproductive health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity in all matters relating to the reproductive system and to its functions and processes. Reproductive health therefore implies that people are able to have a satisfying and

safe sex life and that they have the capability to reproduce and the freedom to decide if, when and how often to do so (Palmer & Lush, 1999).

As a signatory to several conventions, the government of Timor-Leste acknowledges the importance of fundamental human rights which, in essence, also include women's right to choose the number and timing of her children. However, Timor-Leste's Penal Code (Article 141- Interruption of Pregnancy) which was passed by the Council of Ministers in 2009,³⁶ restricts Timorese women from access to safe abortion on demand. It criminalises almost all sorts of abortion (with the exception of item 4 below), and does not allow a health worker to safely or legally terminate a pregnancy for any reason. This 2009 penal code (Article 141) suggests that (Belton, Whittaker, & Barclay, 2009):

- 1- Any person who performs an abortion through whatever means and without the consent of the pregnant woman shall be sentenced to two to eight years of imprisonment,
- 2- Any person who performs an abortion through whatever means and with the consent of the pregnant woman shall be sentenced to up to three years' imprisonment,
- 3- Any pregnant woman who consents to an abortion procedure by any other individual or induces abortion as a result of her own deeds or those of a third party shall be sentenced to up to three years' imprisonment,

³⁶ The new Penal Code in 2009 was an opportunity for Timor-Leste to allow some legal grounds for abortion, which was highly restricted under Indonesian rule. Public debate was contentious before ratification of the new code, which allowed abortion to save a woman's life and health. A month later, 13 amendments to the code were passed, highly restricting abortion again.

- 4- The provisions of the previous items are not applicable in cases when the interruption of pregnancy is the only means to counter the risk of death or irreversible lesion to the body, and physical or psychological health of the mother or the foetus. This is as long as the procedure is authorised and monitored by a medical team and performed by a doctor or health professional in a public health institution with the consent of the pregnant woman and/or her life partner, and
- 5- The provisions of item 4 of this article will be the object of a separate regulation.

Despite the law, women in Timor-Leste continue to terminate their pregnancies with high health risks. Some women organise their own terminations and a few kill their newly born infants in other words commit infanticide (Belton et al., 2009). Such incidences rarely reach the judicial system because they are dealt with by the family and village elders. Women that resort to illegal abortion and infanticide consequently face shame, stigma and public humiliation because abortion is emphatically denied to them, even when it may be a necessary measure to terminate a pregnancy, because motherhood is framed as a wholesome and desirable at all costs (Murray, 2004).

While there is consensus in the international literature that abortion should not be promoted as a form of family planning, there is considerable evidence suggesting it is one of the traditional methods of family planning and is used in Timor-Leste, for instance in the form of eating herbal plants to terminate pregnancy (Belton et al., 2009).³⁷

³⁷ Even with perfect human resources, excellent FP coverage and a population that accepts and uses modern methods of contraception, unwanted and mistimed pregnancies are still likely to occur.

Experience from the international arena therefore suggests that criminalising induced abortion makes it unsafe and it is advisable from a public health approach not to criminalise the termination of pregnancy but to regulate it (Belton et al., 2009). The goals of Timor-Leste's NRHS which include safe and healthy fulfilment of the desired number of children; avoiding disease and disability related to sexuality and reproduction; and being free from violence and other harmful practices related to sexuality and reproduction, would not be achieved without the prevention of unsafe abortions. Therefore, Timor-Leste's future policy making in relation to abortion needs to be guided by the principles of public health and human rights and to be open to public debate to include traditional and cultural considerations. Although provision of a full package of quality family planning, continuous use of contraceptives, education and empowerment of women needs to be the ultimate goals, given that the unwanted pregnancies still occur, medically supervised abortion need to be made available as an option under certain conditions. If the legal status of abortion was to change and it was possible to offer a termination of pregnancy to women in order to preserve their physical and mental health, this would need to be reflected in the new NRHS policy document post-2015 period.

8.2.1. Implementation of Strategies and Policies

The MoH has overall responsibility for implementing the National Family Planning Policy (MoH, 2004). Based on this policy, a National Family Planning Program was established in 2005 with the following objectives of reducing the population growth rate gradually by promoting the concept of a small family norm to the population in general and to the rural population in particular; increasing the availability of and the demand for family planning services; providing quality services and reducing unmet need for services (MoH, 2004).

Currently the Maternal and Child Health department of the MoH has overall responsibility for the national family planning program. The National Family Planning Officer in the MoH oversees the delivery of family planning services in the districts (Government of Timor-Leste, 2013a). The district level services are delivered in conjunction with district health management teams, district family planning coordinators, logistical and pharmacy staff (Government of Timor-Leste & UNFPA, 2009). Launched in 2008, SISCa (Servico Intergaradu Saude Comunitaria which stands for Integrated Community Health Services Outreach Program) is a primary health care program within the Ministry of Health and has been a key initiative to improve the delivery of health services at the community level with a special focus also on FP/RH promotion. The program is offered on a monthly basis in almost every village in the country and targets mothers and children with the objective of bringing basic services closer to the community (Government of Timor-Leste & UNFPA, 2009). This program resembles the characteristics of the Indonesian Program POSYANDU (Pos Pelayanan Terpadu which means integrated service post in Indonesian) established in the 1980s, which is a monthly clinic for children and pregnant women, and provides vaccinations and nutritional supplements (IRIN, 2012).

A key element of the SISCa program, just like POSYANDU, is the involvement of health volunteers who are chosen from their own communities. These volunteers undertake the responsibility of assisting health staff and communities. They provide health promotion and education, encourage community members to access available services and act as an essential liaison between the community and health staff (Ministry of Health, 2011). SISCa is targeted to play a more effective role in the provision of family planning services. Health posts for example give out condoms,

pills, injectables and also provide advice on natural methods. Implant and Intrauterine Devices (IUDs) are available at Community Health Centres, and sterilisation is available at referral hospitals and higher-level health centres (Government of Timor-Leste & UNFPA, 2009). There are currently 602 SISCa posts operating throughout the country (Government of Timor-Leste, 2013a). The SISCa initiative is a very important step to widen the coverage of rural communities that are exposed to FP and are provided with FP services. This initiative, however, has its own challenges and these will be discussed later in this chapter.

An important aspect of the national family planning program is also related to changing attitudes and behaviour to increase demand for reproductive health and family planning services. Introduced in 2008, the Behaviour Change Communication (BCC, 2008-2012) initiative identifies the behavioural objectives of the NRHS. It aims to achieve the desired behavioural change through culturally-sensitive and rights-based information and awareness-raising campaigns that target men, women and young people of reproductive age (15-49 years old) (Government of Timor-Leste, 2008; Government of Timor-Leste & UNFPA, 2009). BCC uses a variety of “edutainment” (entertainment-education) communication strategies including radio, soap operas, theatre, drama, TV public service announcements and interpersonal communication for instance; that is, the primary form of communication in Timor-Leste (Government of Timor-Leste, 2008). This initiative is very important; however, it is difficult to evaluate its effectiveness at this stage. There is no specific data for example on the audience numbers that are reached or the hours of ‘edutainment’ heard.

Another essential policy initiative aimed at behaviour change is the Breastfeeding Promoting Policy introduced in 2009. This policy aims to improve better health

outcomes for infants and mothers through building an institutional environment that promotes effective breastfeeding practices (Ministry of Health, 2009). Due to a combination of traditional beliefs and lack of education, a high proportion of lactating women in Timor-Leste practice sub-optimal breastfeeding practices. These are reflected in the fact that initiation of breastfeeding in Timor-Leste is generally late; women throw away of colostrum;³⁸ and the rate of exclusive breastfeeding to six months is low (Ministry of Health, 2009). Giving away colostrum is a common traditional practice in Timor-Leste because it is believed that the colostrum is unclean or harmful (Quintao, 2006). Babies are often given water, rice water and sugar during the first week of life to cleanse the intestines, with the belief that this practice will prevent jaundice. It is argued that this advice not only comes from relatives and friends but also may come from health workers (Quintao, 2006). Apart from denying the infant needs the nutrients in colostrum, this practice exposes the baby to unsafe water.

There are other widespread beliefs and practices contributing to poor breastfeeding practices in Timor-Leste. These include lactating women feeling that they do not have enough milk; a woman should not continue breastfeeding if she has become pregnant as it will harm the foetus; infants need other fluids or solids before six months as the baby is growing fast and the breast milk will not be sufficient (Quintao, 2006).

³⁸ Human colostrum is a form of milk produced in late pregnancy. It is a yellow sticky fluid which is secreted during the first three to five days postpartum. Colostrum contains antibodies to protect the newborn against disease. It contains high amounts of sodium, potassium, chloride and cholesterol thought to encourage optimal development of the baby's heart, brain and central nervous system. (See Saint, Smith, & Hartmann, 1984)

Throughout the world, optimal breastfeeding practices have been demonstrated to have the largest impact of any intervention on reducing infant mortality (Ministry of Health, 2009). The health and survival of the infant improve dramatically with exclusive breastfeeding. It is recorded that breastfed babies have lower rates of diarrhoea, respiratory tract, and middle ear infections (otitis media) compared with non-breastfed infants (Ministry of Health, 2009). There are also other benefits of breastfeeding. For example:

1. Initiation of breastfeeding reduces postpartum bleeding.
2. Exclusive breastfeeding delays the return of fertility and therefore the risks to maternal health of having children spaced too closely together.
3. Children who have been breastfed appear to do better on tests of motor and intellectual development than non-breastfed children.
4. Breastfed children are likely to be less susceptible to chronic diseases (such as diabetes, heart disease, cancer) later in life.
5. Breast milk is safe. Infant formula, an alternative to breast milk, can be contaminated by a bacterium called enterobacter sakazkii which can cause outbreaks of sepsis, meningitis or necrotizing enterocolitis, leading to severe ongoing complications and sometimes death for newborns. Moreover, the bottles used for infant formula milks may not be cleaned well, resulting in more contamination.
6. The economic cost of using infant formulas is high - both for family and nation.

7. The economic cost of using infant formulas is generally high and can impose a great burden on both family and nation (Ministry of Health, 2009).

Promotion of breast-feeding through this policy is, thus, a great opportunity to enhance birth spacing and improve mother's health status as well as an infant's or child's survival and nutrition status (Ministry of Health, 2009). This is also a valuable opportunity as it also aligns with the Church's emphasis on responsible parenthood.

Other promising initiatives and plans in support of better functioning of targeted programs include:

- 1) The development of sex education programs for young people. This initiative is based on the collaboration between the Ministry of Education, Ministry of Health, and the Secretary of State for Youth and Sports (Government of Timor-Leste, 2013a),
- 2) The development of an action plan in 2010 to provide sexual and reproductive health services and information to youth in school, out of school, and particularly those that are hard to reach (Government of Timor-Leste, 2013a),
- 3) The development of an adolescent reproductive health curriculum by the Ministry of Education for children in grades 7-12, which includes learning about human reproductive systems, how to behave in relationships and matters related to gender-based and domestic violence (Government of Timor-Leste, 2013a),
- 4) The piloting of a teacher training program in ten schools across eight districts in Timor-Leste on the provision of knowledge, attitudes and skills to teach

about adolescent reproductive health. This program is waiting to be rolled out at the national level (Government of Timor-Leste, 2013a).

Given the young population structure of Timor-Leste, these above initiatives are important as they focus on fertility issues of teenagers and youths. They contribute reproductive health information, education, communication, counselling and services to become more youth friendly. They are also instrumental in promoting mutually respectful and equitable gender relations at early ages and in helping adolescents deal with their sexuality in a positive and responsible way.

Other plans that are highly valuable include the development of a Logistic Management Information System to ensure sustainable procurement of contraceptives, equipment and supplies (Government of Timor-Leste & UNFPA, 2009), and plans to develop strategies to meet unmet demand for family planning, particularly for older mothers still of childbearing age. Considerable efforts have been diverted to improve human resources. There are plans to train health care providers not only in the technical and managerial aspects, but also in attainment of appropriate interpersonal communication and counselling skills (Government of Timor-Leste & UNFPA, 2009).

8.3. CHALLENGES FOR IMPLEMENTING REPRODUCTIVE HEALTH AND FAMILY PLANNING: IDENTIFYING AREAS OF IMPROVEMENT

Developing a Reproductive Health and Family Planning (FP/RH) program from scratch is a significant undertaking for any country, but is particularly so for countries such as Timor-Leste with limited human resources and institutional capacity. The task includes the recruitment and training of program managers; providing adequate staff, equipment and resources to the service delivery points; having procurement and logistics in place; establishing quality monitoring and

evaluation systems; and finally, developing community outreach and communication programs (Hayes, 2010). Timor-Leste faces multi-layered challenges in the functioning of such newly established systems.

Having identified the progress up-to date in policy and programming related to RH/FP, this chapter now discusses several of the major challenges in implementing RH and FP programs in Timor-Leste. On the basis of the available literature and consultations of this research³⁹, the challenges and areas of improvement are structured under four categories.

8.3.1. Religion: Strict Roman Catholicism Restricting Free Communication Strategies and Program Implementation

Timor-Leste is predominantly a Roman Catholic country with 98 percent of its population identifying themselves as Catholic. The Catholic Church is known to have played an important role in Timorese society, particularly as a strong defender of human rights during the country's recent history (Hayes, 2010). The Church continues to hold an important position in mediating the messages to be communicated to the community, and as such, was argued to be the most universal and horizontal medium influencing communities, families and individuals alike (Vittachi, 1990). Catholic nuns and priests had an almost absolute influence on the population maintaining the status quo (Redman, Spencer, & Sanson-Fisher, 1990).

Although the Church has been a supportive development partner in Timor-Leste, it stands out as a constraint to the implementation of FP/RH programs in Timor-Leste. Murray (2004) suggested that the Church has been one of the main reasons for the

³⁹ Consultations of this research include 40 in-depth interviews conducted in 2011-2012 with stakeholders from local and international NGOs, the government of Timor-Leste and international agencies such as UNFPA working on issues related to population, health and sustainable development.

slow uptake of the FP interventions. This claim is supported by the consultations (for instance with key informants from UNFPA) undertaken for this research. Currently, the distribution and the use of contraception in Timor-Leste are continuously discouraged by the Bishop. Due to the heavy influence of the Church, health service providers find it problematic to talk directly about the modern and traditional methods of contraception. Neither an ideal size of family nor modern or traditional contraception use can be openly discussed. Instead, the concept of responsible parenthood is used as a communication theme and, with the consent of the Bishop, three years of birth spacing is encouraged. This spacing is encouraged to be achieved only through traditional methods.

The Church dictates that the fertility transition in Timor-Leste needs to be conveyed through formal education. This is supported on the basis that formally educated people can make the best choices for themselves and think about the costs and benefits of having many children. Although there is considerable empirical evidence supporting the argument that education can lead to women's empowerment and declining fertility (this was discussed in Chapter 5), there is no doubt that human capital development needs to be coupled with universal access to high quality RH and FP services for reducing fertility in developing countries (Caldwell & Caldwell, 2005), including Timor-Leste. High quality also entails that the means for women to limit their childbearing are communicated openly and freely. The human capital transformation in Timor-Leste is being taken up slowly, particularly in rural areas, where fertility rates are the highest. Hence, it is very important that RH and FP services are made accessible to those who lack or miss out on formal education opportunities.

The consultations of this research (with key informants, researchers and practitioners in health sector), suggest that the strong influence of the Church not only impacts on the functioning of RH and FP programs but also inhibits ideal policy making that could be achieved through effective mass media. Thus, it is clear that the supportive role that the Church could be playing in Timor-Leste to address the key public health concern of reproductive health, is likely to remain absent or, at best, will only be insufficient and unresponsive in Timor-Leste when considering the need.

Communicating the benefits of small size families through quality advice is very important in order to increase the demand for family planning. It is therefore important for the Government of Timor-Leste to work in partnership with civil society organisations and international donors to reduce barriers against free communication and implementation of FP/RH initiatives. There is no doubt that collaboration with religious leaders in the context of Timor-Leste needs to continue, nevertheless, alternative mass media tools ought to be considered to provide a climate that is favourable to openly and freely communicate matters related to reproductive health through all possible channels. This is required to accelerate efforts towards the voluntary transition to lower fertility in Timor-Leste.

8.3.2. Limited Community Knowledge and Restricted Demand for Reproductive Health and Family Planning Services

This research has identified that one of the major constraints related to poor demand for FP programs is people's lack of knowledge of how to access the FP/RH services. The SISCa program is provided in villages only once a month, hence coverage of the service remains insufficient. Even if they receive information about the availability of such services, poor roads, the rainy season, and women's heavy workload make it hard for women to access these.

Timor-Leste is a highly patriarchal society with strong social norms that dictate gender roles which generally restrict women's role in decision-making (Harris-Rimmer, 2009). Women do not hold positions of power in traditional power structures; hence their participation in decision-making in both private and public spheres is limited (Ospina, 2006). This is even the case for matrilineal groups in Timor-Leste where women are less influential than men in household decision-making (Thu, Scott, & Niel, 2007). Patriarchal structures are also evident in decision-making in regards to child bearing (Saikia, Dasvarma, & Wells-Brown, 2009).

As discussed previously, the SISCa program particularly targets women and children. A study by Kohan et al. (2012) argues that this targeting creates a perception among men that the responsibility for seeking out family planning services is a female task. Men, therefore, do not regard the participation in family planning programs as their responsibility and continue making uninformed decisions. This particular study suggests that poor participation of men in family planning services also leads to low interest in these services among women. One of the recommendations of this study to increase demand for FP is the need to target couples rather than women alone. This study suggests that given the current patriarchal structures, men's participation is important in changing behaviour in the short term and this would require increasing male health personnel and volunteers in the delivery of SISCa programs.

Kohen et al. (2012) also observed that although the family planning is free of charge, women consider that a comprehensive reproductive health service is not without a cost. Health centres provide contraceptives free of charge, however, women believe that treatment of complications arising from the use of contraceptives will cause

them financial burden. This study concludes that the perceived cost of using FP restricts women's demand for the available services. It is suggested that efforts to increase the demand for FP be directed at creating positive public perceptions with considerations of the traditional structures which shape women's role in the society.

8.3.3. Poor Financial Management of Health Services and Family Planning Programs

This research has identified that the overall financial management of health services is inadequate. Budgetary plans and decisions are made at the central government level and rarely match the needs of the communities or district level proposals. Asante et al. (2011) argue that the MoH has no effective mechanism to link district health plans to the central budget, leaving district level health providers often with no budget to implement activities. Decisions regarding community proposals can take months as information needs to be sought from the central government (Asante et al., 2011). Health policies, strategies and guidelines are developed by the central government with limited participation of local representatives. The harmonization of external funding is often problematic and results in complicated budget development (Asante et al., 2011).

These problems are also experienced in planning and financing of RH and FP programs. The government's financial commitment for FP programming and implementation is insufficient. This research has identified that while the government only finances the salaries of staff and operational costs, commodities are solely financed by the UNFPA. Ensuring contraceptive security has been a challenge in the past and there are still problems associated with the lack of stocks and misdistribution of commodities (Belton, 2010).

The consultations of this research reveal that a greater budget is needed to broaden the coverage of FP and RH programs. A stronger financial commitment is required to establish contact with larger numbers of women in an effective, consistent and continuing pattern. Timor-Leste's 2010 DHS reported that the unmet need for family planning is as high as 31 percent (Government of Timor-Leste, 2010d). To achieve a faster voluntary transition to smaller families, it is crucial that the RH and FP services urgently aim at meeting this unmet demand. It was suggested that 1500 to 2000 health posts are needed to increase the coverage of the SISCa program, yet only 300 new UNTL graduates were posted among 290 villages in 2013 (Fieldwork, 2011- 2012, Personal Communication).

It is evident that there is a requirement for more financial commitment to increase the coverage of the program, train and qualify more health posts, and sustain an adequate supply of commodities. This thesis suggests further research should be undertaken to explore necessary budget enhancement to provide universal access to quality RH and FP programs in Timor-Leste. Whilst Timor-Leste's oil revenue can provide for the necessary budget, responding to local needs more efficiently requires decentralisation of power and strengthening of local level decision-making for effective health expenditure planning. Decentralising management functions would, indeed, raise the requirement to increase financial management capacity at the district level.

8.3.4. Poor Recruitment Mechanisms and Inadequate Human Resources

This research has identified that the mechanisms for health staff recruitment and distribution among the districts are problematic. Employment usually occurs based on a candidate's political affiliation rather than their merit. There is lack of transparency in the way in which health practitioners are posted to certain positions

and places. Low salaries and lack of incentives to work in remote areas contribute to unequal distribution of health staff in rural and urban places with implications for the coverage of RH and FP services in certain areas. Rural areas, where such services are most needed, are often left with inadequate health staff.

Like many other sectors, weak human resources constitute a challenge in maintaining quality in RH and FP services. In service delivery, problems are related to poor attitudes and practices toward customers and also to inadequate technical knowledge and skills. In program management, the challenges are poor managerial and leadership skills, lack of supervision in monitoring and evaluation practices, and inadequate skills in maintaining evidence-based and delegated decision-making.

The National University of Timor Lorosa'e (UNTL) is the major university qualifying doctors, nurses and mid-wives. This research, however, revealed that health graduates from UNTL rarely acquire the necessary technical knowledge and skills to provide adequate level of health care. As a teaching hospital, UNTL has the responsibility to increase its quality of education to equip graduates with necessary skills, knowledge, and practice. In this respect the government certainly needs to provide opportunities for the university to improve its education through improved facilities and access to international expertise. The Ministry of Health has plans to provide continuous training opportunities for health professionals and to improve their management and leadership skills. While ongoing training is certainly needed, the skills set and capabilities of health providers need to be validated and audited regularly.

It is important that accountability and transparency are ensured for merit based recruitment. Adequate distribution of quality health posts can only be ensured if

sufficient numbers of health providers are qualified and favourable conditions are created for them to work in rural areas. While a number of staff would have implications of the success of the RH and FP programs, quality would only be ensured with adequate technical knowledge, improved leadership management and communication skills of health providers.

8.3.4 Coping with the Demographic Situation: Recommendations

In Chapter 5, this research has discussed that the future demographic scenario is not only the result of the present but also of past demographic dynamics which cannot be altered by prospective policies. With 42 percent of its population under the age of 15, a majority of the Timorese population will still be in the reproductive age group in the near future, at least until 2030. Bringing down fertility rates from the current level is a difficult challenge considering the fact that Timor-Leste has extremely low levels of contraceptive use and a high preference for a large family size. As discussed previously, rapid fertility decline through improved reproductive health and family planning programs can help achieve a substantial dividend for poverty reduction, peace building and environmental sustainability. However, these need to be coupled with good policy settings.

Timor-Leste's current policies and interventions in meeting the needs of its population will certainly set conditions for the country's future development path. Although a rapidly increasing youthful population raises demographic concerns for Timor-Leste's peace and poverty reduction efforts, an adequate public investment in formal and informal education at the earliest stages of life, and throughout that life, has the potential to change this demographic concern into a future demographic dividend.

No country can simply sit back and rely on expanding income-related growth to flow into the knowledge sector (Saikia & Hosgelen, 2011; Saikia et al., 2011). Countries like Timor-Leste need to acknowledge the resourcefulness of its own population and actively invest in the education sector to improve the quality and accessibility of services to achieve human resource development. Well-structured and well-targeted public spending on education is imperative to Timor-Leste's nation-building process. This is also because the intrinsic value of human resource development feeds back into collective societal, economic and environmental development as a whole (Saikia et al., 2011).

In previous chapters of this thesis it was discussed that multi-dimensional poverty in Timor-Leste has a strong association with poor education and increasing women's education can aid lower fertility. Investment in education therefore needs to be prioritised as an essential tool not only to reduce poverty, but also to achieve a faster demographic transition leading to the opening of a demographic window of opportunity. A demographic window of opportunity opens when the dependency ratio (particularly the young dependency ratio) declines, which in turn is achievable through sustained and substantial fertility decline.

Investment in women's education and RH/FP programs could hasten the opening of a window of demographic opportunity, but it would not ensure achieving a demographic dividend. Investments are needed in up-skilling the labour force through education and training programs, and improving the health and nutrition of the population. Investments would be also needed in the productive sectors of the economy so that there will be opportunities for potential skilled labourers to find valuable employment. These sectors may be the service, manufacturing and tourism sectors. As discussed in Chapter 5, one of the challenges that Timor-Leste faces

today is the enormous disparity between available jobs and the number of people entering the labour force. This situation results in extremely high waste of human potential and the cost of lost production. The current market entrants not only struggle with a shortage of jobs, but also face a mismatch between skills that they are able to offer and those required by the employers. While these challenges jeopardise the socio-economic development of Timor-Leste, it may also contribute to dysfunctional behaviours, rising levels of crime, violence, and political extremism among young people (Neupert & Lopes, 2006). In this respect, it is important that population factors are integrated in Timor-Leste's development planning. This planning also needs to address Timor-Leste's rapid and concentrated urbanisation trends in one major city, Dili. The tendency for uneven distribution of population, although not the main focus of this thesis, may need to be addressed by the government through creation of policies to attract people away from heavily populated parts to less dense areas.

Transforming a community into a fully skilled nation and making use of future demographic opportunity is a mission that requires long term commitment. In the context of Timor-Leste, this commitment entails a sustainable and inclusive development model where spending of Timor-Leste's oil revenue is aimed at human capital formation, and the creation of productive and meaningful employment opportunities for the increasing numbers of youth. This development model also requires that the foundations of both formal and informal education are built on the harmonious relationship between humans and the environment, and support the transition toward a sustainable economy and society. In this respect integration of population education (that highlights the relations between population, health, environment, economy and peace) into schools and universities is essential.

The Government of Timor-Leste is committed to developing and funding a vocational training scheme to enable a skilled workforce to respond to needs of the country. The National Technical and Vocational Education and Training (TVET) Strategic Plan has just been approved by the Council of Ministers, with a focus on introducing structure and standards to ensure that industry and the community are provided with the skills needed for growth (PATVET, 2011). Current areas of vocational training include construction, tourism and hospitality, finance and administration, information technology and education, training and assessment, agriculture, and automotive engineering. Planning has started for the Petroleum and Maritime as well as Health Services industries. While these are great opportunities for skills development for potential jobs, this research suggests that other programs need to be developed for the manufacturing and processing of forest products, eco-tourism, agro-forestry, renewable energy and waste management, which can help equip the workforce for the green and productive sectors of the economy. Job creation in green areas is particularly important for Timor-Leste to improve its environmental sustainability and social equity.

There is great potential in the informal education and training and these can be targeted specifically for groups such as youth and women. Investing in youth and women's education and training is particularly important to enable them to participate fully in their economic and social life. Collaboration with the civil society, donors and private businesses is needed to create more entry points for locals, particularly the marginalised, to benefit from training opportunities and become beneficiaries of these projects. This research identifies that sustainable farming, environmental protection, reforestation, rainwater harvesting, water catchments, use of renewable energy, recycling, waste reduction and disposal,

maintenance and repair of appropriate technology, sustainable construction, entrepreneurship, practical literacy, work ethics and leadership training are all areas to be strengthened (Fieldwork, 2011-2012). Civic education and training can help the emergence of community youth leaders for sustainable development stewardship.

At the same time, it is important that the government of Timor-Leste strengthens collaborations with multilateral organisations including the International Labour Organisation to improve the functioning and capacity of employer organisations and national regulatory bodies, such as the National Labour Board, the Labour Relations Board, and the Minimum Wages Board. Combined results in skills development, improved capacity of employer organisations, and legal constituents coupled with rapid infrastructure development can well contribute to the prospects of job creation and private sector development in Timor-Leste. In the short to medium term, investments are needed in the agricultural sector as it is the major sector that supplies the bulk of the Timorese population. The forestry sector also offers great potential for short to long term job creation and these prospects will be discussed in Chapter 9.

While skills development in Timor-Leste is essential to promote a conducive environment for private sector development and diversification, ultimately an employment strategy in Timor-Leste may need to look beyond the countries' shores (Curtain et al., 2013). This is because even with the improvement of infrastructure and private sector development by the productive investment of oil wealth, Timor-Leste is likely to provide excess labour than available jobs in the next few decades.

According to a study by the World Bank (2006a), increasing labour migration from the Pacific Islands to developed countries (where demand for labour would remain very high due to low fertility) through the development of temporary worker

programs can be designed as global best practice. The same study also states that while labour mobility alone may not make these islands prosperous, it can significantly lower pressures on their labour markets and enable the workforce to attain skills overseas also enhancing peace and stability in the region (World Bank, 2006a). There is considerable evidence suggesting that international labour migration can hold important benefits for home country development. It can significantly help in the development of livelihood strategies for under-resourced communities and directly contribute through remittance transfers to poverty reduction at the individual level (International Organisation for Migration [IOM] & UNDESA, 2012). Diasporas, for example, can accumulate human and financial capital during the process of migration which can help contribute to the development of their home communities. Migrants can also assist in establishing networks that link scientific and technical know-how to their home and contribute to wealth and job creation upon their return. Economically driven migration, thus, can create valuable opportunities for development in countries of origin (IOM & UNDESA, 2012). Timor-Leste currently has bilateral agreements with Australia, New Zealand, Japan and South Korea for short-term work placements. For example about 1,100 Timorese nationals have relocated as a part of the bilateral arrangement with South Korea to work in factories and fishing companies between 2009 and 2012 (Ora, 2013). The Government of Timor-Leste planned to send 600 more workers in 2013 (Ora, 2013). Since mid-2012, Australia's Seasonal Worker Program allows Timorese nations for seasonal work in horticulture as well as on a pilot basis, in seasonal tourism and a few other sectors (Curtain et al., 2013). These partnerships are very valuable as they are great opportunities for the reasons discussed above, and particularly when Timor-Leste's limited employment opportunities and domestic market is considered. A stronger regional employment strategy can therefore be developed to provide the

Timorese youth the chance of obtaining skilled, semi-skilled or unskilled work in Australia or other overseas countries. This could also give many young Timorese the incentive to acquire basic and advanced skills, including English (Curtain et al., 2013).

As a part of a global community Timor-Leste is a member of several international groups including the Small Island Developing States (SIDS), the Community of Portuguese-Speaking Countries (CPLP), and the Group of Fragile States (g7+). These memberships provide Timor-Leste a more visible stand in the global platform to gain access to financial support, training and expertise from donors, international development partners, and aid institutions. Such networks need to be utilised fully to exchange know-how and best practices in managing demographic challenges and investing in a sustainable and inclusive economy with advances in human development.

8.4. CHAPTER SUMMARY

This chapter has discussed current policies and programming in RH and FP in Timor-Leste as direct measures to reduce fertility and, hence, as important mediums to lower pressures on natural resources, reduce poverty and the demographic risks associated with conflict. This chapter provided a review of Timor-Leste's National Reproductive Health Strategy (2004-2015), National Family Planning Policy (2004), Behaviour Change Communication (BCC) and Sex Education Strategy. Based on the available literature and this research's consultations, this chapter explored the barriers, challenges and opportunities in the provisioning of RH and FP services.

The present chapter has elaborated on the need for strengthened RH/FP services to reduce fertility in Timor-Leste which can then hasten the opening of a window of

opportunity. It has also discussed the necessity of a sound policy setting that needs to accompany effective RH and FP programs to achieve a substantial demographic dividend for poverty reduction, peace building and environmental sustainability in Timor-Leste. Further, this chapter identified pathways to cope with demographic change and highlighted areas for sound policy making. These include well-structured and well-targeted public spending on formal and informal education for human capital development; spending of Timor-Leste's oil revenue aimed at human capital formation; and creation of productive and meaningful employment opportunities for the increasing numbers of youth. This chapter also discussed the foundations of a future development model where the constituents of education and job creation are built on the harmonious relationship between humans and the environment, and which support the transition toward a sustainable economy and society in Timor-Leste.

CHAPTER 9: POLICIES AND PROCESSES FOR SUSTAINABLE FORESTS: IDENTIFYING THE CHALLENGES AND OPPORTUNITIES

9.1. INTRODUCTION

Addressing the root causes of environmental degradation, including the loss of forests, requires a multifaceted response. As discussed in the previous chapter, it involves lowering population pressures on the environment through effective implementation of RH and FP initiatives and allowing Timor-Leste the time to make structural adjustments. These structural adjustments often have to deal with institutional factors and policies which directly impact on people's livelihood strategies. In this respect, the institutions, policies, and programs related to the environment and forests particularly, are some of the major tools to preserve the country's remaining natural resources, and to employ in poverty reduction and improved livelihoods. This chapter focuses on the historical governance structures that shaped the current state of forests in Timor-Leste and highlights how these have impacted on the nation's current policy framework for the environment. In this context, this research initially presents a brief review of the forest governance and management systems under three different regimes in consecutive periods of Timor-Leste's past, including Portuguese colonial rule, the Indonesian administration, and the United Nations Transitional Administration in East Timor (UNTAET).⁴⁰ Based on available literature and consultations with relevant stakeholders, this chapter also discusses the weaknesses of the current policy framework and identifies the challenges in their implementation. Finally, it makes recommendations for

⁴⁰ UNTAET provided an interim civil administration and a peacekeeping mission in the territory of East Timor, from its establishment on October 25, 1999 until its independence on May 20, 2002.

appropriate adaptive responses to conserve Timor-Leste's land and forests, and to develop a strong forestry sector for improved livelihoods and poverty reduction.

9.2. POLICIES AND STRUCTURES FOR FOREST GOVERNANCE IN TIMOR-LESTE: FROM PAST TO THE PRESENT

9.2.1. Trends in Forest Governance under the Colonial Portuguese Rule: Depleting Sandalwood Reserves and Expansion of Coffee Production

Beginning with the early 16th century, and with the arrival of the Spanish and Portuguese explorers, Southeast Asia was colonised by European powers that were much concentrated on trade and market access, and were in search of valuable trade commodities that were light in weight and could withstand a long sea journey (Poffenberger, 1999). Spices, gums, resins aromatic wood, and timber were very much in demand and fetched high prices in Europe. The depleted forests of Europe also led colonial powers to increasingly depend on Asia's natural resources for materials for the shipping and construction industries which gave rise to commercial timber extraction (Poffenberger, 1999). This has not only happened in Southeast Asia, but in many other parts of world.

The Portuguese were involved in the lucrative and extractive trade of high-quality white sandalwood and this was exactly why they were initially interested in Timor-Leste and its forests (McWilliam, 2003). For a couple of centuries, Timor-Leste's sandalwood reserves were a great bounty for Portuguese traders but toward the 18th century these were already depleted. The main reason was overharvesting rather than the vulnerability to foreign competition or world market conditions (Gunn, 1999).

By the late 19th century, the colonial government diverted its focus on plantation agriculture. Starting with districts like Ermera, Ainaro and highland Liquica (two of these districts are included in this research as study areas), the Portuguese introduced

large scale coffee production. From 1912 onwards, all smallholder families were encouraged to plant 600 coffee bushes (McWilliam, 2003). In the final decades of the Portuguese rule, coffee accounted for over 80 percent of exports from Timor-Leste (Gunn, 1999).

Forest management under successive Portuguese administrations was largely limited to controlling the remaining sandalwood stocks, promoting coffee plantations, and developing timber plantations in the southern hinterland of the island (McWilliam, 2003). To some extent, it also included reducing the cultural burning practices of the Timorese farmers (Metzner, 1977). In the face of pressing financial and political objectives, the sustainable management and development of forest resources were given low priority and little was done to limit or reverse the continuing conversion of forest areas (McWilliam, 2003). The result was loss of valuable forest species and, to a large extent, conversion of primary forests.

9.2.2. Forests under the Indonesian period: Mostly a Security Matter

During the Indonesian administration (1975-1999), policies were directed at increasing economic activity and development in the territory and also maintaining stability across the region. This was done rarely in a way that contributed to increased prosperity for the local Timorese people or opportunities for self-determination (McWilliam, 2003). During this period, the forests were considered more as matters of security than economy (McWilliam, 2003), mainly because the forests and rugged mountain hinterland were the active battleground between the Indonesian army and the East Timorese opposition. Hence, the Indonesian army controlled the forests and, at the same time benefitted from monopolies over coffee exports and the remaining sandalwood reserves (Aditjondro, 1994).

Poor planning and implementation, combined with chronic corruption, little public consultation and general institutional disinterest in project achievements contributed to ineffective forest management resulting in a 30 percent decline in forest cover between 1972 and 1999 (McWilliam, 2003). Other reasons behind this dramatic decline in forest cover were linked to smallholder expansion of crop land, logging, timber extraction, forest conversion for roads, the development of new settlements following Indonesia's internal security arrangements and transmigration programs, and finally, napalm bombing to some extent (McWilliam, 2003).

9.2.3. Forests under the UNTAET Period: Establishing Regulations

During the transitional UNTAET period, progress in policy development was achieved in two major issues. The first one, Regulation 17/2000 on the prohibition of logging operations and the export of wood from East Timor, was a ban on commercial logging of existing timber stocks and larger-scale commercial exploitation of non-timber forest products (UNTAET, 2000a). The second one, Regulation 19/2000 on protected areas, established a regulatory framework for the protection of designated areas of natural significance (UNTAET, 2000b). The former regulation, which came into force on 8 June 2000, effectively imposed a ban on commercial logging in Timor-Leste and the export of any form of timber products, as well as the burning or any destruction of forests. The latter, which came into force on 1 July 2000, was designed to protect designated areas; endangered species; coral reefs; wetlands, including mangroves; historic, cultural and artistic sites; and biological resources, as well as the conservation of biological diversity of Timor-Leste.

The recognition of community participation in managing or co-managing local resources was significant within the UNTAET administration (Palmer & Carvalho,

2008; McWilliam, 2003). In fact, this was a major reaction to the manner in which local resources were managed under Indonesian rule, when communities were excluded from designated resource reserves, and the benefits they acquired from the exploitation of local traditional resources were minimal (McWilliam, 2003). Regulation 19 under UNTAET, for example, allowed a variety of extractive activities within the zones of protection if conducted in accordance with local law and the traditions of local communities living in or adjacent to these areas. These activities included harvesting of non-forest products, selective grazing of animals, use of non-endangered animals and plants for religious and cultural ceremonies, traditional hunting of non-endangered species, traditional harvesting of trees at elevations below 2000m (if the extraction is conducted in a sustainable manner and without the use of machinery). In other words, any activity with a traditional purpose which is consistent with the intent of the regulation was permitted. This aspect of this regulation showed that the Timorese people's diverse dependence on forest resources was recognised as an essential part of their tradition and subsistence living.

Although not explicitly articulated within the regulation, the importance of indigenous rights and claims to land within protected areas and the potential for involving local communities in forest land management were emphasised (McWilliam, 2003). Both the regulations stated above provided a working framework to legally define natural areas for protection, demarcate zones of conservation, set penalties for offences and acknowledge indigenous rights and community participation in transitional Timor-Leste. However in reality, there was no assurance of the effective implementation or monitoring of these rules. Budget restrictions during this period on the other hand led to a dramatic decline in the number of civil servants and technical staff within the government. This meant that

the Directorate within the Ministry of Agriculture, Forestry and Fisheries had a core staffing of just 21 people, compared to the 153 employed under Indonesian rule (McWilliam, 2003).

Despite the well-targeted policy development, budgetary constraints and inadequate forestry staff (totalling no more than one individual in each of the 13 districts) during the UNTAET period meant that there was limited scope for an effective management system in the pre-independence period (Palmer & Carvalho, 2008; McWilliam, 2003).

9.2.4. Forest Governance under the Independent Timorese Government: New Developments

Following 2002, in addition to many other development problems, an independent Timor-Leste was left with enormous environmental challenges, poor institutions, and weak policy framework. In the short period of fourteen years since its independence, Timor-Leste has achieved considerable progress in strengthening its policy framework for environmental governance. Article 61 of the constitution of Timor-Leste acknowledges that everyone has a right to a healthy and ecologically balanced environment and states that the citizens and the state are responsible for the preservation and protection of the environment for future generations and also for a sustainable economy (Government of Timor-Leste, 2002).

Recognising the importance of environmental governance for the achievement of the MDGs and sustainable development, both within and beyond national boundaries, Timor-Leste has ratified several international conventions in just over a decade. These include the United Nations Convention to Combat Desertification (ratified in April 2006), the United Nations Framework to Combat Climate Change (ratified in January 2007), the United Nations Convention on Biological diversity (ratified in

January 2007), the Kyoto Protocol (ratified in January 2009) to introduce clean development mechanisms, the Vienna Convention for the protection of the ozone layer (ratified in September 2009), and the Montreal Protocol for the reduction of substances that destroy the ozone layer (ratified in September 2009). Following the ratification of the above-mentioned international conventions, a number of action plans were drafted to ensure the sustainability of the environment. These include:

- The drafting of the National Action Plan for Land Degradation in 2008 under the United Nations Convention to Combat Desertification
- The endorsement of a Sustainable Land Management (SLM) plan in 2009.
- The drafting of the National Adaptation Program for Climate Change under the UN Convention on Climate Change (NAPA 2010).
- The drafting of the National Biodiversity Strategy and Action Plan under the UN Convention on Biological Diversity (NBSAP 2011)

In relation to forests in particular, the government of Timor-Leste was initially left with rules and regulations from the Indonesian and UNTAET period which were largely adopted until they were replaced by new government regulations. Article 65 of the National Constitution recognises these former regulations. Two former regulations issued by the UNTAET, Regulation 2000/17 on the Prohibition of Logging Operations and the Export of Timber from East Timor, and the Regulation 2000/19 On Protected Areas are still adopted (Anon, 2004). Although applicable to Timor-Leste, Indonesian regulations No.42 Series 1999 on forest conservation were not implemented by the judiciary system mainly because it was argued that the access to, and understanding of, these were restricted (Godinho, 2009).

The legal framework for governing forests in Timor-Leste is continuously evolving. In August 2007, the Government of Timor-Leste adopted a National Forest Policy. This policy is aimed at achieving a balance between forest protection on the one hand and, on the other, the production of timber and non-timber forest products for national economic development, and in meeting the needs of the poor and vulnerable people (Chew, Hewitt, & Keong, 2012). The six objectives of this policy, which are listed below, demonstrate that the emphasis is put on community participation and private sector development in the forestry sector to promote sustainable livelihoods, poverty reduction and forest conservation (Thang, 2008).

Objectives of the National Forest Policy

- Protection of Forests
- Community and Private Participation in Forestry Development
- Watershed Conservation
- Reforestation and Land Restoration
- Development of a Private Sector Business Environment
- Forestry Sector Institutional Development

In support of the National Forest Policy, a number of other legal initiatives were undertaken following 2007. In 2011 for instance, the Council of Ministers approved a decree law on Environmental Licensing. Following broad consultations, a Basic Environment Law came into effect in July 2012. A National Biodiversity Decree Law and a Wildlife Conservation Law were drafted in 2012, specifically targeting biodiversity conservation concerns. With the support of FAO, a Forest Resources Management Decree Law was drafted and submitted for approval in 2010, however, it is still being discussed at the council of ministers and no final decision has been made.

With the support of the International Union for Conservation of Nature (IUCN), a draft Decree on Protected areas was prepared and presented to the government in March 2013. The Program of Work on Protected Areas (PoWPA) is being adapted to promote and review initiatives and strategies for conservation in protected areas. Currently, Timor-Leste has thirty declared protected areas covering 3,535 square kilometres. Established in 2007, the largest protected area is Timor-Leste's first National Park named Nino Konis Santana in Lautem district. Table 9.1 provides a brief account of the size of the protected areas in thirteen districts of Timor-Leste.

Table 9.19

Size of Timor-Leste's Protected Areas and Their District Level Distribution

District	Total number of Protected Areas	Total Protected Area (km²)
Dili	6	410
Lautem	5	1,595
Manatuto	5	420
Manufahi	2	220
Bobonaro	2	60
Cova-Lima	2	130
Viqueque	3	210
Liquisa	1	80
Oucusse	2	210
Baucau	1	40
Ainaro	1	160
Timor-Leste	30	Around 3,535

Source: Democratic Republic of Timor-Leste, 2011

Since October 2007, the Ministry of Agriculture Forestry and Fisheries (MAFF) has been the major government agency responsible for forestry development. Under MAFF, the National Directorate for Forestry implements and enforces forestry policy, ensures the protection and conservation of nature and biodiversity, manages National Parks and Protected Areas and, finally, monitors activities detrimental to the integrity of the fauna and flora. The stated policy initiatives are particularly important for strengthening Timor-Leste's legal framework to guide the directorate

in performing its responsibilities. However, there are still major weaknesses in the judiciary system and institutional capacity to implement effective forest management and conservation mechanisms. These will be discussed below based on stakeholder consultations of this research.

9.3. IDENTIFYING THE CHALLENGES IN FOREST GOVERNANCE AND MANAGEMENT

In the following section, several of the challenges identified in forest governance systems are presented. These challenges are identified based on the consultations of this research with relevant stakeholders and reflect the perspectives of the government, civil society organisations, and international development partners to provide a more comprehensive outlook on the nature of the major obstacles to forest governance. After reviewing the problems and weaknesses identified in this section, this chapter discusses the opportunities and pathways that can be utilised to develop an effective and inclusive system of governance to manage Timor-Leste's forests for sustainable development and poverty reduction.

9.3.1. Blind Spots in the Legislation and Weak Law Enforcement

An important gap in the current legislation related to forest governance is the lack of a land law which can promote and clarify the property rights of communities and individuals. As has been noted previously, land ownership is a problematic area in Timor-Leste as, in the past; people were given different types of land titles which were issued by the governments under Portuguese, Indonesian and Timorese rules. This has caused a wide range of complexities, which are exacerbated by the lack of a current land law, and which the local communities are not capable of solving. It was reported that in March 2012, there were 5,616 land disputes which constituted 11 percent of the total claims (Rede Ba Rai, 2013). Moreover 3,227 of these were

awaiting the courts. In Timor-Leste, the lack of a land law not only jeopardises the existing high social capital within communities, but also contributes to local level conflict. It leads to a weakened interest of communities in managing their land sustainably, and of private investors to contribute to the economic development of the country. Furthermore, it contributes to malfunctioning forest protection measures. For example, communities living in or adjacent to, protected areas continue to farm because they claim the ownership of that land: “There is no clear division between the community forest and the government owned forests. There is still farming going on in protected areas because people claim that land belongs to them” (Personal Communication, 2012, Fieldwork).

This research finds that a second major constraint behind poor forest governance in Timor-Leste is the weak monitoring and enforcement of the existing rules and regulations. Several examples of this problem were raised during the research interviews. According to the Environmental Licensing Decree Law, a licence needs to be obtained from Dili for logging wood that is larger than three cubic metres otherwise it cannot be obtained at the district level. There are some checkpoints to control the logging transfers, however, law enforcement is very weak and the monitoring system is constantly malfunctioning. Therefore, there is no guarantee that a person has not harvested ten cubic metres of wood when they are only licensed to harvest three. Moreover, there is a limited communication mechanism to share information regarding existing laws, policies and rules.

9.3.2. Inadequate Human Resources

This research identifies a number of severe problems associated with human resources in the governance of forests in Timor-Leste. To begin with, the research revealed that most leaders lack quality education, and do not have an awareness of

the importance of the environment for sustainable development and poverty reduction. They are mostly educated in politics and have experience around political issues. A large pool of leaders with no science background or technical knowledge of sustainable development means that many projects are rejected simply because their importance and contribution to sustainable development are not understood. The decision makers have a very low understanding of environmental degradation, climate change and their potential impacts on the livelihoods of the people.

The National University of Timor-Leste, through its Faculty of Agriculture offers courses in technical education on forestry, but the focus of the courses is usually diverted to traditional agriculture with no specialisation offered in forest management. Moreover, the quality of education is not up to a good standard. Many university graduates from the Faculty of Agriculture take up civil servant jobs, without adequate technical knowledge and capacity to work independently (Personal Communication, 2012, Fieldwork). This research revealed that civil servants are unable to deliver what is expected of them without being reminded of their tasks and duties. Lack of transparency in recruitment and low levels of pay are also highlighted as factors leading to employment of poorly educated staff.

Furthermore, numbers of staff employed in forestry are insufficient. There are only four to five forest officials who are deployed in each district. Seventy percent of these officials are employed as forestry extension workers for the purpose of raising awareness within communities (Personal Communication, 2012, Fieldwork). The remaining thirty percent are employed as guards to report illegal activities to the police (Personal Communication, 2012, Fieldwork). These officials are often left alone with no resources or support upon recruitment. Although there are training opportunities offered by different ministries or donors in relevant sectors, forestry

staff hardly benefit from these. This reveals that there is a great deal of missed opportunities when it comes to utilising staff development training for public servants.

There is also limited scope in the currently available vocational training programs to equip young people with the skills that would be essential for forest sector development. The available programs include those on construction, tourism and hospitality, finance and administration, information technology and education, training and assessment, and the agriculture and automotive sectors. Planning has started for training in Petroleum and Maritime industries and in Health Services as well.

This research suggests that additional training programs need to be developed for the manufacturing and processing of forest products, eco-tourism, agro-forestry and renewable energy technology to help equip the workforce to be employed in green and productive sectors of the economy.

9.3.3. Conflicting Interests of Different Ministries within the Government

Often conflicting interests and lack of coordination among different ministries cause problems for effective forest governance. This research finds that an integrated solution is not always sought by different segments of the government. For instance, whilst the forestry department may be supporting eco-tourism as a sustainable way of conserving the forests in the country, the Ministry of Tourism may be encouraging mass tourism. The differing political agendas of different political parties, lack of motivation and commitment at the ministerial level to coordinate with each other, and consult with civil society organisations or the community contribute to poor governance and a problematic chain of command.

9.3.4. Budgetary Constraints and Poor Prioritising of Forest Sector Development

This research found out that Ministry of Agriculture, Forestry and Fisheries (MAFF) was allocated an annual budget of \$16,186 million in 2012 to be distributed among its 12 national directorates and offices (Government of Timor-Leste, 2012b). This amount was about one percent of the total government budget in 2012. Out of these 12 directorates, the National Directorate for Forestry was allocated an annual totalling to \$542,000 to be spent between its seven departments (Government of Timor-Leste, 2012b). These departments dealt with reforestation, protected areas, production, protection, soil conservation, finances and planning. Staff salaries which was \$273,000 constituted more than half of the budget (Government of Timor-Leste, 2012b) and were spent among a total of 182 staff members; 84 employees in Dili, and 98 in the rest of the 12 districts (Personal Communication, 2012, Fieldwork). This meant that the directorate was left with an operation budget of \$269,000.

Whilst MAFF received only one percent of the total government budget, which is already very small, the budget allocations for forestry directorate within MAFF is an indication that forestry is not a main priority within the ministry. The overall sense this research acquired from the consultations is the view that Timor-Leste is as a very young country which cannot afford to prioritize environmental concerns yet. This way of thinking among decision makers also reflects that there is limited understanding of the role of forests for people's livelihoods and the importance of their sustainability for poverty reduction and MDGs.

Based on the consultations of this research, it was clear that in the face of a very limited operational budget, the donor contribution to the functioning of the directorate was considerable. The Japanese government for instance has supported

the directorate with \$1.2 million worth of inventories including motorbikes, cars, remote sensing and computers (Personal Communication, 2012, Fieldwork). A personal interview with a representative of the Japanese International Cooperation Agency (JICA) revealed that because of insufficient personnel, the majority of the inventories were rarely used (Personal Communication, 2012, Fieldwork).

Moreover, while ideally a budget should follow management plans, the plans are drafted according to the budget in Timor-Leste. Given the restricted government budget, many projects remain donor-driven, poorly designed, and generally short sighted with restricted or no strategy in place to ensure environmental sustainability, gender equality and community participation for effective decision-making (Personal Communication, 2012, Fieldwork). Generally, there is a lack of motivation to implement environmental impact assessment into environmental management, and planning and project design. This is partly because large donor-driven projects are attracted to low costs, and environmental protection measures are simply ignored because they increase the cost of the projects. This research also identified that there is no political leadership to push for better budget allocation for the directorate.

9.3.5. Lack of Public Awareness and Interest in Sustainability Measures and Initiatives

Lack of community awareness and local people's poor economic conditions are some of the factors contributing to Timor-Leste's environmental problems including forest loss. This research suggest that some of the unsustainable traditional practices that are aggravated by people's lack of awareness of their implications and poverty are human-induced bush fires, unsustainable harvesting of firewood for energy needs and income generation, free grazing of animals, and slash and burn agriculture.

Myths about climate change and mis-information about what it is caused by are wide spread in the community, which contribute to unsustainable use of natural resources.

This research has found that community participation in project design is often limited. The objectives of environmental or livelihood projects are not communicated well to the local people, which results in community disinterest in matters related to environmental sustainability or forest regeneration. Socio-economic and cultural factors including poor education and social norms about women's roles constrain environmental/livelihoods project development and its implementation. For example, having consulted with some of the participants of the bio-gas and solar energy projects in rural districts, this research found that there were problems in the design of these projects. The beneficiaries of the projects were rarely given training on how to maintain the infrastructure and address any problems in case of a malfunction. For example, beneficiaries of the bio-gas project in Manatuto district were left with two biogas-tanks filled with water during the rainy season. The climate proofing of the infrastructure was ineffective and the participants had no means of maintaining and recovering the system. This was contributing to a lack of community ownership of the projects and high expectations amongst the beneficiaries that the government or another implementing agency would come and attend to the problems. Although collecting solid waste for bio-gas projects was not a social taboo, in the dry season, the local communities found it much easier to collect firewood instead of animal dung for which one would have to travel far after the free grazing animals which would themselves travel long distances in search of water.

The fieldwork of this research also revealed that rural people would not be so willing to get involved in a project unless the end result was demonstrated. This meant that securing community interest and willingness to participate in projects require time

and convincing. Moreover, unless very strong incentives are provided, people often lack the motivation to undertake hard work such as terracing land, planting trees, or collecting animal dung in the dry season which all require time and labour.

9.4. RECOMMENDATIONS FOR SUSTAINABLE FOREST GOVERNANCE: IDENTIFYING STRENGTHS AND OPPORTUNITIES

Sustaining a healthy eco-system, increasing the well-being of forest dependent communities, and developing green sectors of the economy for job creation require political commitment, better prioritisation of, and budgeting for relevant sectors, and increased human and institutional capacity to manage Timor-Leste's natural resources. Political leadership that is equipped with a well-developed vision for sustainable development is essential to push for strengthened policies, enforcement mechanisms, and better budget allocation for projects that support conservation and sustainable use of forest. The creation and enhancement of a vision for sustainable development also lies within the systems that create human capital at all levels of the society; albeit in the form of formal education, vocational training or other sorts of learning and skills attainment schemes through civic education and communication campaigns. The prospects for human capital development to improve people's socio-economic status and sustainable development were discussed in detail in the previous chapter of this thesis.

Under the current government structure, the Ministry of Agriculture Forests and Fisheries (MAFF) is the key department to take the sustainable development leadership on board, push for continuing financial and political support for legal framework and programming that internalises the links between forests, balanced ecosystems and sustainable livelihoods. It is the duty of the government to create a transparent and efficient environment for strengthened synergies between the

community, academia, research institutes, NGOs and international development partners for long-term goals that are in line with the national priorities. It is also important that the different ministries within the government (such as the Ministries of Investment, Education, and Tourism, Economy and Development) coordinate for strategic action to translate ideas into projects and benefit from Timor-Leste's forests to reduce poverty, increase food security, and foster green growth and job creation. Public consultation in identifying the priority areas and public participation in project design and co-management schemes are particularly important to ensure public ownership, trust and public confidence in the government, civil society organisations, and other development partners. Strong bilateral and multilateral collaborations are also significant to secure sustainable financial, technical and technological support to implement sustainable forest policies and programs that are aimed at improving the livelihoods of the people. Based on the consultations of this research and the available literature, this chapter identifies some of the opportunities mentioned below to strengthen the governance and management of forests for improved livelihoods and poverty reduction in Timor-Leste.

9.4.1 Prospects for using Timor-Leste's Customary Laws 'Tara Bandu' to Conserve Forests and Resolve Local Conflict

9.4.1.1. Tara Bandu

Since 2002, traditional leaders have been advocating a move, often with support from local authorities or civil society organisations, to revive a set of traditional laws named 'Tara Bandu'. Also described as Timor-Leste's traditional ecological wisdom, Tara Bandu literally means the hanging laws and they are used by communities to regulate relations between people as well as people and the environment. They are a set of verbally agreed procedures and methods based on people's agreement at the village level. The rules may also cover issues between villages or at the district level.

Tara Bandu generally restricts access to, and use of, natural resources and spaces for a particular period of time to allow regeneration of the natural environment and may be used to prohibit certain unsustainable practices. The bans may include restrictions on fishing in an over-exploited reef, a ban on disturbing a turtle nesting site, or fair use of sandalwood or of a tamarind forest (Carvalho, 2011). The customary law also deals with local level conflict such as land disputes and may prohibit activities such as theft of produce or livestock or sexual misconduct. Tara Bandu varies widely in form and content throughout the country, and given the diversity of languages spoken in the country, can be known under different names such as *Lobu* and *Kerok* (Carvalho, 2011). Although the usage of term varies, the concept generally holds.

Tara Bandu requires a large public ceremony which usually involves animal sacrifice, following a public meeting that determines the things that need protection and particular sanctions or fines for particular activities. The application of Tara Bandu and sanctions may be physically represented in the form of a wooden pole strategically placed in a village, with parts of plants and animals attached to it (see Figure 9.1).



Figure 9.1. Images of Physical Representation of Tara Bandu. Source: Carvalho, 2011

The plants are economically valuable species, common grasses, and other plants; the animal remains may be cattle skulls, or chicken feet, for example. What is symbolised on a pole is generally protected within a certain area for a certain period of time and the symbol can indicate the price that needs to be paid for violating the ban. This ritual then involves requesting the approval of spirits to endorse the regulation agreed by the community members. The ceremony finishes with a large community feast and a celebration of the endorsement of Tara Bandu. This traditional practice reflects the notion that most Timorese citizens retain some vestige of animist beliefs which they have come to regard as more cultural than religious.

According to Tara Bandu, there are two ways of punishment for the person who violates the rules. If the person is caught by the traditional guard (some villages appoint three to four Tara Bandu guards within their community) or is otherwise exposed, they will be fined or burdened according to the agreement of the ceremony. The fine can be either paid with money or animals depending on the local leader's decision. According to traditional belief, if the person violates the rules and is not caught, then they will be punished by natural forces in the form of suffering a curse,

such as a pest attack, illness of one of the family members, or death of their livestock, for example. This relates back to the belief that ancestral spirits will protect the natural resources and ensure good use of them.

9.4.1.2. A historic view on Tara Bandu

In this section, this research presents a historical review of Tara Bandu to elaborate on how these rules have evolved. The context of the past is important to reflect on the current strengths and weaknesses of this traditional practice and to give a more complementary outlook.

The majority of the older people in the governing roles believed that Tara Bandu was conducted all throughout Timor-Leste in the pre-colonial times (Carvalho, 2011). Tara Bandu was applied when the tradition of oath-taking was adopted among the *liurai* who governed areas with adjoining boundaries. Through cooperation between kingdoms, Tara Bandu could be passed on to other places and expand boundaries.

During the colonial period under Portuguese rule, it was stated that there was great confusion and inconsistencies in the practice of Tara Bandu (Carvalho, 2011). It was believed that the introduction of military influences and various levels of military ranking in the traditional administration system caused internal conflict between the *liurai* and destroyed their friendship. This was mainly because the colonial powers gave ranks to the governors based on their trust and their loyalty to Portuguese authority and, hence, weakened the system of Tara Bandu which initially bound the *liurai* together (Carvalho, 2011).

Under the Indonesian military regime, the practice of Tara Bandu was banned by militaristic enforcement (Carvalho, 2011). The conduct of Tara Bandu was weakened to a large extent and the tradition could not be passed on to the next generation. The

revival of culture and national identity through the revitalisation of traditional practices is not very uncommon in transitional societies. After Timor-Leste's independence, not surprisingly multiple grassroots organisations, traditional leaders, and also the government of Timor-Leste had an interest in revitalizing the tradition of Tara Bandu. Although two influential people at the time (Mr Manuel Mendes and Mr Demetrio do Amaral de Carvalho) pushed for traditional laws to be integrated into Timor-Leste's constitution, they did not succeed. The laws remained excluded from public law. The first ceremony of Tara Bandu was held in 2003. Civil society groups such as Haburas and KSI have been very influential in the revitalisation of this custom in various parts of the country. The government is currently supporting this initiative by involving village chiefs in its socialisation.

9.4.1.3. Current use and strengths of Tara Bandu

Tara Bandu is currently implemented in various parts of the country and has differing rules and penalties. This research identifies that there are two common features of Tara Bandu. These are the inclusion of the ban on arbitrarily chopping down trees and, secondly, great community respect for Tara Bandu in rural areas. It was apparent that when Tara Bandu was not implemented in the village, the community raised its concerns for the need to have it. Quotes taken from focus group discussions of this research shed light on how the context of Tara Bandu differs from one district to another. They also hint at the great community respect for this traditional practice:

We have Tara Bandu and it is the rule to not chop down trees arbitrarily. It creates respect for the environment and forbids animals to enter other people's plantations, rivers and dry lands.....The chief of the village informs the whole village and for the celebration we kill buffalo, cows and pigs. If

someone does a faulty behaviour then based on the fault, they have to pay back double the amount of animals that were killed during the ceremony for that particular prohibited action. (Fieldwork, 2011- 2012: District Manufahi).

Tara Bandu is being implemented in Manutasi by the chief of our village. The rules are about preventing us cutting [down] trees arbitrarily, stopping us fighting or insulting each other or stealing each other's goods. If we have a dispute and somebody gets a sanction we agree to pay for our fault in the form of money or buffalo. (Fieldwork, 2011- 2012: District Ainaro).

Tara Bandu has been implemented since 2005. According to Tara Bandu, we should only collect and chop [down] trees in our own land. We also have to protect the *Ai bubur* (gum tree) and mangroves. We respect Tara Bandu and some people even get penalised for their faulty behaviour. We believe we need Tara Bandu because there is no other way. (Fieldwork, 2011- 2012: District Liquica).

This research has found that although the practice was traditional in nature and has always been governed by the traditional leaders in the past, the current society of Timor-Leste supports a hybrid governance structure where modern and traditional structures coexist and support one another. This community view was reflected in the quote below.

The village chief has informed us about not chopping [down] trees arbitrarily. We have been informed about Tara Bandu but it is not socialised or practiced in the community yet. We want the government to implement it. (Fieldwork, 2011-2012: District Lautem).

Besides civil society organisations and the government, international agencies such as the UNDP and bilateral donors such as JICA support Tara Bandu. Besides its relevance for environmental management, the UNDP acknowledges the importance of Tara Bandu in its ability to preserve and resolve conflict at the community level. UNDP country director, Mikiko Tanaka, in her speech quoted below, gives Tara Bandu as an example to reflect on how far Timor-Leste has come in dealing with conflict:

A long running violence in a rural village just outside Timor-Leste's capital ended yesterday with a dance, a prayer, a speech, and the sacrifice of a goat and a pig. For years, rival youth groups in two communities in the hilly sub-district of Metinaro, fought fiercely over land issues. Nothing could put an end to their aggression, until now. A ceremony, known locally as a Tara Bandu, brought villagers together to make a communal promise. In this case, nearly three dozen members of three rival martial arts groups and elder representatives from two villages signed a document pledging them to respect the environment, cease using violence to solve their disputes, stop occupying others' land, and end hunting in protected areas. More than 500 villagers came to witness this

traditional ritual that ended in an animal sacrifice to seal the deal (UNDP, 2011a).

The Government of Timor-Leste has supported the customary law of Tara Bandu and commitment was made through the establishment of a new department called the Department of Peace-Building and Social Cohesion in 2010, under the Ministry of Social and Solidarity. This commitment is also aligned with the National Constitution (section 56: Social Security and Assistance) stating that the state shall promote, in accordance with its national resources, the establishment of a social security system (Government of Timor-Leste, 2002). The role of the new department is to support and mediate social conflicts around the country in close cooperation with community leaders, Council of Villages, churches, districts officers, as well as development partners. The new department has also played a crucial role in training mediators at the national level to be able to work with community leaders and promote peace and security across the nation. The methods used by these mediators in dealing with conflict issues are a blend of the local cultural practice of Tara Bandu and modern mediation techniques, a combination that is unique to Timor-Leste. This scheme hence advocates Timorese's culture and dignity in order to address social conflicts in a constructive manner.

This research identifies that the main strengths of Tara Bandu are the fact that the practice builds social capital for protection and conservation of natural resources, is a mediating tool for conflict resolution at the local level, and also strengthens national identity through the preservation of Timor-Leste's unique culture. Tara Bandu provides a venue for people to come together and discuss their own problems and create mechanisms for solving these within the capacity of their resources. Tara Bandu's strength also lies in the fact that the approach is mostly participatory and

encourages a collective effort for peace building, conflict resolution and natural resource management.

9.4.1.4 Weaknesses of Tara Bandu

Although Tara Bandu offers great potential as a community-based environmental governance and management practice, this research also identified some weaknesses which need to be taken into account. First of all, as discussed earlier, the customary laws of Tara Bandu are passed down by word-of-mouth which means they do not exist in written form. Because they are not written, their interpretation varies from community to community depending on the elders. Due to the displacement of people and break down of traditional community life during the Indonesian occupation the knowledge of Tara Bandu was not able to be passed down between generations and subsequently the interpretations of Tara Bandu have become confused. Moreover they are not incorporated into the Timorese legal system or supported by the public law. With the diversity of languages spoken in Timor-Leste and the above-mentioned reasons the sustainability of these laws is threatened (Carvalho, 2011).

Secondly, there is limited means of measuring the impacts of using Tara Bandu on the improvement of the environment. Thirdly, the enforcement of sanctions is problematic and rules are not implemented very well. In some areas where Tara Bandu is in place, people fail to obey the rules and can evade punishment. Illustrated in the quote below, some of the stakeholders responded that people chop down trees or collect sand in rivers where Tara Bandu is conducted and they still do not get any sanctions:

The rules are not implemented very well. People cut trees and sometimes do not get any sanction properly. Near the Comoro River there has been a Tara Bandu ceremony. They said there is a rule for not getting sand 200 metres from each side but no one is following the rules. It is still going on.

(Fieldwork, 2011- 2012)

Another weakness associated with Tara Bandu is related to the ill-defined roles and responsibilities of customary authorities and the government. This research has found that in some villages there was great confusion about who should be responsible for the implementation and monitoring of Tara Bandu. This was because in some villages the practice was initiated by the local government representatives (village chief) and this contributed to a perception that the government was responsible. On the other hand the police did not intervene in certain instances suggesting that the problem needs to be dealt with by Tara Bandu. These issues are reflected in the quotes below:

Tara Bandu has a long history but people for example used to collect money to employ *-Kabuleha-* traditional police to look after the rules and monitoring of Tara Bandu. The new system tries to do the same but the community thinks it is the government initiative therefore the government shall pay for the Kabuleha. Who is going to monitor the people?

(Fieldwork, 2011- 2012)

In Manatuto, there have been a few issues with human induced fire. People wrote a claim and complained to the

police but the police did not take responsibility as they thought this problem needs to be taken care of by Tara-Bandu. (Fieldwork, 2011- 2012)

There are also certain constraints on the ability of communities to protect and manage resources the way they once could. Many communities have been resettled onto land over which they have no ancestral claims. These ‘outsiders’ were dislocated from their own ancestral lands through the upheaval of occupation and warfare and currently have rights of use to the land they occupy. Customary belief systems in Timor-Leste tie ancestors to their place of origin and when communities have to make offerings for planting or harvest ceremonies, they are paying tribute to the ancestors of the land. In some areas, people find the main obstacle to the enforcement of Tara Bandu as the presence of ‘outsiders’ in the community who do not recognise or comply with these local prohibitions (Carvalho, 2011).

Another weakness of Tara Bandu is linked to the difficulties in terms of sustaining trust in this traditional system. A report by UNESCO stated that young people tend to refuse to accept the customary laws. A higher percentage of young people violate the rules of Tara Bandu compared with the older generation (Carvalho, 2011). This particular report also shows that ten percent of the people prefer to go to local legal authorities and would like be referred to the formal justice system if they contravene the prohibition (Carvalho, 2011). Although respected by the majority of the community, it is evident that Tara Bandu on its own will not be effective enough to deal with local level environmental problems and conflict in Timor-Leste. As reflected in the quotes below, legitimate judiciary, complementary laws and people’s good will are needed.

There is a need for formal regulation system. There are always people who would not like to follow Tara Bandu and therefore there is a need for a legitimate judiciary system to enforce people to obey rules and enforce sanctions. (Fieldwork, 2011- 2012)

Tara Bandu is a good practice but the government shall not force Tara Bandu as the only means to protect forests. I believe Tara Bandu is not a very effective way to protect forests. The Government shall put other systems in place and Tara Bandu shall only be complementary. Effective laws, forest guarding and people's good will are needed. (Fieldwork, 2011- 2012)

Tara Bandu can be also somewhat restricted in its application and capability to respond to some of the emerging problems. This research identified that Tara Bandu is only applied to community and government land whereas it does not have any binding enforcement to people's individual inherited land. This means people are allowed to overexploit resources on their private land which is a problematic issue considering that land law is not in place and there are around 49,654 land claims as of March 2012 (Rede Ba Rai, 2013). In the context of rapid population growth and insecure land tenures, it is of great concern that if land titles are given in forested areas, it will cause further deforestation and environmental degradation even if Tara Bandu is practiced.

Moreover, Tara Bandu does not respond to some of recent environmental problems such as excessive rubbish which may have not existed in the past. Although flexible

in nature, Tara Bandu on its own may remain restricted in its capability to respond to some of the recent challenges such as solid waste and pollution:

We have a big rubbish problem in the village. Tara Bandu does not apply to this and it does not force people to put rubbish in the bins. We need forest policing (Fieldwork, 2011- 2012: District Ainaro).

Finally, the practice of Tara Bandu is strongly influenced by the culture of paternalism. Women in Timor-Leste have been traditionally locked out of decision-making (Hicks, 2012). Most decisions are made by hereditary or appointed authorities who are men. Therefore, there is a strong gender bias in the process of Tara Bandu.

9.4.1.5. Weighing strengths versus weaknesses: Recommendations related to Tara Bandu

Given the post-conflict context of the government with weak institutions and inadequate human resources, it is important that the power, duties and responsibilities for sustainable development and forest management are delegated amongst different stakeholders including the community members. One way to encourage this in a traditional society like Timor-Leste is not to isolate culture and tradition from policy making. In the context of Timor-Leste, despite its weaknesses, Tara Bandu stands out as an organic system that is an essential building-block for peace, sustainable development, and the conservation of biological and cultural diversity. It is also a means to preserve and create social capital within communities. Tara Bandu can help support the legal system through communities finding solutions to their own problems and monitoring and enforcing the rules they have established themselves. Often ideas created at the community or household level can create

societal and technical ingenuity to reform local institutions and to solve collective action problems.

Giving customary leaders more formal recognition and power and supporting the implementation of Tara Bandu can help communities establish flexible systems of governance and adjust to new pressures at the local level. Such an approach would entail changes in the way the government sets development priorities related to the preservation and use of forest resources by giving greater responsibility to local communities (with priority given to the most forest reliant communities), and placing them at the centre of integrated forest management. In this way, policy and project development can start with the local people who are both victims and agents of environmental change.

In supporting the recognition of Tara Bandu it is also important to promote greater participation of women in the decision-making process. In a study of 351 communities in Nepal and Gujarat (a state in India), Bina Agarwal finds that greater participation of women in decision-making bodies makes a notable difference towards conservation outcomes and women's contribution to the setting up of rules and enforcement mechanisms are associated with better forest outcomes (Meinzen, Jain, & Di Tommaso, 2012). Agarwal suggests that this is partly due to the fact that the nature of women's dependence on forests is somewhat different or often greater than that of men. This author argues that this is because of the differences in gender division of labour and the fact that women earn and own less which makes them more reliant on common natural resources. Hence, their contribution provides a complementary approach to decision-making in regards to the conservation and use of forest products (Sharma, 2013). In a patriarchal society like Timor-Leste, there is no simple policy lever that can ensure effective participation of women. Their

participation can simply become token; that is, women physically being present yet remaining silent and their decisions being unheard. However, Agarwal's study also finds that if there are more women in such governance structures (even with external facilitation), their presence attracts more women's participation and this, in turn, leads to more effective systems of governance. Hence, it is important to encourage women's participation in Tara Bandu even if it is initially facilitated by NGOs or the government itself.

More participatory research can improve the understanding of the potential role of traditional knowledge systems for sustainable forest management. Research related activities such as developing a traditional ecological knowledge (TEK) database, storing traditional land use information, and oral stories can also contribute to job creation. It is evident that recognition of culture and traditional ties are important in efforts to promote justice and sustainable development programs in Timor-Leste. The government and other development partners then should promote the ownership of this unique Timorese cultural practice among all segments of society including youth. This is not to say that the customary laws shall replace the modern justice system, but to suggest that Tara Bandu is a complementary measure which can support the current legal system of environmental governance in Timor-Leste. It is a way to promote local management systems for conservation of forest resources whilst creating a sense of responsible citizenship for a sustainable future.

In the absence of a well-funded and functioning government forest protection system, strengthening Tara Bandu seems to be a viable and practical option for conflict management over forest resources and stewardship of natural resources. By investing in local management schemes like Tara Bandu, Timor-Leste can preserve the ecological and cultural diversity and also maintain its high social capital. As

discussed previously, it is imperative that Tara Bandu is complemented by an effective and well-enforced judiciary which would require the endorsement of an appropriate land law. Furthermore, even with a strong legal system, it would also be very difficult to reduce forest degrading activities if they are a part of people's subsistence living. Therefore, alternative livelihood assets such as human and physical capital and sustainable strategies (such as the ones mentioned below) need to be strengthened for a more complementary solution.

9.4.2. Prospects for Community-Based Reforestation and Agro-Forestry Programs

Timor-Leste's National Strategic Development Plan (SDP)⁴¹ (2011-2030) is committed to preparing a Forestry Management Plan in order to promote reforestation and sustainable land management practices in the nation (Government of Timor-Leste, 2010a). The plan is aimed at defining zones suitable for small-scale and commercial forestry, selecting the best species for hardwood, construction and agro-forestry, identifying potential markets and depicting Timor-Leste's comparative advantage for high-value tropical hard-woods. This plan targets community contribution for the decision-making in all aspects of forest planning and management. The forest management plan will certainly be a crucial step in strengthening the forestry sector for income generation and land management through community participation and, once fully approved, it will help achieve concrete outcomes. In this report for example, high-value timber trees, such as

⁴¹ The Timor-Leste Strategic Development Plan (2011-2030) is a twenty year vision that reflects the aspirations of the Timorese people to create a prosperous and strong nation. SDP envisions extensive work and strategic thinking carried out across all industry sectors and ministries and provides a road map for collaborated action to achieve sustainable development in the country.

sandalwood, red cedar, teak, mahogany and rosewood are suggested as species to be propagated in community-based nurseries (Government of Timor-Leste, 2010a). Planting of such species is a good way to regenerate Timor-Leste's exploited native trees and, at the same time, provide timber sources for industries such as sawmills and high quality furniture making. What is missing in SDP however; is the importance of regenerating forest resources that would provide people the means for subsistence living without further degrading the existing natural resources.

This research has identified that there is predominantly heavy reliance on forest resources for energy and construction purposes and the demand put on Timor-Leste's already degraded forests will be further exacerbated by the increasing population pressure. Community-based nurseries could provide a practical alternative to allow farmers to grow trees in their locality in line with their needs. Chapter 7 of this thesis provided a list of commonly used forest resources that people employ for their energy needs, for food, construction, housing, medicine and income generation in the five districts of Timor-Leste. This study can be extended to explore commonly used forest resources in all districts. The identified species need to be considered for potential nurseries, however further research is needed to assess the compatibility of these species with Timor-Leste's climatic and soil conditions.

One possibility of the community reforestation scheme is the creation of village-based plantation woodlots and reforestation of degraded areas to meet domestic demand with limited commercial opportunities. Small scale forest blocks under direct or joint ownership and management by close-knit communities can provide assurance for long term success. During the stakeholder consultations of this research, it was mentioned that the rural people would be more interested in participating in such schemes if they are provided with demonstration sites and they

could see the end result. Piloting of village reforestation projects is therefore important to create demonstration sites for other villagers to apply these ideas and learn from previous experiences. As an example, with the support of a local NGO named Haburas, the coastal village Ulmera (in Liquica district), has established Timor-Leste's first mangrove seedling bank (see Figure 9.2). The community appears to enjoy the economic and environmental benefits since they have been involved in the management of this project. This initiative could be used as a demonstration site for other coastal communities.



Figure 9.2. Mangrove Seedling Bank Project in Ulmera, Liquica District. Source: Photo taken by the researcher

The government is committed to supporting the planting of one million trees nationwide every year through community-based nurseries (Government of Timor-Leste, 2010a). It is indeed a very ambitious target, however as indicated previously, a clear plan of how this target will be implemented and how regeneration of forests will be achieved, particularly in the heavily degraded and populated areas, needs to be communicated. Stakeholder consultations of this research revealed that there is a

lack of investment in the native seed collection. Most seeds are bought from outside (mainly Indonesia) which creates a form of dependence. It is very important that investment is directed at development of a national seed bank based on collection and preservation of good quality local seeds.

Moreover, support mechanisms need to be in place for communities to benefit from these nurseries and create the incentive to manage and protect the plants until they grow to a maturity. For example, the Indonesian model could be explored. This is a model in which the private sector becomes involved in community planting schemes with cash contributions. Consequently, regenerated forest products provide investment returns both for the private investors, government, and the local people themselves. This research noted that percentage of households that plant trees increased when they were supported (either with seeds or other products, training or cash) by NGOs, donors, or the government. This research also found that support provided in the form of training and products had a more profound effect on households' tree planting activities compared with cash transfers. In developing community based reforestation schemes, it is vital that appropriate incentives are put in place. Such incentives can also provide opportunities to empower women and invest in their potential role as environmental stewards.

This research suggests that agro forestry initiatives,⁴² despite their current unpopularity in Timor-Leste, deserve further attention. Currently Timorese farmers rarely incorporate tree planting within their rotational fallow systems of food crop gardens. McWilliam (2002) argues that this is mainly due to past failures under

⁴² In agro forestry systems, one or more tree crops are combined with one or more food crops or animal farming on the same land.

different government regimes, corruption, the exclusion of local farmers in planning and decision-making, poorly skilled extension staff unable to assist farmers, and promotion of inappropriate or unhelpful tree species. Integrating agro-forestry techniques into farming practices offers great potential to respond to concerns related to land degradation and deforestation.

Stakeholder consultations suggest that growing legumes alongside with crops have numerous advantages. Legumes are nitrogen fixing trees and stay green throughout the dry season, hence improving the soil fertility. The trees grow rapidly within a year or so which means that there is no long waiting period for farmers. Having legumes growing on the farm land reduces soil erosion and weed invasion. Legumes also weaken the impact of heavy rainfall and strong winds on crops and plants, and reduce the speed of water running off of the top layer of fertile soil that is rich in nitrogen. Moreover, legumes can also be a source of household firewood and, depending on their management, can be sufficient to meet a household's needs. The branches can be harvested repeatedly after leaves are used as forage. Legumes are also high in protein and highly palatable to livestock. Therefore, reforesting areas with legume trees can also help decrease grazing pressure and improve watershed health. Crop rotations based on legumes, intercropping, and relay cropping can help reduce the need for nitrogen fertiliser. Through diversification into livestock, farmers can make efficient use of forages, crop residues and manure, thus, improving soil organic matter and quality. Moreover, consultations of this research suggested that an agro forestry system is particularly suitable for small farmers and for poor quality lands because well-chosen crops reinforce each other and yield more food and fuel than when grown separately. Provided the benefits, investment in agro-forestry initiatives seems to be a very practical option for Timor-Leste.

There is also a need to identify appropriate exotic and native tree species which are both economically useful and can support (or, at least, not prohibit) production of staple and commercial crop yields. Prospective agro-forestry species can include combinations of timber, fodder and marketable fruit trees such as coffee, candlenut, and cocoa. Sandalwood as a long term component can be a complementary commodity.

For an agro-forestry development initiative to be successful, however, there needs to be an integrated landscape approach that addresses both the diverse and short term agro-ecological needs of farming communities and the balance of competing agro-economic practices. The initiative also needs to be supported by secure land tenure and land use policy environments. Without an effective communication strategy, securing the interest of the farmers would also be very hard. Village or subdistrict level demonstration sites can be an effective way to facilitate communication with farmers and provide training. Through educational demonstration sites, local farmers can be involved in the use of appropriate technologies, selection of species, and propagation process. Their participation can also revive traditional methods which can be adopted for management of agro-forested plots. Finally, attempts to promote afforestation, reforestation and agro-forestry would be undermined unless complementary initiatives are adopted to improve extensive cattle, buffalo grazing systems, and cultural burning regimes.

9.4.3. Prospects for Renewable Energy

One of the aims of the Strategic Development Plan (SDP) is to develop a National Renewable Energy Policy to address energy poverty, oil dependence, and people's widespread use of firewood for energy needs (Government of Timor-Leste, 2010a). The SDP acknowledges that there is high potential for renewable energy in Timor-

Leste such as in the form of hydro-electricity, wind, bio-mass and solar energy. Current policies such as the Rural Electrification Plan also give high priority to renewable energy. For example, the off-grid strategy is based on providing households with standalone solar photovoltaic (PV) systems.

The plan aims to provide financial and technical support to communities to install renewable energy sources. This reflects a potentially good entry point for renewable energy solutions. In fact by 2020, at least half of Timor-Leste's energy is targeted to be met by renewable energy sources (Government of Timor-Leste, 2010a). In 2009, the Secretariat of State for Energetic Policy (SEPE) launched a renewable energy program. The 2011 government budget for renewable energy was USD \$1, 963, 000. From 2007 to 2010, more than 2000 PV systems were allocated to households with no cost incurred by the government (Government of Timor-Leste, 2012). It is estimated that currently nationwide 60, 000 households are provided with access to electricity through solar panels (Government of Timor-Leste, 2012).

The contribution of the local and international NGOs to the renewable energy schemes has been also substantial. Several solar energy, fuel efficient stove and bio-gas projects are implemented by international agencies and donors (see Figure 9.3 for a selection of images).



Figure 9.3. Images of Energy Efficient Stove and Installation of a Solar Panel. Source: Government of Timor-Leste, 2012

These projects are aimed at reducing the burden put on Timor-Leste's forests, reducing time spent collecting firewood and cooking, decreasing the household's energy expenditure, and providing a clean alternative with less exposure to smoke and associated health problems. Consultations of this research with some of the project beneficiaries suggested that community members, particularly the women, were very satisfied with cooking using fuel efficient stoves and solar panels.

Mercy Corps (an international NGO that is heavily involved in renewable energy projects in Timor-Leste) argues that a variety of management models have been piloted for a wide range of energy sources, but only community-based models have shown potential for success (Mercy Corps, 2009). Although no project has shown the capacity to succeed on a self-sustainable economic scale after the project closure, there are lessons to be learnt.

In the context of Timor-Leste, the problems seem to lie in the maintenance of technological systems, lack of community ownership, and lack of access to finances for development of enterprises in the energy sector. Consequently, this research recommends that the government, and other local and international development partners need to focus on ensuring public ownership of such projects by increased

training opportunities in the technology and intensive skills development area (such as installation of solar panels, designing and producing fuel efficient stoves or maintaining bio-gas tanks), and also encouraging voluntarism amongst young people for project support. Moreover, for a more sustainable business model, service providers need to be brought closer to the communities and provided with increased access to finances.

9.4.4. Prospects for Plantations and Commercial Partnerships

SDP states that Timor-Leste has some of the finest bamboos in the world, including the giant *Dendrocalamus asper* (au-betun) and *Bambusa lako* (au-metan, Timor Black) (Government of Timor-Leste, 2010a). Bamboo has been used for a variety of purposes in Timor-Leste for many generations and, as found in this research, continues to be widely collected by local communities for construction and housing purposes. Ecologically, bamboo is also very important and can be planted strategically to stop soil erosion and land degradation. It grows much faster than other marketable plants, taking only four to five years to reach maturity and can be harvested annually for about thirty to forty years.

Having taken the first step in establishing a bamboo industry, Timor-Leste opened its first Centre for Bamboo in 2008 in Tibar in the Liquica district. This centre produces bamboo panels and furniture. There is great potential for growth in this industry and as planned by the SDP, a National Bamboo Policy and Marketing Strategy would help initiate the steps towards producing bamboo plantations both in forested and non-forested areas (Government of Timor-Leste, 2010a). The policy can also clarify the pathways in creating jobs in the value-adding businesses and developing farmer's skills in managing and harvesting bamboo. Cultivation of bamboo would also

contribute to land conservation and erosion control purposes, as well as meeting the local demand for construction materials.

Besides bamboo, Timor-Leste has the potential to contribute to the global niche market through its valuable cash crops such as coffee, coconut, cacao, vanilla, candle nuts and palm oil. Aggregate evidence shows that, in most developing countries, the expansion of cash cropping for export is not necessarily at the expense of staple food production (Govereh & Jayne, 1999). In general, countries tend to manage sufficient growth in both, or fail to achieve either.

The SDP aims to focus on the production of organic coffee, doubling the size of coffee plantations and the rehabilitation of 40,000 ha of land (Government of Timor-Leste, 2010a). If not done at the expense of losing primary forests and putting food security at risk, the coffee business can provide both the farmers and the national economy considerable benefits. It is however important that farmers are supported with the necessary skills and organic material for pest management; that youth are trained to take on jobs for the processing of coffee; and that a sustainable and inclusive industry model is developed where benefits are shared equitably.

Secondly, the candle nut crop is primarily grown for its oil and is used by the local communities to produce energy, medicine and generate income. Small amounts have been exported in recent years; nonetheless, the four year waiting period between planting and harvesting suggests that farmers need financial support to expand candle nut production.

Coconut production processing (such as copra cooking oil) and manufacturing (products such as brooms, baskets and cooking implements) also provide great potential for employment and the export market. Although the productivity of

coconut trees in Timor-Leste is much lower than the world averages due to old and poorly tended trees, almost forty percent of Timorese households have coconut trees. Small amounts of copra are exported to Indonesia but very little value adding processing is done. Opportunities need to be sought to process coconuts not only to meet local demand, but also the international market. In this respect, SDP states that in the processing of coconut oil lies an opportunity of replacing the import of approximately US\$2 million worth of edible oil annually (Government of Timor-Leste, 2010a).

It is clear that the need exists to research synergies between cash crops and food crops to explore direct and spill over effects. These effects may include the reduced cost of input, improved farming techniques, more frequent opportunities to access credit and inputs, increased private investment leading to infrastructure, and human capital development that has broader benefits such as food crop production (Govere & Jayne, 1999)

The challenge for the government is identifying and facilitating strategic pathways to create positive interactions between food and cash crops, and between the public and private sector to improve smallholder welfare whilst preserving the ecological balance. It is equally important that the market prices for forest products reflect the true resource value of the goods.

9.4.5. Prospects for Eco-Tourism

Sustainable tourism has proven to be one of the most effective ways of providing economic and employment opportunities for local communities while protecting the world's natural resources (FAO, 2011). Eco-tourism, characterised by responsible travel to natural areas that promotes conservation of the environment, is one of the

fastest growing segments of tourism worldwide, and is growing at a pace of more than twenty percent annually - two to three times faster than the tourism industry overall (FAO, 2011). Eco-tourism not only provides employment opportunities for people who live close to the natural forests which attract the tourists, but also provides communities with the motivation to maintain and protect forests and wildlife. Although research indicates that increases in tourism may not necessarily mean poverty reduction, innovative partnerships often lead to the development of tenure and tourism rights that benefit local populations (Moser, 2006; Nimpuno-Parente, 2006).

Timor-Leste's diverse and pristine natural resources provide great opportunities for eco-tourism (see Figure 9.4). The government seems to acknowledge that eco-tourism can become a major contributor to the national economy and, hence, is committed to working with the private sector to develop tourism infrastructure that supports the key areas of eco- and marine tourism (Government of Timor-Leste, 2010a).



Figure 9.4. Images of Timor-Leste's Pristine Natural Resources. Source: Photos taken by the researcher

Since 2007, the government has been collaborating with the local NGOs to support community projects for the establishment of small scale eco-tourism industries in Timor-Leste. Communities are encouraged to submit proposals to run businesses such as guesthouses or restaurants and, if the proposals are successful, they are provided with cash credit. For example, there are eco-lodges in the districts of Lautem (village Tutuala), Liquisa, Viqueque, Dili (Atauro Island) and Maubisse (see Figure 9.5 for an image of an eco-lodge initiative in Lautem District).



Figure 9.5. Images of an Eco-Tourism Initiative in Lautem District. Source: Photos taken by the researcher

Most of the eco-lodges are run by a group of community members and do well economically. The management of such projects by community groups not only generates economic benefits but also fosters community participation and collaboration for preservation of natural resources and social capital.

Private investment can indeed provide the grounding for a more established and wide-spread eco-tourism development in the country. These investments can focus on areas that are in or around Timor-Leste's protected parks. Through eco-investment initiatives, a powerful economic model can be established to protect the land and natural resources and provide attractive returns to local communities and investors. In this respect, infrastructure development in rural areas (without undermining the natural capital) and secure land arrangements are pre-conditions for establishing an environment that attracts private investment and enables local businesses to survive. Therefore, the government has the responsibility to oversee

developments in both of the mentioned areas for transparency and appropriateness and to encourage public participation at all levels.

9.5. CHAPTER SUMMARY

This chapter has provided a review of historic trends that shaped the current institutional and policy framework for forest governance in Timor-Leste. On the basis of the consultations of this research, it presented major challenges in conserving and managing Timor-Leste's forests from the perspectives of the government, civil society organisations, international development partners, and the community. It highlighted that the problems associated with the forestry sector are related to weak legal systems with blind spots in the legislation; poor law enforcement; inadequate human resources; conflicting interests of political parties and, hence, of ministries; poor prioritisation of environmental issues and forest sector development; insufficient financial support; and finally, local people's socio-economic status leading to lack of awareness and unsustainable traditional practices. This chapter suggested that a typology of adaptive responses is needed to conserve Timor-Leste's land and forests, and to develop a strong forestry sector for improved livelihoods and poverty reduction. It identified that, in the absence of a well-funded and functioning government system, Timor-Leste's customary laws - 'Tara Bandu' - can complement the legal system for natural resource management and local conflict resolution. It suggested that by strengthening Tara Bandu, Timor-Leste can also help preserve ecological and cultural diversity and maintain high social capital within local communities. This chapter also highlighted the need for the endorsement of essential laws such as the land law and better enforcement of the existing policies and regulations for a stronger legal framework and for environmental sustainability in Timor-Leste. This chapter remarked that political leadership with a vision for

sustainable development is essential for good governance, and the emergence of such leadership is conditioned on the systems that create human capital at all levels of the society. In this respect, this chapter suggested that human capital development for sustainable development in the form of formal education, vocational training, or other sorts of learning and skills attainment schemes are necessary. This chapter has suggested that the government needs to seek synergies between the community, academia, research institutes, NGOs, the private sector and international development partners for initiatives aimed at ensuring the sustainability of forests, reducing poverty, increasing food security and creating jobs in the green sectors of the economy. Four areas that have potential for the above-mentioned objectives above were also identified. These include community reforestation and agro-forestry schemes, renewable energy initiatives, commercial partnerships and industry development for forest products, and finally, eco-tourism. Finally, in investing in these areas, this chapter suggested that public consultation and participation in the design, implementation, and the management of future projects need to be prioritised to ensure public ownership, trust and public confidence for future benefits to be shared.

CHAPTER 10: CONCLUSION

10.1. RECAPITULATION

This thesis has attempted to understand the population, poverty and environment (PPE) linkages in Timor-Leste in the context of rapid population growth, low levels of human development, and the continuing state of fragility of the young nation. The research presented has investigated current and future population dynamics of Timor-Leste and projected its population to 2030. It measured Timor-Leste's multi-dimensional poverty and forest reliance at the household level and examined relations between these with links to population dynamics. It has suggested pathways for effective policy making and governance in this new nation's efforts to fight against poverty and achieve sustainability. The main focus throughout this study has been the understanding of the role of population dynamics and forests in maintaining and improving peace, livelihoods, and in fostering sustainable development in Timor-Leste. This focus makes the present study unique as PPE relations and the role of forests in contributing to sustainable livelihoods in Timor-Leste are not well-researched in this country's context, and as such, they are not fully reflected in the nation's future development agenda. The research presented in this thesis was aimed at filling this gap and suggesting relevant policies for sustainable development of this new nation. In terms of methodology, this research is based on analyses and interpretation of available data from censuses and relevant surveys conducted in Timor-Leste and primary data collected for this research in five of the 13 districts of Timor-Leste. The primary data included data from village and household surveys, focus group discussions, in-depth interviews conducted with a wide range of stakeholders, and project observations. Where needed, the primary data were analysed using descriptive statistical techniques of frequency distributions and cross-

tabulations of relevant variables. This final chapter begins with a summary of the major findings and an assessment of the extent to which the study has achieved its objectives. On the basis of the study's results, the theoretical and policy implications are outlined and attention is drawn to the desired directions for future research.

10.2. MAJOR FINDINGS

The primary objective of this study was to initially explore the current demographic characteristics and population growth trends in Timor-Leste; and then use the insight gained from these trends to project the population to 2030. This research also aimed to use the future population trajectory of Timor-Leste to shed light on the major demographic challenges and opportunities lying ahead in the nation's efforts to reduce poverty, maintain peace and achieve environmental sustainability in Timor-Leste. This objective was addressed in Chapters 4 and 5.

This research has revealed that Timor-Leste is notable, in the Asia Pacific region and in the world, as having one of the highest population growth rates and a very youthful population structure. In 2010, 69 percent of Timor-Leste's population was under the age of 30, and 42 percent was under the age of 15. Despite going through later stages of demographic transition with declining fertility and mortality rates, Timor-Leste still has one of the highest fertility rates in the world with 5.7 children per woman. This rate is the major contributor to the population growth rate and to the exceptionally large young population. The proximate determinants shaping the high fertility rate in Timor-Leste include early age at marriage, low contraceptive use, short postpartum insusceptibility, and lack of legal and safe abortion opportunities. High fertility is also influenced by religious, cultural, and historic factors which are linked to strong Catholicism, a highly patriarchal society, and post-conflict psyche. In Chapter 6, it was revealed that socio-economic factors such as the education level

of the household head, the economic wealth of the household, or multi-dimensional poverty were not significantly associated with high fertility in Timor-Leste.

A number of demographic assumptions have been made to project Timor-Leste's population to 2030. One of these assumptions is that the fertility rate would not decline dramatically over the next two decades due to the slow uptake in reproductive health and family planning programs, slowly declining age at marriage between 2004 and 2010, and a continuing desire for large families. This research assumed that the age-specific fertility rates would change slightly and be concentrated more toward the younger ages of women; that life expectancies for both women and men would increase by eight to nine years between 2010 and 2030; and that international migration would be negligible.

This research projected that the small island nation of Timor-Leste would add another 760,000 people to its total population by 2030. The future age structure would remain very young with 40 percent of its population aged below 15 years. A total dependency ratio as high as 80 percent in 2030 suggested that a window of demographic opportunity would be unlikely to open in the next two decades unless a more dramatic decline in fertility was achieved. This dramatic decline would be of the order of more than 26.3 percent, as assumed in this thesis.

Exploring the implications of population growth and the future demographic structure of Timor-Leste, it was highlighted that demographic factors and rapid population growth alone were not the determinants of economic, social, political or environmental change and would not hinder peace, poverty reduction and sustainable development in Timor-Leste. However, this research noted that it is the contextual and the mediating factors such as poor performing domestic economy, limited

opportunities in non-agriculture sector, lack of jobs, weak institutional capacity, and a weak legal framework could lead to increased poverty, environmental degradation and risks for conflict if coupled with Timor-Leste's future population trajectory.

The enormous disparity between available jobs and the number of people entering the labour force was also identified; a fact that results in extremely high waste of human potential and cost of lost production. If this gap continues in the future (in the face of approximately 18,000 new entrants to the labour market annually in the next two decades), it may also contribute to dysfunctional behaviours, rising levels of crime, violence and political extremism among young people, thus, jeopardising the socio-economic development and peace in Timor-Leste. Increasing population pressures may also impose greater burden on the natural resources and contribute to further deterioration of Timor-Leste's environment if people are not provided with alternative livelihoods, policy framework and if their institutional capacity remains weak. This study has also suggested that whilst the petroleum sector is unlikely to generate employment or business opportunities for the majority of people in Timor-Leste in the next two decades, Timor-Leste's large oil revenue can provide a head start in a rapid transformation for lasting peace, poverty reduction, and sustainable development in the country.

The second major objective of this research was to measure multi-dimensional poverty and forest reliance in Timor-Leste at the household level. To achieve this objective, primary data covering 170 households and eight village surveys were utilised. These data were collected using a purposive sampling method. Adopting a sustainable livelihoods approach, multi-dimensional poverty at the household level based on a household's asset portfolio was measured. In Chapter 6, several indicators were developed to assess five different livelihood assets including economic, social,

human, physical, and natural capital. In Chapter 7, forest reliance as a livelihood strategy was explored. The households' level of forest dependence was assessed on the basis of their use of forest resources for housing, construction, energy, medicine, and income generation.

Having adopted a livelihoods approach to measuring poverty in Timor-Leste, as an alternative to income poverty, this research identified that 25 percent of the households included in the present study were poor, 46 percent were average and 29 percent were better off. It was also highlighted that multi-dimensional poverty had significant associations with the level of education and type of employment of a household head (p values 0.000 and 0.000 respectively). In the group of poor households, 88 percent of the household heads worked in the agriculture sector, while 60 percent lacked any formal education. Moreover, 95 percent of the time, the average stock of formal education among adult members of the poor households was less than six years. In other words, the majority of adults in poor households had no formal education or did not complete primary school. Similarly, 81 percent of the poor households also had poor economic capital which suggests that the majority of the poor were landless or had land smaller than two hectares, owned durable assets worth less than \$190 (an amount found to be the average for the whole sample population), and lived in vulnerable housing conditions (such that the roof and the walls of the house were entirely made of forest products).

This study has also contributed to the understanding of the importance of forests for Timorese people's livelihoods by finding that 93 percent of the households surveyed in this research had collected and used forest products in the year preceding the survey. The heaviest reliance on forest products was driven by people's energy needs where 77 percent collected firewood from the forest, and the remaining 23 percent

bought firewood from the market. This was followed by 53 percent of households collecting forest products for construction needs, 42 percent using it for income generation, 39 percent for food, and finally, one percent for medicine. These findings suggested that the gathering of forest products by Timor-Leste communities was still a complementary part of subsistence and traditional living and a considerable source of household income.

The third objective of this research was to identify the trends and relations between population dynamics, multi-dimensional poverty, and forest reliance at the household level and this objective was addressed in Chapter 7. No statistically significant relationship between a household's poverty and the number of children in that household was found. It was therefore concluded that high fertility was not a strong determinant of multi-dimensional poverty in Timor-Leste. On the other hand, the larger number of children in a household was statistically linked with high natural capital of the household (better access to abundant and quality land and forests) ($p=0.046$) and considerably linked with poor physical capital (limited infrastructure development and market access that was shared by the households in a village and often built by the government or development agencies). This may suggest that immediate dependence on open access natural resources in an impoverished rural setting increases a households' labour requirements to meet their basic needs such as fuel wood, fodder and water and that this contributes to families having many children. In other words the underlying contributor to high fertility may be interpreted as the need to have more children to fulfil the needs of a large pool of labour within the household in order to take advantage of the abundant and accessible natural resources (in other words high natural capital).

In places where natural capital is high and physical capital is low, human capital also appeared to be low. Although the immediate determinants of high fertility (or larger number of children within a household) in these places would include lack of contraception, early marriage, short post-partum insusceptibility and low abortion, poor human capital (or educational attainment among adults) may be seen as an overarching factor that proves to be a hindrance to these families practising family planning. All in all, these findings suggest that a higher number of children within a household can be explained by isolation, poor access to infrastructure (such as roads, hospital, electricity, improved water and sanitation) and poor educational attainments and also relatively accessible and abundant natural resources.

In relation to forest reliance as a livelihood strategy, the present study revealed a situation in which the majority of the households (55.6 percent) relied on forests heavily, while 26.6 percent relied on forests to a medium degree. The findings showed no statistically significant relationship between the level of a household's multi-dimensional poverty and their level of forest reliance. However, a considerably larger percent of the poorest households relied on forest resources heavily (67 percent) while this percentage declined to 46 percent for the better-off households. Heavy reliance on forests is one of the contributing factors to the deteriorating condition of the forest ecology in Timor-Leste (McWilliam, 2001). Therefore these results are concerning, as they show that, regardless of their poverty level, eight out of ten people in Timor-Leste rely on forests to a considerable extent. Unless policies are aimed at enabling households to accumulate alternative livelihood assets and adopt other livelihood strategies that are sustainable, the rapid population growth projected in this thesis suggests that the sustainability of the forests and the livelihoods of the poor will be at great risk.

It was also revealed that the households with a high level of forest reliance were predominantly the ones with a male household head ($p=0.036$) and with six or more children ($p=0.031$). This was higher than the average number of 4.2 children found in this research. Forest reliance appeared to be negatively associated with human and physical capital (p values 0.001 and 0.000 respectively), and positively associated with natural capital ($p=0.005$). This means that forest reliance declined with increased years of formal education amongst adults (the sole component of human capital) within a household. In contrast, forest reliance increased when a household had better access to abundant and quality land and forests, and were also restricted with limited market access and infrastructure development.

This research also highlighted that high physical capital was positively associated with higher human capital ($p=0.000$) and considerably linked with smaller family size. Conversely, it was negatively correlated with natural capital ($p=0.000$). This could suggest that infrastructure development made available to the households in Timor-Leste helped increase human capital formation and also contributed to smaller family size in the country, however, the type of development was largely done at the expense of degrading people's natural capital.

The fourth major objective of this study was to develop appropriate adaptive responses to maintain peace, reduce poverty and improve environmental sustainability in order to achieve sustainable livelihoods in Timor-Leste. This was predominantly done based on stakeholder consultations of this research (including in-depth interviews and focus group discussions), observations in the field, and empirical findings of the present study. This objective was mostly addressed in Chapters 8 and 9 under three thematic areas of discussion. These included population control and slowing down of the population growth rate, managing the demographic

change, and finally, conserving and regenerating forest resources for improved livelihoods.

To begin with, the present study posited that population control and efforts to reduce fertility needed to be considered as a part of a policy package to lower pressures on natural resources, and reduce the demographic risks associated with conflict. Slower population growth was also discussed as a way to reduce the rate at which societal and technological ingenuity was rising, and to allow Timor-Leste the time for structural, political, societal and technological change to adjust to being a populous country. It was also identified that, reproductive health and family planning programs in Timor-Leste needed to be strengthened as direct measures of reducing fertility. In this respect, it was recommended that the Government of Timor-Leste work in partnerships with the civil society organisations, and the international donors to reduce barriers against free communication and implementation of FP/RH initiatives (which are predominantly caused by the influence of the Catholic Church), to create positive public perceptions for small size families and to increase the demand for these services. This research suggested also that increased financial commitment, decentralised decision-making and merit based employment were required to widen the coverage of FP and RH programs. These needed to be supported by an adequate number of skilled health personnel who were qualified to deliver quality services.

This research also suggested that increasing education and employment opportunities for women were indirect measures of slowing down the population growth. On the basis of the significant associations found, investments directed at human and physical capital and accumulation in rural and isolated places also led to lower fertility in these areas. Efforts to increase physical and human capital accumulation were not only seen to help communities adopt alternative and more sustainable

livelihood strategies in the mentioned areas, but also to lower the pressures on the forests by reducing forest reliance and slowing down the population growth.

This study drew attention to the moderate to high levels of social capital embedded among almost all communities included in this research. In this regard, it was suggested that high social capital could provide an advantage to facilitate the rapid transformation for future human and physical capital accumulation in Timor-Leste. However, it was important that the transformation did not come about at the expense of deteriorating natural resources.

Secondly, this research demonstrated that preparedness for a growing population and adaptations to the future population were a necessity in Timor-Leste as the future demographic scenario was not only the result of the present, but also of the past demographic dynamics which could not be altered by prospective policies. It was mentioned that rapid fertility decline through improved reproductive health and family planning programs would help achieve a substantial demographic dividend for poverty reduction, peace building, and environmental sustainability, provided they are accompanied by appropriate policies. One of the pathways to divert demographic concerns into demographic potentials was the adequate public investment in knowledge-producing services at the earliest stages of life and throughout that life. This research recommended sound policy making for well-structured and well-targeted public spending on formal and informal education for human capital development; the spending of Timor-Leste's oil revenue aimed at human capital formation; and the creation of productive and meaningful employment opportunities for the increasing numbers of youth. This study also emphasised the need for a future development model where the constituents of education and job creation were built

on the harmonious relationship between humans and the environment, and support the transition toward a sustainable economy and society in Timor-Leste.

Thirdly, it was recommended that an inclusive and sustainable development model for improved livelihoods was needed to create opportunities for long-term asset accumulation and their re-investment without degrading the natural resource base. Given the importance of forest-based livelihood strategies for subsistence and traditional living in Timor-Leste, and increasing pressures on forest resources due to rapid population growth, this research drew attention to the pathways to conserve Timor-Leste's land and forests and to develop a strong forestry sector for improved livelihoods and poverty reduction.

The present study identified that in the absence of a well-funded and well-functioning government system (including a strong judiciary and law enforcement), Timor-Leste's customary laws 'Tara Bandu' could complement the legal system for natural resource management and local conflict resolution; could help preserve ecological and cultural diversity; and also maintain peace and high social capital within local communities. Therefore, it was suggested that these customary laws needed to be strengthened and legally recognised. This research also discussed the urgency of formulating an appropriate land law for a more complementary policy framework in terms of forest governance and management.

This study recognised the need for a political leadership that was equipped with a vision for sustainable development. The importance of such leadership was discussed to establish a synergy between the community, academia, research institutes, NGOs, the private sector and international development partners for good governance, and

to pursue a multi-sectoral approach at reducing poverty whilst achieving environmental sustainability.

Four potential pathways were also identified to improve forest-based livelihoods whilst reducing poverty and maintaining environmental sustainability. These include establishment of community reforestation and agro-forestry schemes; strengthening and widening the coverage of renewable energy initiatives; establishing markets, small scale commercial partnerships and industrial development for forest products; and developing eco-tourism. These areas were discussed in detail for their potential contribution to job creation, economic development, improved food security, regeneration and conservation of forest stocks and also preserving Timor-Leste's rich cultural and ecological diversity. This study discussed the importance of public consultation and participation in the design of future policy developments, and the implementation and management of the projects in the above-mentioned areas to ensure public ownership of the programs and trust in the benefits to be shared.

Finally, in implementing the suggested responses, opportunities lie in the effective use of the expertise, training and financial support that can be gained from South-South collaboration, donor support and international assistance.

10.3. THEORETICAL IMPLICATIONS

This study has been a direct application of the sustainable livelihoods approach to measure poverty and understand the relations between population poverty and environmental sustainability in Timor-Leste. The issue of measuring poverty entails a highly contested debate. There have been significant efforts to understand its multi-faceted nature. The present study has applied a livelihoods approach where the components of poverty are shaped by five different sets of capital, namely economic,

human, social, physical and natural capital. This research has developed indicators to measure each of these livelihood assets and constructed a multi-dimensional poverty index based on a household's asset portfolio to identify poor households. It contributed to the understanding of the sustainable livelihoods approach by providing an example of its application for poverty analysis, and by showcasing how the livelihood capitals can be measured in a developing state context. Such approach to measuring multi-dimensional poverty can be followed in similar studies which may be conducted elsewhere. However, in a broader sense other factors such as political capital of the people (in terms of participation in political decision-making) and cultural capital (inclusive of heritage, customs and traditions) could also have been considered in measuring multi-dimensional poverty, but it was not possible to include this in the present research because of constraints/assumptions explained in Chapter 6.

This research was also aimed at testing whether the hypothesis of the vicious cycle model held true in Timor-Leste where poverty, environmental deterioration and high fertility contributed to one another. It was disproved that such a statistical association exists between multi-dimensional poverty, high forest reliance (as an indicator of a major contributing factor to forest deterioration), and high fertility (reflected in number of children within a house). These findings rather described a situation where a larger number of children within a household was linked positively with better access to quality and abundant land and forests, and negatively with infrastructure development. Hence, attention was drawn to the rising labour requirements that might have been due to immediate dependence on open access natural resources in impoverished rural settings to meet basic needs such as fuel wood, fodder and water. As discussed in Chapter 2, similar findings were noted in a number of studies

conducted in developing countries such as Pakistan and Philippines (Biddlecom, Axinn, & Barber, 2005; de Sherbinin et al., 2008; Filmer & Pritchett, 2002).

The present study found no statistically significant relationship between a household's poverty and their level of forest reliance. The recommendations of this research such as bringing education, reproductive health and family planning services closer to the communities (particularly to those who are isolated and cut out from the country's current infrastructure development) and also enabling alternative livelihood strategies that lower people's immediate dependence on natural resources, focused on the mediating factors such as the institutions and policies. Therefore, the principles that were favoured were laid out by the intermediate (or mediating) variable theory (Jolly, 1994), or the holistic approach (Chi, 2005; De Souza, Williams, & Meyerson, 2003; Keyfitz, 1991; McNicoll, 1991)

Finally, although this research was not aimed at applying a theoretical framework to understand fertility behaviour in Timor-Leste, it contributed to the understanding that, in a transitional and conflict-affected country like Timor-Leste, a possible approach needs to incorporate the historical events which may have impacted on the socio-cultural, religious, and physiological beliefs and practices prevailing in these societies.

10.4. DIRECTIONS FOR FUTURE RESEARCH

This research invites potential research in a number of areas. It suggests that further research can contribute to a better understanding of the role played by culture and religion in influencing the high fertility rates in Timor-Leste. Investigation into the reasons behind the large district level variations amongst percentage of exposure to family planning messages, knowledge of contraception methods, and their use, can

provide an insight to people's decision-making in different contexts shaped by RH and FP initiatives. This line of research based on identifying successes and failures can direct RH and FP programs to become more inclusive, accessible and effective.

Secondly, this research suggests that traditional practices like Tara Bandu should receive more research attention to help explain and assess the importance of such practices throughout the country. This would help accumulate further knowledge on traditional systems of environmental management and guide policies accordingly. Moreover, further research can focus on comparative studies exploring indigenous systems of governance for environmental sustainability from other countries in the Asia-Pacific region. Such research can be instrumental in identifying the cultural, institutional and other mediating factors that contribute to such indigenous systems to flourish or fade away. This line of investigation may guide future directions to ensure Tara Bandu is effective and sustainable.

Finally, this thesis invites potential researchers to understand the aspirations and frustrations of the young Timorese people, and to identify factors that compel youth to engage in violence. Studies shedding light on these aspects would be instrumental in shaping policies that invest in youth to become drivers of peace and sustainable development rather than violence and conflict.

10.5. POLICY IMPLICATIONS

The findings of this study suggest five specific policy directions:

1. Formulation of a national population policy is critical for Timor-Leste. The policy needs to take a holistic view of development and address population growth, peace and environmental sustainability with the utmost care and suitability. This policy also needs to integrate population education (i.e.,

education about the effects of population growth on development, environment and peace) in schools and universities. The strategic themes of the policy need to promote a rights-based and gender-sensitive approach to lowering the rate of fertility and, hence, population growth rate and pursuing a multi-sectoral agenda to make use of the demographic situation and resourcefulness of the Timorese population as drivers of sustainable development. The policy needs to put the rights of women at the heart of development plans (particularly, reproductive rights) and be guided by the principles of public health. It should foster provision of culturally responsive, people-centred and integrated RH and FP services which would provide information and education about contraceptives, choice of contraceptives and quality of care in family planning and reproductive health. The policy should also ensure that the same is brought closer to the communities. In this respect, the sensitivities of the Church need to be managed with the utmost care. The legal status of abortion needs to be reconsidered and be open to public debate to allow women the option of safe termination of pregnancies when needed for their physical and mental health. Finally, the policy needs to foster Timor-Leste's transition to a sustainable society with high human resources which can assume the responsibility of transforming the nation to a peaceful and sustainable future.

2. Policy and institutional context should play a significant role in the acknowledgement and legitimisation of Timor-Leste's customary laws, 'Tara Bandu'. Although a new policy document may not be needed, the national forest policy could be revised to include a specific theme on Tara Bandu, recognising the customary land and forest management systems. Progress in that direction would require encouraging an environment for future research

on Tara Bandu and documenting the implications of this indigenous knowledge for forest management and dispute resolution. This way, a collective body of customary knowledge and experience can be shared with the decision-makers and also with those among the wider community; therefore, this can be considered in the revision of forest policy and management programs. Such a policy change would help create a sense of responsible citizenship and empower communities to rightfully manage their own resources whilst conserving their cultural identity.

3. Timor-Leste's renewable energy programs are currently falling short in terms of meeting the needs of people and being sustainable. The research here suggests that for the renewable energy sector to outgrow its infancy phase in Timor-Leste, formulation and endorsement of an adequate national renewable energy policy are essential. In formulating such a policy, special attention needs to be paid to energy-conserving strategies and generating clean alternatives to address three specific aspects: heavy reliance on firewood, energy poverty particularly in rural areas, and high oil dependency in Timor-Leste. The foundations of this policy need to be based on scientific measures and articulate the successes and failures experienced in pilot projects including, for instance, energy efficient stoves, solar energy and bio-gas.

The policy needs to aim at addressing problems associated with maintenance of technological systems, lack of community ownership, and lack of access to finances. It also needs to create a favourable environment for the establishment of a multi-sectoral partnership that provides an opportunity to increase finances, up-skill human resources, provide ongoing technical support, and improve access to resources, know-how and technology. By

suggesting a favourable environment, it is recommended that the policy framework incorporate economic incentives to lower the higher capital costs of renewable energy technologies, ensure public ownership, and incorporate people's culture and values to make the projects compatible with traditional life in Timor-Leste.

4. The potential contribution of agro-forestry to national development ought to be recognised and the mainstreaming of agro-forestry between sectors and government bodies needs to be supported by policies. Without policy support, agro-forestry initiatives may remain unpopular, underinvested and unresponsive (FAO, 2013). Reforming several of the existing policies, such as the agriculture policy or national forest policy, can help achieve better policy coherence and synergies. Such approaches in reshaping the current policy and regulatory framework (related to rural development, land use, agriculture, forestry and the environment), are more preferable to mainstream agro-forestry across many sectors, and this is also because sound and integrated policy arrangements can be achieved without changing the whole context of institutional structure (FAO, 2013). The policy framework, however, needs to be complemented by secure land tenure as when rights to land are not clearly stated by law, their absence makes any other measures ineffective (FAO, 2013). Also, access to resources, know-how, technology, markets and incentives need to be in place, making initiatives beneficial for farmers.

Whilst policy shifts are recommended across various sectors, a national steering committee on agro-forestry should be established, for instance, as a leading body to: foster an environment to include government agencies from various departments, NGOs and donors; disseminate success stories; prioritise

areas for research; review appropriate technologies; prevent the promotion of failed or limited technologies, and encourage the best use of research outcomes. Such an institutional body can also help draft a road map to enhance agro-forestry strategies in the process of policy adjustments (FAO, 2013).

5. Eco-tourism development in Timor-Leste can be strengthened by policy support. This policy can promote the cultural identity and environmental riches that are unique to Timor-Leste. For example, five to ten year policies can be formulated to guide national plans and arrange institutional elements to effectively implement and operate eco-tourism in the country that is beneficial to the local communities. The planning can involve identifying eco-tourism sites, primary and secondary eco-tourism attractions, major internal transportation network, skills development initiatives, and employment generation strategies accordingly (Fennell & Dowling, 2003). Such short-term planning and policies can provide a road map to make use of the country's natural resources and cultural identity for both achieving tourism and environmental protection goals whilst generating resources for future generations. Initiatives in the direction of establishing commercially successful and environmentally sustainable eco-tourism development would help preserve the cultural identity, empower local communities to take control over their environment, and benefit from increased opportunities to learn about their surroundings.

Furthermore, this research invites broad stakeholder consultation and input in the design of the policies mentioned above. It suggests that future policy needs to create favourable conditions, a set of actions and norms (including national and local

institutional arrangements, sustainable markets, short and long-term economic incentives, finances and access to resources, technology and expertise) for local communities to participate fully in the nation-building process, and benefit from the future development of Timor-Leste.

10.6 CLOSING REMARKS

This research has contributed to the debate on population poverty and environment relations in the context of Timor-Leste's poor human resources, weak institutions and continuing state of fragility. It has demonstrated that Timor-Leste is in an early transition phase, not only in terms of demographic transition but also in terms of socio-economic, environmental, and institutional development. It has contributed to the understanding of the value of forests in supporting people's livelihoods in Timor-Leste and has drawn attention to the importance of maintaining the harmonic relations between people and the environment. The study has also unpacked the components of multi-dimensional poverty in Timor-Leste and contributed, in part to the debate on poverty analysis. The analyses carried out in this study have suggested several solutions and policy directions to reduce poverty and maintain environmental sustainability in the newest nation in Asia. It has called for a holistic and multi-sectoral approach to reduce and reverse the pressures caused by a rapidly growing population in Timor-Leste on the economy, environment, society and the government itself. It has invited strengthened efforts to address mediating factors such as the policies and institutions which are also shaped by culture to ensure sustainable use and management of Timor-Leste's forests for future generations. The solutions and policy guidance suggested in this thesis can be beneficial for other fragile developing states that are experiencing rapid population growth, wide-spread poverty and deforestation. The recommendations of this thesis offer particular

significance for transitional communities who have faced conflict, mass environmental degradation, and colonisation in the past.

Appendix 1

DemProj Model of Population Projection: Input used and output that can be generated by using software

<i>Inputs needed for DemProj</i>	<i>Types of results that can be generated with DemProj</i>
1- Initial age and sex structure of population (urban and rural)	1- Age and sex structure of the population
2- Assumptions of mortality (national) a. Expectations of life at birth by sex b. Sex ratio at birth c. Model life table (IMR)	2- Various population aggregates, such as population size, young and old age population, the number of women at the childbearing age
3- Assumptions of fertility a. Total fertility rates b. Age specific fertility rates	3- Indicators of the population structure, such as the proportions of population in broad age groups (0-14; 15-64; 65+) and the sex ratio of the population
4- Assumptions of international migration a. Total net migrants by sex	4- Rates of population change due to births, deaths, and international migration
5- Regional assumption a. Urban percentage of total population	5- Population doubling time and demographic dividend

Appendix 2

Village Level Questionnaire

Questionnaire Number _____

1. Naran Distritu	
2. Naran Sub distritu	
3. Naran Suco:	

1-Sim (Yes)

Obrigado barak ba ita-nia partisipasaun. Agora hau persiza ita-nia tempu minutu 15-20 hodi kompleta Survei ida nee. Mai ita komesa ho ita-nia pergunta sira.

Thank you very much for participating. Now I need 15-20 minutes of your valuable time to complete this survey. Let's begin with our questions.

A. Village Identification

1. Suco nia naran saida? What is the name of this village?	Naran (Name)
2. Iha ruma sentru saude iha suco? Is there any health centre in the village?	(1-0)
3. Karik suco iha Estrada ruma hodi aksesu transporte durante bai loron no udan? Se 'sim', ba 5. Does the village have one road that is useable by cars during wet and dry season? <i>If 'yes', go to 5.</i>	(1-0)

<p>4. Se 'laos': Distansia hira maka besik liu ba dalan neebe maka bele usa ba suco durante bai loron no udan?</p> <p>How far is the useable road from the village?</p>	<i>Km or metres</i>
<p>5. Distansia hira husi sentru suco ba dalan seebe besik liu merkado distrito?</p> <p>How far is the district market from the centre of the village?</p>	<i>Km or metres</i>
<p>6. Dook oinsa hosi nee ba Merkado distritu nian?</p> <p>Serku tipu transporte:</p> <p><i>(1-lao; 2- bisikaleta; 3- motor; 4- kareta; 5- microlet, 6- kuda ; 7-seluk spesifik)</i></p> <p>How long does it take to get to the district market from this village?</p> <p>Circle the transport</p>	<i>Minutes or hours</i>
<p>7. Distansia hira husi sentru suco ba dalan seebe besik liu merkado neebe faan product agrikultura?</p> <p>How far is the food market from the centre of the village?</p>	<i>Km or metres</i>
<p>8. Dook oinsa hosi nee ba merkado aihan nian?</p> <p>Serku tipu transporte:</p> <p><i>(1-lao; 2- bisikaleta; 3- motore; 4- kareta; 5- microlet, 6- kuda; 7-seluk spesifik)</i></p> <p>How long does it take you to get to the food market from the centre of the village? Circle the transport/</p>	<i>Minutes or hours</i>

<p>9. Ita iha merkado ruma diferente hodi faan produtu floresta neebe ema so faan ai-sunu, au, tali-tahan?</p> <p>Se ‘Laos’, ba Section B.</p> <p>Is there a different market for forest products where people only sell things like firewood, bamboo, palm leaves?</p>	(1-0)
<p>10. Se Sin (if yes), how far is the forest product market from the centre of the village?</p>	<i>Km or metres</i>
<p>11. Dook oinsa hosi fatin nee ba merkado neebe faan produtu floresta?</p> <p><i>How long does it take you to get to the forest product market from the centre of the village?</i></p> <p>Serku tipu transporte:</p> <p><i>(1-lao; 2- bisikaleta; 3- motore; 4- kareta; 5- microlet, 6- kuda; 7-seluk spesifika)</i></p>	<i>Minutes or hours</i>

B. Risk

<p>1. Agora hau sei husu ita-boot konaba iventu estrimu neebe suco nee esperiensi iha tinan kotuk. Hau sei husu ita karik suco nee esperiensi krize ruma neebe maka hau lista agora. Favor hatete hau problema ida neebe mak akontese iha suco nee iha fulan 12 liu ba.</p> <p><i>Now I will ask you about</i></p>	<p>1- Karik suco nee hasoru hahan laiha/menus ruma iha tinan ida liu ba?</p> <p>Did your village experience food shortages during the last year?</p>	(1-0)
	<p>2- Karik suco nee hasoru hahan ba laiha/menus ruma iha tinan ida liu ba?</p> <p>Did your village experience water shortages during the last year?</p>	(1-0)
	<p>3- Karik suco nee hasoru hahan mota sae no udan makas ruma iha tinan ida liu ba?</p> <p>Did your village experience flooding during the last year?</p>	(1-0)

<p><i>extreme events that the village may have experienced in the past year. I will ask you whether the village experienced any of the crises that I will list now. Please tell me which of the following problems the village had in the past 12 months.</i></p>	<p>4- Karik suco nee hasoru hahan bai loron ruma iha tinan ida liu ba?</p> <p>Did your village experience drought during last the year?</p>	(1-0)
	<p>5- Karik suco nee hasoru hahan sunu ai laran durante tempo colheta hahan, no floresta ruma iha tinan ida liu ba?</p> <p>Did your village experience wild fire in crops or forests or grasslands during the last year?</p>	(1-0)
	<p>6- Karik suco nee hasoru hahan ular han aihan/mora/moras animal ruma iha tinan ida liu ba?</p> <p>Did your village experience widespread crop pest/disease or animal disease during the last year?</p>	(1-0)
	<p>7- Karik suco nee hasoru hahan problema politika maka mosu ruma iha tinan ida liu ba?</p> <p>Did your village experience political problems during last year?</p>	(1-0)
	<p>8- Karik suco nee hasoru hahan konflito rai iha suco laran ruma iha tinan ida liu ba?</p> <p>Did your village experience land conflicts during the last year?</p>	(1-0)
	<p>9- Karik suco nee hasoru hahan konflito konaba rekursu natureza (nauk) ruma iha tinan ida liu ba?</p> <p>Did your village experience conflict about forest products during the last year?</p>	(1-0)
	<p>10- Karik suco nee hasoru hahan iha refujiado ka migrasaun ruma iha tinan ida liu ba?</p> <p>Did your village experience migration issues or problems during the last year?</p>	(1-0)
	<p>11- Karik suco nee esperiensa ponte/ dalan monu ou at ruma iha tinan ida liu ba?</p> <p>Did your village experience a bridge or road being washed away during the last year?</p>	(1-0)

<p>Karik nia resposta – “Sim” konaba problema ruma iha leten; entaun problema nee boot oinsa no oinsa suco nee responde ba situasaun nee?</p> <p><i>If the answer is Yes to any above: How big was the problem and how did the village manage the situation?</i></p>		

C. Forest services

<p>1. Karik iha suco laran komunidadada ou individual ruma simu osan, atu suporta treinamento ruma konaba kuda ai durante tinan ida liu ba?</p> <p>Has the village (as a community or individuals in the village) received cash, support or training related to tree planting in the past 12 months?</p>	<p>(1-0)</p> <p>Serku ida karik Sim:</p> <p><i>Osan/ produto /treinamento</i></p>
<p>2. Karik iha suco laran komunidadada ou individual ruma simu osan, atu suporta treinamento ruma konaba turizmu durante tinan ida liu ba?</p> <p>Has the village (as a community or individuals in the village) received cash, support or training related to tourism in the past 12 months?</p>	<p>(1-0)</p> <p>Serku ida karik Sim:</p> <p><i>Osan/ produto /treinamento</i></p>
<p>3. Karik iha suco laran komunidadada ou individual ruma simu osan, atu suporta treinamento ruma konaba protejeje area ou floresta sira durante tinan ida liu ba?</p> <p>Has the village (as a community or individuals in the village) received cash, support or training related to protecting areas or forests in the past 12 months?</p>	<p>(1-0)</p> <p>Serku ida karik Sim:</p> <p><i>Osan/ produto /treinamento</i></p>
<p>4. Karik iha suco laran komunidadada ou individual ruma simu osan, atu suporta treinamento ruma konaba halo rai-terras durante tinan ida liu ba?</p> <p>Has the village (as a community or individuals in the village) received cash, support or training related to</p>	<p>(1-0)</p> <p>Serku ida karik Sim:</p>

terracing land in the past 12 months?	<i>Osan/ produto /treinamento</i>
<p>5. Karik iha suco laran komunidadada ou individual ruma simu osan, atu suporta treinamento ruma konaba implementasaun lei tradisaun hodi proteje ambiente durante tinan ida liu ba?</p> <p>Has the village (as a community or individuals in the village) received cash, support or training related to implementing customary laws to protect the environment in the past 12 months?</p>	<p>(I-0)</p> <p>Serku ida karik Sim:</p> <p><i>Osan/ produto /treinamento</i></p>
<p>Karik nia resposta nee, Sim ba problema sira iha leten; ita-boot bele fo detalla ruma konaba saida mak suco nee simu, se mak fo treino/ osan/ apoiu no ita hanoin nee ajuda ka lai?</p> <p><i>If the answer is Yes to any above: Can you give us details of what the village received, who gave the training/cash /support and do you think it was useful?</i></p>	

D. Forest Perceptions

<p>1. Ita-boot hanoin katak ema iha suco nee uza produtu floresta hodi suport sira-nia moris?</p> <p><i>Do you think people in this village use forest products to support their lives?</i></p>	(I-0)
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2. Ita-boot hanoin katak iha suco nee uza floresta nudar aktividade hodi hetan lukru? <i>Do you think people in this village use forests as an income earning activity?</i>	(1-0)
3. Iha lei tradisaun ruma hodi proteje ambiente no floresta iha suco nee ka lae? <i>Are there customary rules to protect the environment and forests in this village?</i>	(1-0)
4. Karik iha , lei neebe ita pratika nee naran saida? <i>If yes, can you please tell me the name of the customary rule that the village is practicing?</i>	naran
5. Produtu ou ai naran saida mak hetan protesaun? <i>Which products or trees are protected? Can you give me the names?</i>	Lista Naran
6. Iha grupu Uza Floresta neebe mak iha responsabilidade atu maneja produtu floresta? <i>Are there forest user groups which are responsible for managing the forest products?</i>	

Ida-nee mak ita-nia entrevista ikus. Obrigado barak ba ita-nia partisipasaun iha survei ida-nee.

That is the end of our interview. Thank you very much for your participation.

Hanoin atu prenze seksaun nee/Remember to fill out this section

Naran ema neebe halo Intervista	Data	Lingua usa ba Intervista	Tempu neebe usa hodi kompleta intervista (Minutu)
GPS coordinates of the village:			

Appendix 3

Household Level Questionnaire

Household Level Survey

Questionnaire number _____

Hello, my name is _____. I am conducting this survey for a student's research project. The project is called 'Population Growth, Poverty and Environmental Dependence in Timor-Leste' and it collects information about poverty, environment and forests. As a member of the research team, I am here to do an interview with you. We will also be visiting several villages in Manufahi, Ainaro, Liquica, Lautem and Dili to do interviews. I have discussed this research project with your village chief and now we have permission to do interviews with people in this village. Your participation is very important to understand environment and poverty issues in your village. If you would like to participate in this research, please sign this consent form. Thank you very much. Now I need 40-60 minutes of your valuable time to complete this survey. Let's begin with our questions.

A. Identifikasaun/Identification

Can I please write down the census code for the house you live in (actually the code on the door)?

1. Code census uma kain (Census Code)	(sticker number)
2. Naran Suco (Name Village)	(naran)
3. Naran Distritu (Name District)	(naran)

B. Informasaun Familia/ Family Information

Now can I ask you about the members of your household? (When I say household I mean the members of your family who live with you in the same house)?

Se maka iha uma kain (Persons in the household)	Relasaun ho chefe uma kain (Relation to household head)	Idade (Age)	Sexo (Sex) Codes:0=mane 1=feto Codes:0= male 1=female	Edukasaun (Education completed) 0= laiha edukasaun 1=primaria; 2= pre-secondaria; 3= secundaria; 4= as liu; 5= seluk, specifika Codes:0= no education/ed;1=primary; 2= pre-secondary; 3= secondary; 4= university & higher;	Occupasaun (Occupation) 0= Agriculture 1=Civil Servant; 2= Owns business; 3= Student; 4= NGO; 5= Housewife 6= Casual (fishing, sand collecting etc) 7= other

				5=other, specify	

1. Ema nain hira maka hela iha ita nia uma? How many people live in your house?	<i>numera</i>
2. Ita boot iha oan nai hira dadaun ne'e? How many children do you have at the moment?	<i>numera</i>
3. Ita boot hakarak iha oan nain hira? How many children would you like to have?	<i>numera</i>
4. Karik ita boot moris iha suco ida ne'e? Se 'sim', ba section C. Were you born in this village? If 'yes', go to Section C.	<i>(1-0)</i>
5. Se 'lae': Se ita boot laos moris iha ne'e tinan hira ona ita boot hela iha suco ida ne'e? If 'no': If you were not born here, how long have you lived in the village?	<i>Tinan</i>

C. Rai

Now I will ask you some questions about land.

<p>1. Karik ita boot iha aksesu ruma ba rai (iljemplo hanesan kuda a'í han ou kuda du'ít ba animal)? Do you have access to land (for example for planting crops or grazing animals)?</p>	(1-0)
<p>2. Karik ita boot iha rai ruma? Se 'lae': ba Section D Do you own any land?</p>	(1-0)
<p>3. Se 'sim' Karik ita boot iha rai floresta ou plantasaun ruma? If yes, do you own any forest land or plantation?</p>	<p>(1-0) Serku ida karik Sim: Circle below natural forest or plantation if answer is yes floresta/plantasaun</p>
<p>4. Ita bo'ot nia floresta ne'e luan oinsa/ rai plantasaun? How big is your forest/plantation land?</p>	(hectares) (Kampu football)
<p>5. Ita boot nia produto importante saida maka kuda ou kolheta husi rai floresta/plantasaun ida ne'e? What are the main products that you grow or harvest from this forest land/plantation?</p>	Naran (Name) 1 Naran (Name) 2

D. Assets no rai osan iha banku /Assets and savings

Now I will ask you questions about the things you own.

1. Ita bo'ot iha uma rasik? Do you have your own house?	(1-0)
2. Material saida husi didín? (Codes: 1=rai; 2=Aí (aikabelak, Aí lolon); 3=besi ; 4=beton; 5= duút, aú; 9= seluk spesifika) What is the material of the walls? Codes: 1=mud/soil; 2=wooden (boards, trunks); 3=iron (or other metal) sheets; 4=bricks or concrete; 5=straw/grass/fibres/bamboo; 9=other, specify	(code)
3. Oinsa ita boot nia kakuluk? Ita boot nia kakuluk neé halo ho saida? (Codes: 1=besi; Talin tahan; 2= aí (aí kabelak); 3=duút no nú tahan; 4= genteng; 9= seluk spesifika) What about your roof? What is your roof made of? Codes: 1=thatch; 2=wooden (boards); 3=iron or other metal sheets; 4=tiles; 9=other, specify:	(code)

Ita boot iha ruma:

1. Karetatrek (Car)	(1-0)
2. Traktor (Tractor)	(1-0)
3. Motor (Bike)	(1-0)
4. Bicikaleta (Bicycle)	(1-0)
5. Telephone uma (Telephone)	(1-0)
6. TV	(1-0)
7. Radio	(1-0)
8. Sana tein (gas ou usa eletrisidade deit) (Stove)	(1-0)
9. Bero (Boat)	(1-0)
10. Chensor (Chainsaw)	(1-0)
11. Katana (Machete)	(1-0)
12. Baliun (Axe)	(1-0)
13. Solar panel	(1-0)
14. Bomba bé (Water pump)	(1-0)

E. Base rekursu floresta /Forest resource base

Agora hauú hakarak husu konaba floresta no aí sunu / Now I will ask questions about the forests and firewood

<p>1. Dinstansia hira ba floresta/ plantasaun neébe besik liu husi ita boot nia uma?</p> <p>Ita boot laó tempo hira toó iha neba?</p> <p>How far is the nearest forest/plantation from your house?</p>	<p><i>metre/Km</i></p> <p><i>Min/hour</i></p>
<p>2. Karik ita bo'ot no ita bo'ot membru familia buka aí sunu?</p> <p><i>Se 'laos', ba 8.</i></p> <p>Do you and your family members collect firewood?</p> <p><i>If 'no', go to 8.</i></p>	<p><i>(1-0)</i></p>
<p>3. Se 'sim': Oras hira iha semana ida ita bo'ot nia membru uma kain kolekta aí sunu?</p> <p>If 'yes': how many hours per week do you and others in the family spend on collecting firewood?</p>	<p><i>Min/hour</i></p>
<p>4. Semaka bain-bain buka aí sunu ba ita nia uma kain?</p> <p><i>Codes: 1= sira neébe maka iha uma 2= ema boot deit 3=labarik deit 4=feto deit 5=mane deit</i></p> <p>Who usually goes to collect firewood for your family?</p>	<p><i>(code)</i></p>

<p>5. Karik ita bo'ot nia uma kain kleur los hodi buka ai sunu kompara ho tinan 5 liu ba?</p> <p><i>Codes: 1=kleur liu; 2=nafatin; 3=menus</i></p> <p>Does it take you longer time to collect firewood now than it did 5 years ago?</p> <p><i>Codes: 1=it takes less time to collect; 2=it takes more time now; 3=about the same time</i></p>	<p>(code)</p>												
<p>6. Oinsa ita boot nia hanoin karik iha ona mudansa oituan durante tinan 5 liu ba?</p> <p><i>Codes: 1=Tun;2=nafatin;3=aumenta</i></p> <p>Se code '2' ou' 3', ba 8.</p> <p>How do you think the amount of firewood has changed during the past 5 years?</p>	<p>(code)</p>												
<p>7. Se nia resposta ne'e: dadaun ne'e iha menus ahi sunu.</p> <p>Karik ita bo'ot halo buat ruma resolve situsau ida ne'e? hau'u sei le ninia ijemplo favor dehan hau'u se ita bo'ot halo balun konaba resposta ida ne'e:</p> <p>If the answer is there is less firewood now, ask:</p> <p>Did you do anything to deal with this situation? I will read few examples please tell me if you did any of this in response:</p>	<table border="1"> <thead> <tr> <th data-bbox="770 719 1637 751" style="text-align: left;">Response</th> <th data-bbox="1637 719 2092 751"></th> </tr> </thead> <tbody> <tr> <td data-bbox="770 751 1637 874"> <p>a) Karik ita bo'ot lao dook atu hili ahi (e.g., dook liu tan husi uma)</p> <p><i>Did you walk further away to collect firewood</i></p> </td> <td data-bbox="1637 751 2092 874" style="text-align: right;"> <p>(1-0)</p> </td> </tr> <tr> <td data-bbox="770 874 1637 987"> <p>b) Karik ita kuda ai iha ita nia rai</p> <p><i>Did you plant trees on your land</i></p> </td> <td data-bbox="1637 874 2092 987" style="text-align: right;"> <p>(1-0)</p> </td> </tr> <tr> <td data-bbox="770 987 1637 1101"> <p>c) Karik ita bo'ot hola ahi sunu</p> <p><i>Did you buy firewood</i></p> </td> <td data-bbox="1637 987 2092 1101" style="text-align: right;"> <p>(1-0)</p> </td> </tr> <tr> <td data-bbox="770 1101 1637 1230"> <p>d) Karik ita bo'ot usa menus ai sunu ba tein no sunu</p> <p><i>Did you use less firewood for cooking & heating</i></p> </td> <td data-bbox="1637 1101 2092 1230" style="text-align: right;"> <p>(1-0)</p> </td> </tr> <tr> <td data-bbox="770 1230 1637 1345"> <p>e) Karik ita bo'ot tein ne'ebe ladun presisa ai sunu</p> <p><i>Did you cook food which needs less firewood</i></p> </td> <td data-bbox="1637 1230 2092 1345" style="text-align: right;"> <p>(1-0)</p> </td> </tr> </tbody> </table>	Response		<p>a) Karik ita bo'ot lao dook atu hili ahi (e.g., dook liu tan husi uma)</p> <p><i>Did you walk further away to collect firewood</i></p>	<p>(1-0)</p>	<p>b) Karik ita kuda ai iha ita nia rai</p> <p><i>Did you plant trees on your land</i></p>	<p>(1-0)</p>	<p>c) Karik ita bo'ot hola ahi sunu</p> <p><i>Did you buy firewood</i></p>	<p>(1-0)</p>	<p>d) Karik ita bo'ot usa menus ai sunu ba tein no sunu</p> <p><i>Did you use less firewood for cooking & heating</i></p>	<p>(1-0)</p>	<p>e) Karik ita bo'ot tein ne'ebe ladun presisa ai sunu</p> <p><i>Did you cook food which needs less firewood</i></p>	<p>(1-0)</p>
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<p>8. Karik ita bo'ot hola ai sunu?</p> <p>Do you buy firewood?</p>	(1-0)	
<p>9. Se Sim, Ai sunu hira maka ita bo'ot hola iha semana 1?</p> <p>If yes, how much firewood do you buy in 1 week?</p>	Quantity	
<p>10. Hau'u hakarak husu ita bo'ot konaba kuda ai. Karik ita bo'ot nia familia kuda ai ruma iha ita bo'ot ou ema seluk nia rai durante tinan 3 liu ba?</p> <p>Se 'Lae', ba section F.</p> <p>Now I will ask you about tree planting. Did your family plant any trees on your land or someone else's land over the past 3 years?</p>	(1-0)	
<p>11. Se sim, ita bole dehan mai hau'u tipu ai saida maka ita bo'ot kuda ona?</p> <p>If yes: Can you tell me the type of the tree you planted?</p>	Naran	
<p>12. Ita bo'ot bele dehan mai hau'u rasaun importante nusa maka ita bo'ot kuda ai</p> <p>Hau'u sei le ba ita bo'ot opsaun balun. Favor dehan mai hau'u rasaun ida ne'ebe halo ita bo'ot kuda ai.</p> <p>Can you tell me the main reason why you planted trees? I will read you some options. Please tell me which ones were the reasons why you planted trees.</p>	<p>Rasaun</p>	
	<p>1. Karik ita bo'ot kuda ai atu iha ai sunu ne'ebe barak ba ita bo'ot nia familia?</p> <p>Did you plant trees to have more firewood for the family?</p>	(1-0)
	<p>2. Karik ita bo'ot kuda ai atu faan ai sunu?</p> <p>Did you plant trees to sell firewood?</p>	(1-0)
	<p>3. Karik ita bo'ot kuda ai atu iha nia tahan no ai ba ita bo'ot nia familia hodi halo konstrusaun?</p> <p>Did you plant trees to have leaves and wood for your family for construction?</p>	(1-0)
<p>4. Karik ita bo'ot kuda ai atu faan nia tahan no ai?</p> <p>Did you plant trees to sell leaves and wood?</p>	(1-0)	

	5. Karik ita bo'ot kuda ai atu aumenta valor rai? Did you plant trees to increase the value of land?	(1-0)
Iha ruma rasaun seluk? Favor fó hau'u detailhas ruma? Is there other reasons? Please give some details (Record)		

F. Eventu no Gastus ne'ebe bo'ot/Events and Big Spending

Agora hau'u sei husu ita bo'ot konaba eventu balun no gastus ne'ebe bo'ot ne'ebe maka ita nia familia iha durante tinan uluk (husi natal ida ne'e ba natal tinan uluk)

Now I will ask you about some events and big spending that your family had during last year (from this Christmas time to last Christmas time).

1. Karik ema ruma husi ita bo'ot nia familia hetan kulheta ne'ebe ladiak iha tinan uluk? Did anyone in your house have a bad harvest during the last year?	(1-0)	
2. Karik ema ruma iha ita bo'ot nia uma hetan moras bo'ot no labele servisu durante tinan uluk? Did anyone in your house get seriously sick and was not able to work during the last year?	(1-0)	
3. Karik ema ruma iha ita bo'ot nia uma mate durante tinan uluk? Did anyone in your house die during the last year?	(1-0)	
4. Karik ema ruma iha ita nia uma lakon nia sasan ou moda uma tamba bé sa'e, rai monu ou ahi sunu durante tinan uluk? Did anyone in your house lose things or move house because of flooding, land slide or fire during the last year?	(1-0)	

<p>5. Karik ema ruma husi ita bo'ot nia uma gastu osan barak ba kasamento ou seremonia tradasional durante tinan uluk?</p> <p>Did anyone in your house spend so much money for a wedding or a traditional ceremony during the last year?</p>	(1-0)	Osan hira?
<p>6. Karik ema ruma iha ita bo'ot nia uma hetan sansaun ruma husi governu ou lederansa suco iha tinan uluk?</p> <p>Did anyone in your house get any fine/punishment from the government or the village leaders during the last year?</p>	(1-0)	Osan hira?

Se nia resposta ne'e Sim ba pergunta sira iha leten, Saida maka familia ne'e halo hasoru situasaun ida ne'e?

If the answer is yes to any of the questions above, What did the family do to deal with (pass through) the situation?

<ol style="list-style-type: none"> 1. <i>Familia hetan barak liu produto floresta</i> <i>Family collected more forest product</i> 2. <i>Familia Koelheta barak liu produtu agrikultura</i> <i>Family harvested more agricultural products</i> 3. <i>Familia Gastus osan rai uma/banku</i> <i>Family spent savings</i> 4. <i>Familia Faan Rai ou Animal</i> <i>Family sold land or animals</i> 5. <i>Familia devé husi kolega no familia</i> <i>Family borrowed from friends and family</i> 6. <i>Familia hetan ajuda husi NGO, igreja ou governo</i> <i>Family got support from NGO, church or government</i> 7. <i>La halo buat ida</i> <i>Did not do anything</i> 8. <i>Seluk, spesifika</i> <i>Other</i> 	<p>Please write down the answer or use codes on the left</p>
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G. Persepsaun moris diak no Kapital Sosial**Welfare perceptions and social capital**

<p>1. Karik ita bo'ot iha hahan ne'ebe natón atu fo han ita bo'ot nia familia durante tinan uluk?</p> <p><i>Codes: 1=Lae; 2=rasoavel (nato'on deit); 3=sim</i></p> <p>Have you had enough food to feed your family during last year?</p>	<i>(code)</i>
<p>2. Kompara ho uma kain seluk iha suco (ou comunidade) oinsa ita bo'ot nia uma kain ninia diak?</p> <p><i>Codes: 1=at loiu; 2=mais e menus diak; 3=Diak liu</i></p> <p>Compared with other households in the village (or community), how well-off is your household?</p>	<i>(code)</i>
<p>3. Oinsa ita bo'ot nia uma kain ninian diak ohin lora kompara ho situasaun tinan 5 liu ba?</p> <p>Compared with 5 years ago, how well-off is your household?</p> <p><i>Codes: 1=ladun diak ;2=nafatin;3=Diak liu</i></p>	<i>(code)</i>
<p>4. Karik ita bo'ot hanoin katak ita bo'ot nia suco ne'e fatin diak atu hela?</p> <p><i>Codes: 1=sim; 2=laos 3= dala ruma</i></p> <p>Do you think your village (community) is a good place to live?</p>	<i>(code)</i>
<p>5. Karik ita bo'ot fiar comunidade sira iha suco?</p> <p><i>Codes: 1=sim; 2=fiar balun no balun lae; 3= hau'u la fiar</i></p> <p>Do you trust people in the village (community)?</p>	<i>(code)</i>

<p>6. Karik ita bo'ot hetan ajuda husi komunidadade sira iha suco, bain hira ita presisa, ijemplo, se ita bo'ot presisa osan ruma tamba ema ruma moras iha ita bo'ot nia familia?</p> <p><i>Codes: 1=sim; 2= can sometimes get help Bele halo dala ruma, maibe laos bebeik, but not always; 3=laos</i></p> <p>Can you get help from other people in the village (community) if you are in need, for example, if you need extra money because someone in your family is sick?</p>	(code)

I. Suporta servisu no ambiental / Environmental and Forest Support/

I have few more questions about forest services.

<p>1. Karik ita bo'ot nia familia simu osan, treinamento ou material ruma ba kuda ai horis durante tinan uluk? Has your family received any cash, training or material for planting trees during last year?</p>	(1-0)
<p>2. Karik ita bo'ot nia familia simu osan, treinamento ou material ruma ba terasing tinan liu ba? Has your family received any cash, training or material for terracing during last year?</p>	(1-0)
<p>3. Karik ita bo'ot nia familia simu osan, treinamento ou material ruma atu proteje areas hanesan floresta ou jardim durante tinan uluk? Has your family received any cash, training or material for protecting areas such as forests or parks during last year?</p>	(1-0)
<p>4. Karik ita bo'ot nia familia simu osan, treinamento ou material ruma atu implementa lei tradisional hanesan tarabandu? Has your family received any cash, training or material for implementing customary laws such as Tara Bandu??</p>	(1-0)
	<p>Serku ida karik Sim:</p> <p><i>Osan/produto/treinamento</i></p>

<p>5. Karik ita bo'ot nia familia simu osan, treinamento ou material ruma ba Solar energia iha tinan uluk? Has your family received any cash, training or material for solar energy during last year?</p>	<p>(1-0)</p> <p>Serku ida karik Sim:</p>
<p>6. Karik ita bo'ot nia familia simu osan, treinamento ou material ruma Sanan eficiente energia durante tinan uluk? Has your family received any cash, training or material for energy efficient stoves during last year?</p>	<p>(1-0)</p> <p>Serku ida karik Sim:</p>
<p>Se Sim ba sira iha leten; Favor fó treinamneto detailha ne'ebe ita bo'ot simu! Se maka fó osan/ treinamneto/suporta? Saida maka ita bo'ot halo?</p> <p>If Yes to any above: Can you please give details of any training you received! Who gave you the cash/training/support? What did you do with it? Was it useful?</p>	

J. Hamos Floresta /Forest clearing

Now I will ask you few questions about clearing forests.

<p>1. Karik ema ruma iha ita bo'ot nia uma sunu ou hamos floresta ruma durante fulan 12 liu ba??</p> <p>Se 'lae', ba section K</p> <p>Did you or any one in your house burn or clear any forest during the past 12 months?</p> <p>If 'no', go to section K.</p>	<p>(1-0)</p>	
<p>Se nia resposta Sim:</p>	<p>6. Bele dehan mai hau'u, luan hira rai floresta ne'ebe maka ita bo'ot sunu/hamos?</p> <p>Can you tell me: how big was the forest land that you burned/ cleared?</p>	<p>(hectares) or (Kampu football)</p>

	<p>7. Tipu floresta saida maka ne'e? karik ida ne'e floresta natureza ou plantasaun? Codes: 1- Floresta natureza 2- Plantasaun</p> <p>What type of forest was it? Was it a natural forest or plantation?</p>	(code)
	<p>8. Karik ita bo'ot hatene semaka iha direito ba floresta ne'e? Codes: 1-governo ninian; 2- comunidade ninian; 3- Hau'u nian; 4-Ema ruma husi suco ida ne;e nian;5- La hetene senian ida ne'e loka ba ema hotu</p> <p>Do you know who owned that forest?</p>	(code)
	<p>9. Floresta ne'e distansia hira ba ita bo'ot nia uma? Lao tempo hira lao to'o iha neba? How close was this forest to your house? How long does it take you to get there?</p>	metre/Km Min/hour
	<p>10. Faan Floresta sai da? codes: 1= kuda ai han; 2=plantasaun ai; 3=hakiak animal; 4= Halo uma;5=Hauu nia rai;6= Seluk, espesifika</p> <p>For what reason did you clear the forest? Was it because you wanted to plant crops, or turn area the into plantation or own the land? Codes: 1-cropping 2-tree plantation 3-pasture; 4-Halo uma; 5-to own the land; 6- other</p>	(code)

K. Products from the Forests/ Produto husi Floresta

Ida ne'e parte ikus liu questionariu ida ne'e. Favor pasiensa. Hau sei husu lalais hauu nia pergunta final konaba produto floresta ne'e importante maka ita boot kolekta.

This is the last part of our questionnaire. Please be patient. I will try to ask quickly my final questions about the main forest products that you collect.

<p>1. Karik ita boot kolekta produto ruma husi floresta no plantasaun? Fó ijemplo usa tabela tuir mai ne'e se ema ne'e ladun hatene konaba produto.</p>	(1-0)
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<p>Do you collect any products from the forests or plantations?</p> <p>Give examples using the table below if the person is not sure about the products.</p> <p>2. Ita boot bele dehan mai hauú naran produto neébe bai-bain ita boot kolekta husi floresta.</p> <p>Usa table.</p> <p>Could you please tell me the names of the products that you usually collect from the forests:</p> <p>Use table.</p>	
--	--

Instruksaun ba investigador

Dala uluk hakerek produtu nia naran depois ba kada produto husu Q2,3,4,5,6,7,8.

Codes of the forest product:	
1.	Bamboo/ Aú
2.	Coconut leaves/ Nu tahan
3.	Palm stems/ Palma nia kain
4.	Palm leaves/ Palma tahan
5.	Rattan/ Rotan
6.	Banana leaves
7.	Teka
8.	Ai Na
9.	Samtuku
10.	Ai Ru
11.	Kemiri/ Aí kamihi
12.	Wild coffee/ Kafé fuik
13.	Honey/ Pohon madu
14.	Candle nut/ Kamihi fuan
15.	Betel nut/ Bua
16.	Palm Wine Tuá sabú
17.	Rubber
18.	Jackfruit
19.	Rapiles/ Reptiles
20.	Birds/ Balada
21.	Bats/ Ketelawar
22.	Insects/ Serangga
23.	Worms/ Ular
24.	Lizard/ Cicak
25.	Gecko/ Toke
26.	Rabbit/ Kelinci

1.Product/ Naran no kode produto Floresta	2.Se maka kolekta? Who collects it?	3. Nia neé Floresta natureza ou plantasaun?	4.Se maka iha direito ba rai neé? <i>Codes: 1- Governo makaiha direito; 2- Komuidade maka iha direito; 3- Hauú maka iha direito; 4- Ema ruma maka iha direito husi suco ida neé;5-La hetene semaka iha direito, aksesu ba ema hot-hotu</i>	5. Hira maka ita boot kolekta husi produtu ida neé iha fulan 1? How much do you collect of this product in one month	6. Ita boot usa ba saida? What do you use it for?	7. Karik ita boot faan produto ida neé? (1-0) Do you sell this product	8. Ita boot faan ba se?(hakerek nia resposta) Who do you sell it to? (Record the answer)
Name or code of the forest <i>Codes:</i> 1= Ema hotu 2= Ema boot deit 3=Labarik sira deit 4= Feto deit 5=mane deit <i>Codes:</i> 1= every one 2= only adults 3=only children 4=only women 5=only men		Is the land a natural forest or plantation (Codes: 1- Floresta natureza, 2- Plantasaun)	Who owns that land? <i>Codes: 1-government owns; 2- community owns; 3- I own; 4-someone else in this village owns;5-dont know who owns it is open to everyone</i>		<i>(codes:</i> 1- Hahan (food) 2- Aimoruk (medicine) 3-Construcsau, (construction) 4-Faan (to sell)) 5- Tein ou sunu (cooking or heating)		
See next page to finish the interview...							

Ida neé maka ita nia dada lia ikus liu. Obrigado barak ba ita boot nia partisipasaun. Ita sei produs relatório ida no sei fahe ba suco bain hira ita analiza informasaun sira neé. Obrigado dala ida tan!

‘This is the end of our interview. Thank you very much for your participation. We will produce a report and share it with the village when we analyse the information. Thank you again!

Naran investigador	Data	Lingua ba intervista	Tempu usa hodi kompleta intervista (Minutu)	Sei atenden fokus diskusaun grupu?
Name of the investigator	Date	Language of the interview	Completed the interview in minutes	Will attend the focus group discussion (1-0)

Appendix 4

Questions Leading the Focus Group Discussions

A. Forest and land cover/use

<p>1. Produtu saida mak importante liu, uza iha suco ida ne'e? <i>Objetivu atu halo ligasaun ba tipu floresta, ne'ebe mak uza lorloron. Halo mapa no koko hakerek atu uza ba tabela A sai hanesan matadalan ida.</i></p> <p>What are the main forest types, users and products in the village? <i>Note: The purpose is to link forest types, users and products. Mapping & drawing exercise will be used.</i></p>
<p>2. Karik iha suco ida ne'e halo pratika ativu ba format no fornese gestaun/manajementu floresta? <i>Tabela B mak sei sai hanesan matadalan.</i></p> <p>Does the village practice any form of active and deliberate forest management?</p>

B. rekursu husi floresta Forest resources

<u>Firewood</u>	1. What are the most important sources/products for firewood in the village? Rekursu/produtu ai-sunu saida mak importante liu iha suco ida ne'e?
	2. Has the availability of firewood changed over the past 5 years? Karik iha ona mudansa ba kuantidade ai-sunu kompara ba tinan lima(5) kotuk liu ba?
	➤ If the availability of firewood has declined , what are the main reasons? Karik iha kuantidade ai-sunu ne'ebe mak menus, aspeitu/razaun fundamental saida mak halo?
	➤ If the availability of firewood has increased , what are the reasons? Karik iha kuantidade ai-sunu ne'ebe maka sa'e/aumenta, razaun saida mak halo?
	3. In what ways can the benefits gained from firewood be increased (in terms of income use and efficiency)? Iha dalan saida mak ita bele hetan benefisiu husi ai-sunu atu hasa'e rendimenti ne'ebe efisiente?
<u>Timber from the forest</u>	1. What are the most important timber products that come from the forest in the village? Produtu Saida mak barak liu mai husi floresta iha suco ida ne'e?
	2. Has the availability of these products changed over the past 5 years? Karik iha ona kuantidade produtu ne'ebe mak menus durante tinan lima (5) kotuk liu ba?

<u>Ai-husi floresta</u>	➤ If the availability of these products has declined , what are the main reasons? Karik iha ona mudansa kuantidade produutu ne'ebe mak menus, razaun saida mak halo?
	➤ If the availability of these products has increased , what are the main reasons? Karik iha mudansa kuantidade produutu ne'ebe mak sa'e, razaun saida mak halo?
	3. In what ways can the benefits gained from these product be increased (in terms of income and use)?
<u>Food from the forest</u>	1. What are the most important food products that come from the forest in the village? Produutu saida mak importante liu mai husi floresta iha suco ida ne'e?
<u>Hahan mai husi floresta</u>	2. Has the availability of these products changed over the past 5 years? Karik iha mudansa ba kuantidade ba produutu, kompara tina lima(5) kotuk liu ba?
	➤ If the availability of these products has declined , what are the main reasons? Karik iha mudansa produutu ne'ebe mak tuun/menus, razaun saida mak halo?
	➤ If the availability of these products has increased , what are the reasons? Karik iha mudansa kuantidade produutu ne'ebe mak aumenta/sa'e, razaun saida mak halo?
	3. In what ways can the benefits gained from these products be increased (in terms of income and use)? Iha dalan saida mak it abele benefisia/hasa'e husi produutu ida ne'e intermus (rendimentu)
<u>Medicine from the forest</u>	1. What are the most important medicinal products that come from the forest in the village? Produutu Ai-moruk saida mak barak liu mai husi floresta iha suco ida ne'e?
<u>Ai-moruk husi floresta</u>	2. Has the availability of these products changed over the past 5 years? Karik iha mudansa kuantidade produutu, kompara tina lima(5) kotuk liu ba?
	➤ If the availability of these products has declined , what are the main reasons?
	➤ If the availability of these products has increased , what are the reasons?
	3. In what ways can the benefits gained from these products be increased (in terms of income and use)?

C. Forest Management

1. Are there customary rules such as Tarabandu regulating the use of important forest products in the village? If yes, can you give some details of how it works? Which products are protected?
2. Are these customary rules (tarabandu) respected by the population of the village?
3. Are there government rules that regulate forest use? If yes, are they enforced and respected by the members of the village?
4. Do village members require any permission to harvest forest products? If yes, for which products?
5. Who issues the permission?
6. Are there any forest user groups in the village who manage the use of forest products and enforce customary rules such as Tarabandu?

D. General

1. Overall how would you rate the importance of forests and environment in your daily life? Why? (<i>record</i>)
2. What resources, rules or support does the village need to look after the forests and environment better? (<i>record</i>)
3. In your opinion, how should forests and the environment be managed? Who should be responsible? (<i>record</i>)

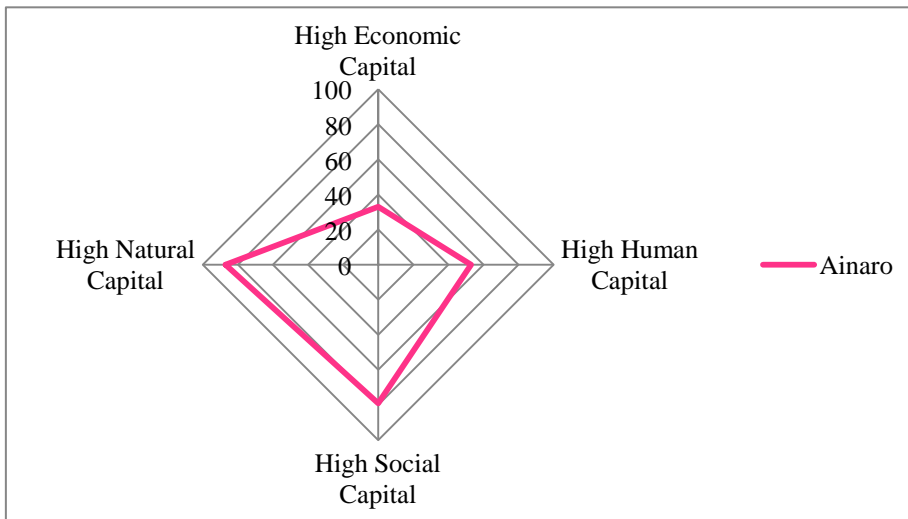
Appendix 5

Asset Portfolio Mapping at the Village Level

The following figures map out the livelihood portfolios of each of the eight villages included in this research. The figures present the percentages of households in each village that are endowed with four of the livelihood capitals at high levels. As described in Chapter 6, physical capital is assumed to be evenly distributed among all households within a village, hence, the maps do not include physical capital. The figures are paired for villages in the same district (with the exception of Comoro and Ulmera village which are 50 kilometres apart) to better illustrate the differences in the asset portfolios in places within close proximity.

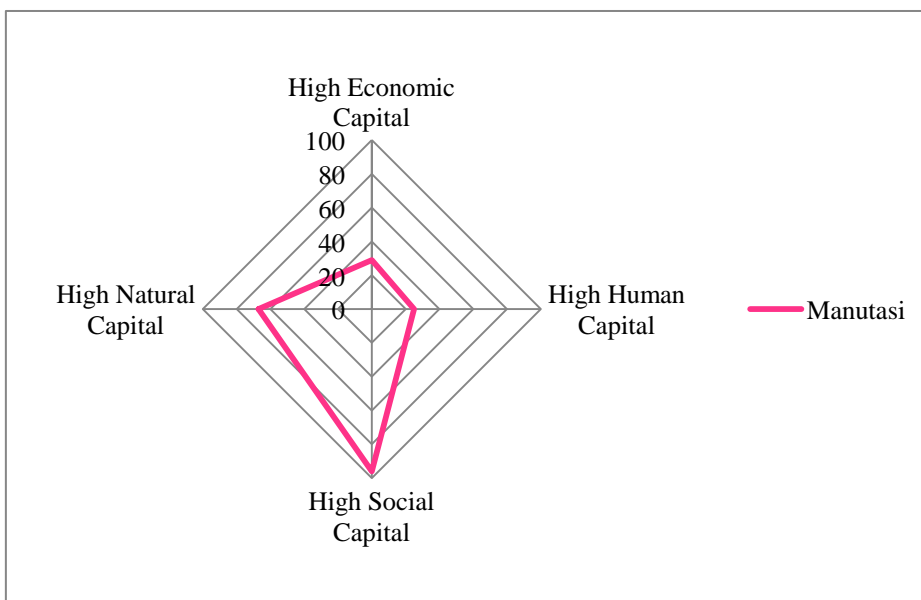
Asset Portfolio Mapping in two villages of Ainaro District

a) Village Ainaro



Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

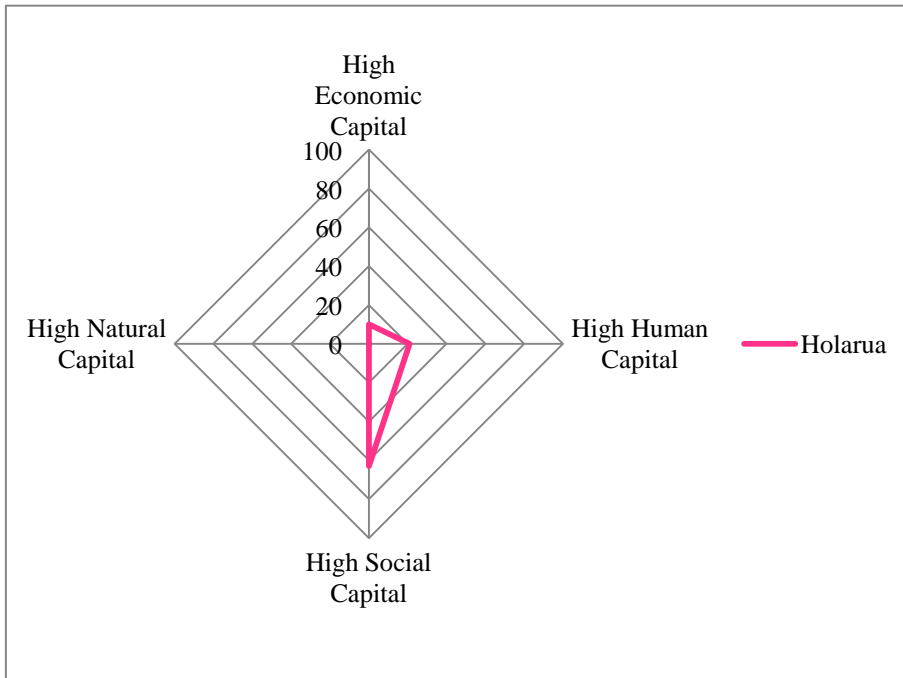
b) Village Manutasi



Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

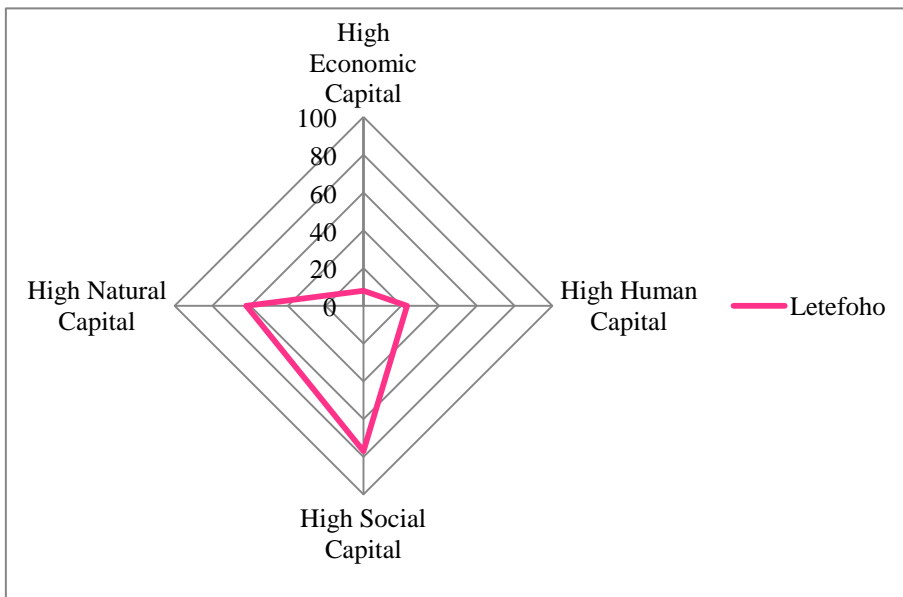
Asset Portfolio Mapping in two villages of Manufahi District

a) Village Holarua



Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

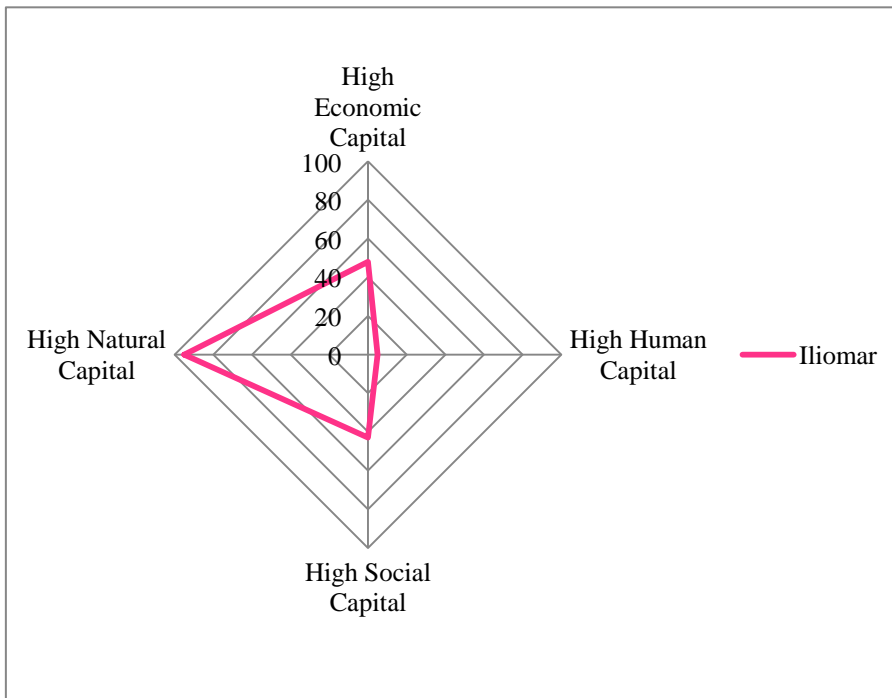
b) Village Letefoho



Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

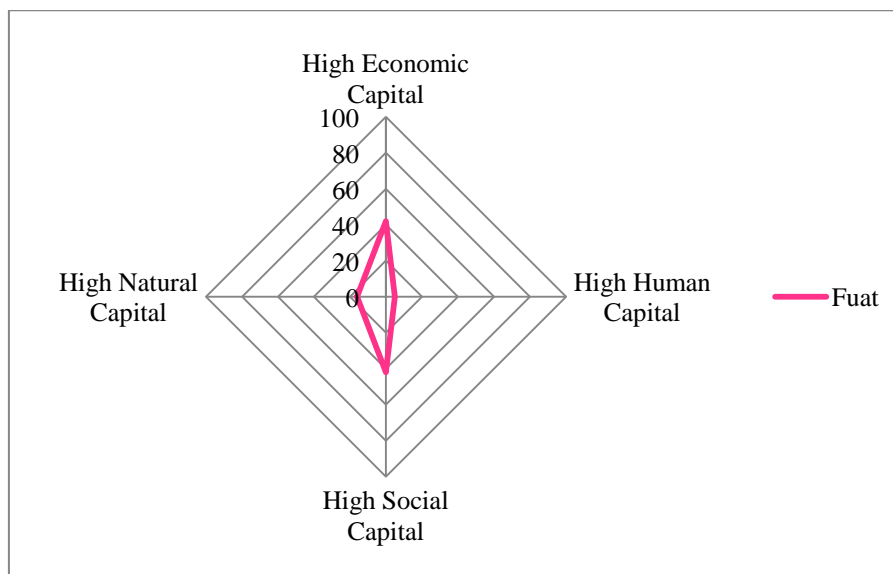
Asset Portfolio Mapping in two villages of Lautem District

a) Village Iliomar



Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

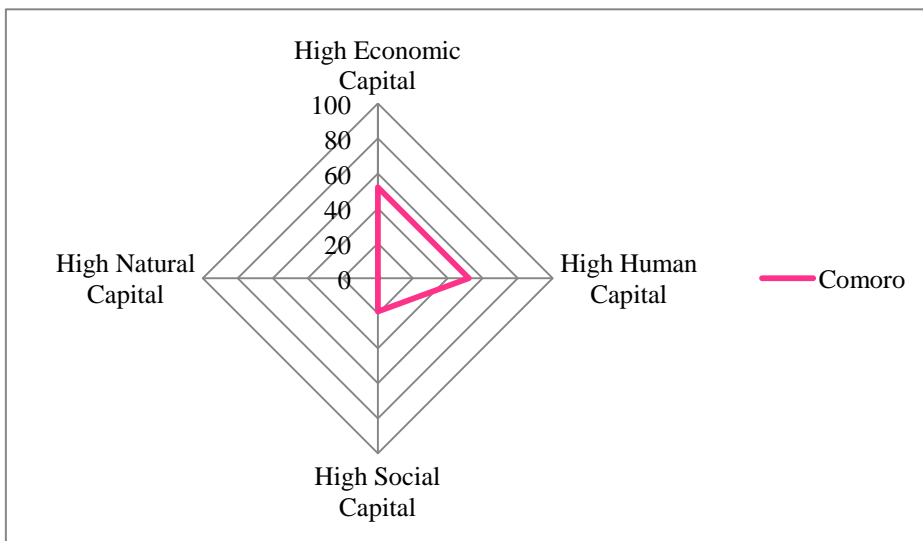
b) Village Fuat



Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

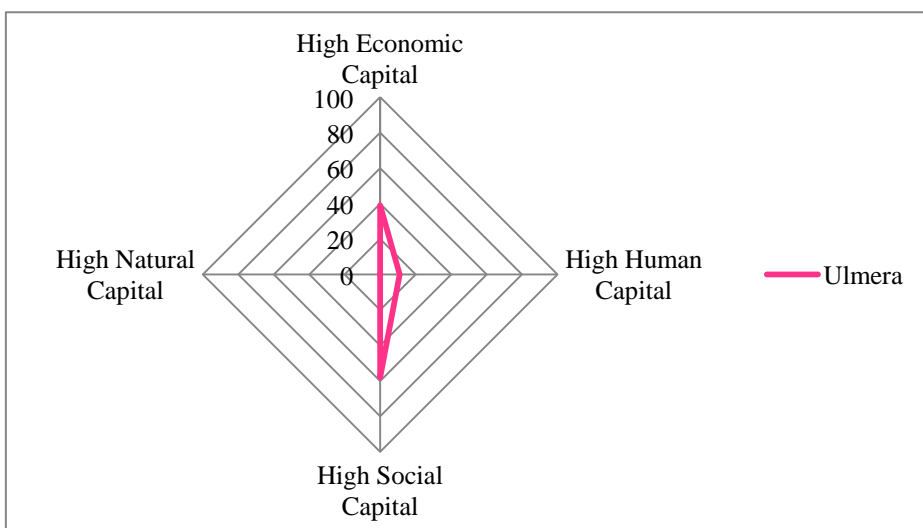
Asset Portfolio Mapping in two villages of Dili and Liquica Districts

a) Village Comoro, District Dili



Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

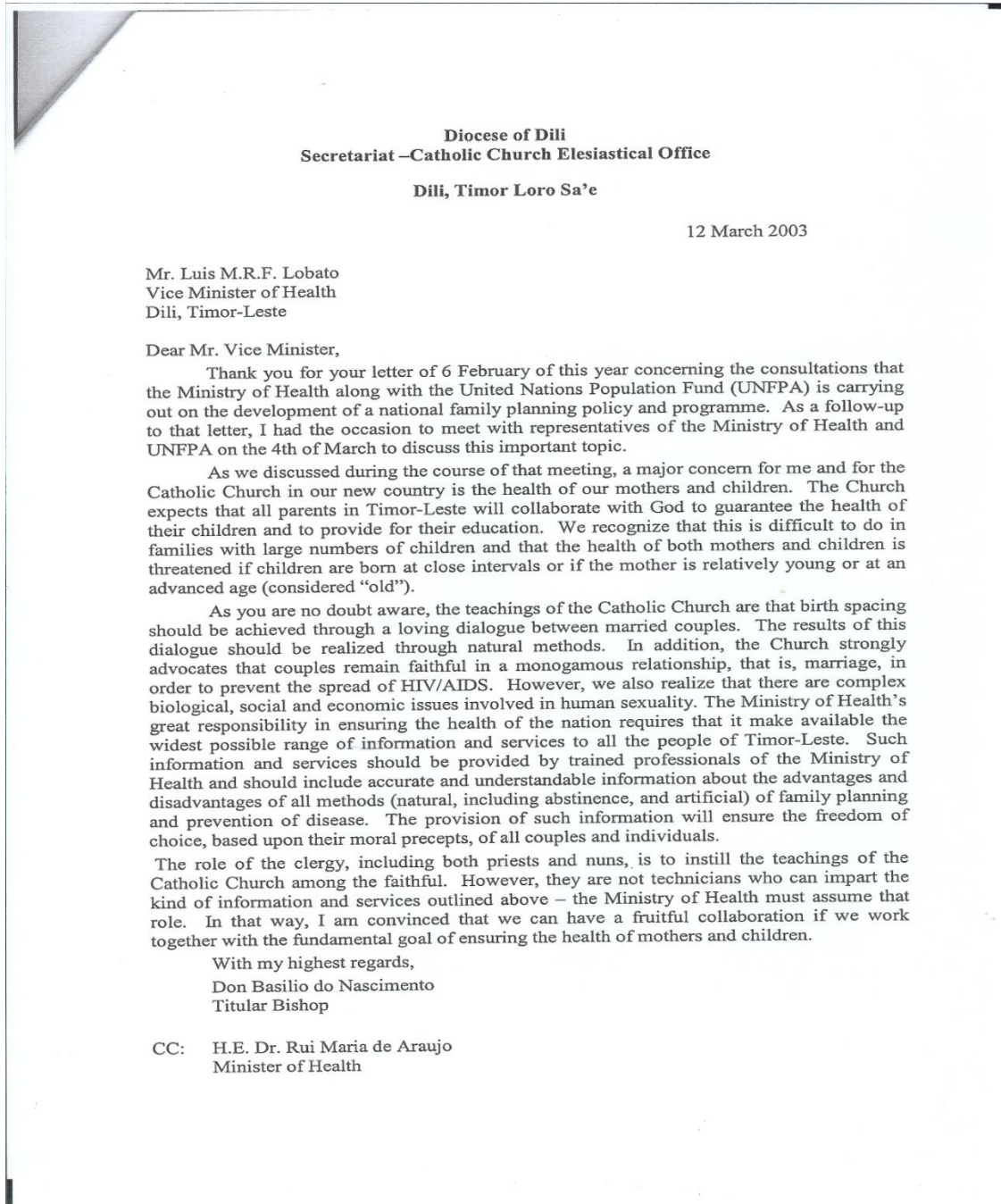
b) Village Ulmera, District Liquica



Source: Prepared by the researcher based on analysis of the fieldwork data 2011-2012

Appendix 6

Letter from Bishop Basilio on Family Planning



Source: Murray, W. (2004). 'Mass' media- the influence of Catholic Church on reproductive health policy in Timor-Leste: (unpublished paper) Flinders University of South Australia.

REFERENCES

- Aassve, A., Engelhardt, H., Francavilla, F., Kedir, A., Kim, J., Mealli, F., et al. (2005). Poverty and fertility in less developed countries: A comparative analysis. Working Paper No. 05/28 University of Leicester.
- Adhikari, B. (2003). Property rights and natural resources: Socio-economic heterogeneity and distributional implications of common property resource management, Working Paper 1-03. Kathmandu, Nepal: South Asian Network for Development and Environmental Economics.
- Aditjondro, G. (1994). *In the shadow of Mount Ramelau: The impact of the occupation of East Timor*. The Hague: Gegevens Koninklijke Bibliotheek.
- Agadjanian, V., & Prata, N. (2002). War, peace, and fertility in Angola. *Demography*, 39(2), 215-231.
- Agarwal, B. (1994). The gender and environment debate: Lessons from India. In L. Arizpe, M. P. Stone & D. C. Major (Eds.), *Population and the environment: Rethinking the debate* (pp. 97-124). Boulder, CO: Westview Press.
- Agrawal, A., & Gibson, C. C. (1999). Enchantment and disenchantment: The role of community in natural resource conservation. *World Development*, 27(4), 629-649.
- Alongi, D., Amaral, A., Carvalho, N., McWilliam, A., Rouwenhorst, J., Tirendi, F., et al. (2009). River Catchments and Marine Productivity in Timor Leste: Caraulun and Lacro Catchments; South and North Coasts. Charles Darwin University.
- Alves, D. S. (2002). Space-time dynamics of deforestation in Brazilian Amazonia. *International Journal of Remote Sensing*, 23, 2903-2908.
- Anderson, R., & Deutsch, C. (2001). *Sustainable Development and the Environment in East Timor*. Paper presented at the Conference on Sustainable Development in East Timor 25-31 January, Dili.
- Anderson, T. (2010). *The Petroleum Fund and Development Strategy in Timor Leste*. A Report for Timor Leste's Petroleum Fund Consultative Council. Retrieved from <http://www.laohamutuk.org/Oil/PetFund/revision/AndersonDraftPFPaperJun10En.pdf>
- Angelsen, A., Chitsike, L., Ekoko, F., Holden, S., Johari, M. Y. J., Nagla, B. K., et al. (1995). *Poverty and the Environment. Paper presented at the CROP/ADIPA/UNCTAD workshop Poverty and the Environment*, Sabah, Malaysia.
- Angelsen, A., Jagger, P., Babigumira, R., Belcher, B., & Hogarth, N. H. (2014).

- Environmental Income and Rural Livelihoods: A Global-Comparative Analysis. *World Development*, 64(1), 12-28.
- Angelsen, A., Larsen, H. O., Lund, J. F., Smith-Hall, C., & Wunder, S. (Eds.). (2011). *Measuring livelihoods and environmental dependence: Methods for research and fieldwork*. Washington: Earthscan.
- Angelsen, A., & Wunder, S. (2003). Exploring the forest poverty link: Key concepts, issues and forest implications. CIFOR Occasional Paper No.40.
- Aning, K., & Atta-Asamoah, A. (2011). Demography, environment and conflict in West Africa. KAIPTC Occasional Paper No. 34. Retrieved February, 2013, from <http://www.africaportal.org/dspace/articles/demography-environment-and-conflict-west-africa>
- Anon. (2004). *Policy and Strategy: Forestry and Watershed Subsector*. Timor-Leste: National Directorate of Forestry and Water Resources, Ministry of Agriculture, Forestry and Fisheries.
- Arnold M. et al. (2011). Forests, biodiversity and food security. *International Forestry Review*, 13(3), 259-264.
- Asante, A., Hall, J., & Roberts, G. (2011). *A review of health leadership and management capacity in Timor-Leste*. Human Resources for Health Knowledge Hub: University of New south Wales Sydney.
- Asian Development Bank [ADB]. (2012). *The Impact of Out-of-Pocket Expenditures on Families and Barriers to Use of Maternal and Child Health Services in Timor-Leste: Evidence from the Timor-Leste Surveys of Living Standards 2001 and 2007*. Dili: ADB.
- Ashley, C., & Carney, D. (1999). *Sustainable livelihoods: Lessons from early experience*. London: Department for International Development.
- Aswani, S. (1999). Common property models of sea tenure: a case study from Roviana and Vonavona Lagoons, New Georgia, Solomon Islands. *Human Ecology*, 27, 417-453.
- Australia Timor-Leste Friendship Network. (2009). *Map of Timor-Leste*. Retrieved from <http://austimorfn.com/timor-leste/>
- Azariadis, C., & Drazen, A. (1990). Threshold externalities in economic development. *Quarterly Journal of Economics*, 105(2), 501-526.
- Babo-Soares, D. (2001). *East Timor: Perceptions of culture and environment*. Paper presented at the Conference on Sustainable Development in East Timor, Dili, East Timor.
- Babulo, B., Muys, B., Nega, F., Tollens, E., & Nyssen, J. (2008). Household livelihood strategies and forest dependence in the highlands of Tigray,

- Northern Ethiopia. *Agricultural Systems*, 98, 147-155.
- Baland, J. M., & Platteau, J. P. (1996). *Halting degradation of natural resources: is there a role for rural communities?* Oxford: Clarendon Press for FAO.
- Barnett, Dessai, & Jones. (2007). Vulnerability to climate variability and change in East Timor. *Ambio*, 36(5), 372-378.
- Barnett, J., & Adger, W. N. (2007). Climate change, human security and violent conflict. *Political Geography*, 26, 639-655.
- Barnett, J., Dessai, S., & Jones, R. N. (2007). Vulnerability to climate variability and change in East Timor. *Ambio*, 36(5), 372-378.
- Barrett, C. B., Bezuneh, M., Clay, D. C., & Reardon, T. (2005). Heterogeneous constraints, incentives and income diversification strategies in rural Africa. *Quarterly Journal of International Agriculture*, 44(1), 37-60.
- Barro, R. J. (1991). Economic growth in a cross section of countries. *Quarterly Journal of Economics*, 106(2), 407-443.
- Barro, R. J., & Lee, J.-W. (1996). International measures of schooling years and schooling quality. *American Economic Review*, 86(2), 218-223.
- Bass, S., Bigg, T., Bishop, J., & Tunstall, D. (2006). Sustaining the environment to fight poverty and achieve the Millennium Development Goals. *Review of European Community & International Environmental Law*, 15(1), 39-55.
- Bebbington, A. (1999). Capitals and capabilities: a framework for analyzing peasant viability, rural livelihoods and poverty. *World Development*, 27(12), 2021-2044.
- Becker, S. (2008). *Life table*. Lecture materials for John Hopkins University. Retrieved from <http://ocw.jhsph.edu/courses/demographicmethods/PDFs/idm-sec7.pdf>
- Bekalo, S., & Bangay, C. (2002). Towards effective environmental education in Ethiopia: problems and prospects in responding to the environment-poverty challenge. *International Journal of Educational Development*, 22(1), 35-46.
- Belton, S. (2010). *UNFPA strategy to enhance reproductive health commodity*. London: HLSP.
- Belton, S., Whittaker, A., & Barclay, L. (2009). *Maternal mortality, unplanned pregnancy and unsafe abortion in Timor-Leste: A situational analysis*. Dili: Alola Foundation.
- Belton, S., Whittaker, A., Fonseca, Z., Wells-Brown, T., & Pais, P. (2009). Attitudes towards the legal context of unsafe abortion in Timor-Leste. *Reproductive Health Matters*, 17(34), 55-64.

- Benjaminsen, T. A. (2008). Does supply-induced scarcity drive violent conflicts in the African Sahel? The case of the Tuareg rebellion in Northern Mali. *Journal of Peace Research*, 6 819-836
- Berry, S. (1989). Social institutions and access to resources. *Africa*, 59(1), 41-55.
- Biddlecom, A. E., Axinn, W., & Barber, J. S. (2005). Environmental effects on family size preferences and subsequent reproductive behavior in Nepal. *Population and Environment* 26(3), 583-621.
- Bilsborrow, R., & Geores, M. (1993). Population, land use and the environment in developing countries: What Can we learn from cross-national data? In D. Pearce & K. Brown (Eds.), *The causes of deforestation*. New York: Oxford University Press.
- Bilsborrow, R., & Okoth-Ogendo, H. (1992). Population-driven changes in land-use in developing countries. *Ambio*, 21(1), 37-45.
- Birdsall, N. (1994). Government, population, and poverty: A win-win tale. In R. Cassen (Ed.), *Population and Development: Old Debates, New Conclusions*. Washington: Transaction Publishers.
- Birdsall, N., Ross, D., & Sabot, R. (1995). Inequality and growth reconsidered: Lessons from East Asia. *World Bank Economic Review*, 9(3), 1-21.
- Birdsall, N., & Sinding, S. W. (2001). How and why population matters: new findings, new issues. In N. Birdsall, A. C. Kelley & S. W. Sinding (Eds.), *Population matters: Demographic change, economic growth, and poverty in the developing world*. New York: Oxford University Press.
- Blaikie, P. (1985). *The political economy of soil erosion*. London: Longman.
- Blanc, A. K. (2004). The role of conflict in the rapid fertility decline in Eritrea and prospects for the future. *Studies in Family Planning*, 35(4), 236-245.
- Bloom, D. E., David, C., & Sevilla, J. (2004). The effect of health on economic growth: A production function approach. *World Development*, 32, 1-13.
- Bloom, D. E., & Williamson, J. G. (1998). Demographic transitions and economic miracles in emerging Asia. *World Bank Economic Review*, 12(3), 419-455.
- Boge, V. (1992). *Bougainville: A 'classical' environmental conflict?*. Zurich: Swiss Federal Institute of Technology/ Swiss Peace Foundation.
- Bongaarts, J. (1978). A framework for analyzing the proximate determinants of fertility. *Population and Development Review*, 4, 105-131.
- Bongaarts, J., & Delgado, H. (1977). Effects of nutritional status on fertility in rural Guatemala. In H. Leridon & J. Menken (Eds.), *Natural Fertility*. Liege: Orinda Editions.

- Bordean, C., & Elbadawi, I. A. (2007). Riots, coups and civil war. *Policy Research Working Paper, No. 4397*. Washington D. C.: The World Bank.
- Borgerhoff, A. (2006). The double task: Nation- and state-building in Timor-Leste. *European Journal of East Asian Studies*, 5(1), 101-130.
- Boserup, E. (1965). *The conditions of agricultural growth*. Chicago: Aldine.
- Boserup, E. (1981). *Population and technological change*. Chicago: University of Chicago Press.
- Botsch, R. E. (2011). Significance Tests and Measures of Association: In Scope and Research Methods in Political Science, Retrieved from <http://www.usca.edu/polisci/apls301/SignifAssoc.htm>
- Bourdieu, P. (1986). The forms of social capital. *Critical Perspectives*: Oxford University Press.
- Bowd, R. (2012). Assessing the risk of violence in Timor-Leste's 2012 elections: People's Peacemaking Perspectives: Saferworld. Retrieved from <file://usergh/h/hosg0001/Downloads/Timor-Leste%20PPP%20report.pdf>
- Brandolini, A., Magri, S., & Smeeding, T. M. (2010). Asset-based measurement of poverty: Brief 68. La Follete School Working Paper No. 2010-004.
- Bremner, J., López-Carr, D., Suter, L., & Davis, J. (2010). Population, poverty, environment, and climate dynamics in the developing world. *Interdisciplinary Environmental Review*, 11(2/3), 112-126.
- Brennan-Galvin, E. (2002). Crime and violence in an urbanizing world. *Journal of International Affairs*, 56, 123-145.
- Browder, J. O. (1992). The limits of extractivism. *Bioscience*, 42(3), 174-182.
- Brown, D. (1998). Participatory biodiversity conservation: rethinking the strategy in the low tourist potential areas of tropical Africa. *Natural Resource Perspective*, (Vol. 33). Overseas Development Institute.
- Brown, D. R., Stephens, E. C., Ouma, J. O., Murithi, F. M., & Barrett, C. B. (2006). Livelihood strategies in the rural Kenyan highlands. *African Journal of Agricultural and Resource Economics* 1(1), 21-36.
- Brown, L. (2009). *Plan B 4.0- Mobilizing to save civilization*. London: W. W. Norton and Company.
- Brown, L., Flavin, C., & French, H. (1998). *State of the world: 1998*. London and New York: The Worldwatch Institute W.W. Norton.
- Bugalski, N. (2010). *Post conflict housing reconstruction and the right to adequate housing in Timor-Leste: An analysis of the response to the crisis of 2006*

- and 2007. Retrieved from <http://www.inclusivedevelopment.net/wp-content/uploads/2012/12/POST-CONFLICT-HOUSING-RECONSTRUCTION-AND-THE-RIGHT-TO-ADEQUATE-HOUSING-IN-TIMOR-LESTE.pdf>
- Buhaug, H., & Urdal, H. (2013). An urbanization bomb? Population growth and social disorder in cities. *Global Environmental Change*, 23, 1-10.
- Bulte, Erwin, Damania, Richard, Deacon, & Robert, T. (2005). Resource intensity, institutions, and development. *World Development*, 33, 1029-1044.
- Butler, C. D., & Oluoch-Kosura, W. (2006). Linking future ecosystem services and future human well-being. *Ecology and Society*, 11(1), 30.
- Cahn, M. (2006). *Sustainable Rural Livelihoods, Micro-Enterprise and Culture in the Pacific Islands: Case Studies from Samoa*. PhD, Massey University, Palmerston North.
- Cain, M. (1983). Fertility as an adjustment to risk. *Population Development Review*, 9(2), 688-702.
- Caldwell, J. C. (2006). *Demographic transition theory*. Dordrecht: Springer.
- Caldwell, J. C., & Caldwell, B. K. (2005). The causes of the Asian fertility decline. *Asian Population Studies*, 1(1), 31-46.
- Caldwell, J. C., & Caldwell, P. T. (1987). The cultural context of high fertility in sub-Saharan Africa. *Population Development Review*, 13(3), 409-437.
- Carment, D., & Yiagadeesen, S. (2011). *The Millennium Development Goals and fragile states: Focusing on what really matters*. The Fletcher Forum of World Affairs.
- Carney, D. (1998). *Sustainable rural livelihoods. What contributions can we make?* London: Department for International Development (DFID).
- Carney, D., Drinkwater, M., Rusinow, T., Neejes, K., Wanmaili, S., & Singh, N. (1999). *Livelihood approaches compared*. London: DFID.
- Carr, D. L. (2005). Population, land use, and deforestation in the Sierra de Lacand on National Park. *Professional Geographer* (57), 157-168.
- Carr, D. L. (2006). A tale of two roads: Population, poverty, and politics on the Guatemalan frontier. *Geoforum*, 37(1), 94-103.
- Carter, M. R., & Barrett, C. B. (2006). The economics of poverty traps and persistent poverty: an asset based approach. *Journal of Development Studies*, 42(2), 179-199.
- Carvalho, D. A. (2011). *Local knowledge of Timor*. Jakarta: UNESCO. Retrieved

from <http://unesdoc.unesco.org/images/0021/002145/214540e.pdf>

- Cavendish. (1998). *The complexity of the commons: Environmental resource demands in rural Zimbabwe* (Vol. WPS/99-8). Oxford: Centre for the Study of African Economies.
- Cavendish, W. (2000). Empirical regularities in the poverty-environment relationship of rural households: Evidence from Zimbabwe. *World Development*, 28(11), 1979-2003.
- Center for International Forestry Research [CIFOR]. (2012). Fact sheet research findings: food and livelihoods. Retrieved from http://www.cifor.org/fileadmin/factsheet/RIO+20_Factsheet%20-%20Food%20and%20Livelihoods.pdf
- Central Intelligence Agency [CIA]. (2013a). *The world factbook*. Washington: Central Intelligence Agency.
- Central Intelligence Agency. (2013b). The world factbook: GDP composition by sector of origin. Retrieved from <https://www.cia.gov/library/publications/theworldfactbook/fields/2012.html>
- Chambers, R. (1997). *Whose reality counts?* London: Intermediate Technology Publications.
- Chambers, R., & Conway, G. (1992). Sustainable rural livelihoods: practical concepts for the 21st century (Vol. Discussion Paper 296). Brighton: IDS.
- Chandy, L. (2011). Fragile states: Problem or promise? *Development Assistance Committee News*. Retrieved from <http://www.brookings.edu/research/articles/2011/12/fragile-states-chandy>.
- Chen, H. C. (1914). The economic principles of Confucius and his school. *The Journal of Race Development*, 5(2), 230-232.
- Chen, R., & Fiering, M. (1989). *Climate change in the context of multiple environmental threats- Research report-89*. Brown University.
- Chew, T. H., Hewitt, J., & Keong, C. H. (2012). *Timor Leste: Scoping baseline information for forest law enforcement, governance and trade*. Kuala Lumpur: EU FLEGT Facility.
- Chi, G. (2005). *Debates on population and the environment*. Population-Environment Research Network (PERN).
- Choucri, N. (1974). *Population dynamics and international violence: Propositions, insights and evidence*. MA: Lexington.
- Cincotta, R. P. (2005). *State of the world 2005 global security brief #2: Youth bulge, underemployment raise risks of civil conflict*. Retrieved from

<http://www.worldwatch.org/node/76>

- Cincotta, R. P., Engelman, R., & Anastasion, D. (2003). *The security demographic*. Washington DC: Population Action International.
- Cline, W. R. (2007). *Global warming and agriculture: Impact assessment by country*. Washington DC: Centre for Global Development and Peterson Institute for International Economics.
- Coale, A. H., & Hoover, E. M. (1958). *Population growth and economic development in low-income countries: A case study of India's prospects*. Princeton, New Jersey: Princeton University Press.
- Cohen, D., & Soto, M. (2001). Growth and human capital: good data, good results *OECD Development Centre Technical Papers No. 179*.
- Cohen, J. E. (1995). *How many people can the earth support*. New York: Norton.
- Cole, M., & Peters, G. (1997). *Recommendations presented to the International Joint Commission: In Environmental Injustice in the Great Lakes Water Quality Agreement*. Ottawa, ON. A presentation to the International Joint Commission, Assembly of First Nations.
- Coleman, J. (1988). Social capital in the creation of human capital. *American Journal of Sociology*, 94, Supplement S95-S120.
- Collier, P. (2000). Doing well out of war: An economic perspective. In M. Berdal & D. M. Malone (Eds.), *Greed & Grievance Economic Agendas in Civil Wars* (pp. 91-111). Boulder, CO and London: Lynne Rienner.
- Collier, P. (2007). *The bottom billion: Why the poorest countries are failing and what can be done about it?*. New York: Oxford University Press.
- Collier, P., & Hoeffler, A. (2004). Greed and grievance in civil war. *Oxford Economic Papers*, 56(4), 563-595.
- Coomes, O. T., & Barham, B. L. (1997). Rain forest extraction and conservation in Amazonia. *The Geographical Journal*, 163(2), 180-188.
- Córdova, A. (2008). Methodological note: Measuring relative wealth using household asset indicators (Vol. 6): *Americas Barometer Insights*. Retrieved from <http://www.vanderbilt.edu/lapop/insights/I0806en.pdf>
- Costanza, R., D'Arge, R., DeGroot, R., Farber, S., Grasso, M., Hannon, B., et al. (1997). The value of the world's ecosystem services and natural capital. *Nature*, 387, 253-260.
- Crawford, R. (1991). *The era of human capital: The emergence of talent, intelligence, and knowledge as the worldwide economic force and what it means to managers and investors*. New York: Harper Business.

- Crossette, B. (2010). *State of world population 2010- From conflict and crisis to renewal: generations of change*. UNFPA. Retrieved from http://nigeria.unfpa.org/pdf/swop_2010_eng.pdf
- Curtain, R., Davies, R., & Howes, S. (2013). Helping Timor-Leste implement a regional employment strategy: A submission to the Joint Standing Committee on Foreign Affairs, Defence and Trade's inquiry into Australia's relationship with Timor-Leste. Canberra: ANU.
- Dae-Bong, K. (2009). *Human capital and its measurement*. Paper presented at the the 3rd OECD World Forum on "Statistics, Knowledge and Policy" Charting Progress, Building Visions, Improving Life, Busan, Korea.
- Dalal-Clayton, B., & Bass, S. (2009). The Challenges of Environmental Mainstreaming, Experience of integrating environment into development institutions and decisions, Environmental Governance No.3. London: International Institute for Environment and Development.
- Dasgupta, M., Bongaarts, J., & Cleland, J. (2011). Population, Poverty, and sustainable development: A review of the evidence *Policy Research Working Paper 5719*. Washington: The World Bank.
- Dasgupta, P. (1995). Population, poverty, and the local environment. *Scientific American*, 272, 40-46.
- Dasgupta, P. (2000). Population and resources: an exploration of reproductive and environmental externalities. *Population and Development Review* (26), 643-689.
- Dasgupta, P. (2008). Nature in economics. *Environmental and Resource Economics*, 39, 1-7.
- Dasvarma, G. L. (2011). Demography of Timor-Leste: A brief overview and some implications for development and security. In Vandra Harris & Andrew Goldsmith (Eds.), *Security, development and nation-building in Timor-Leste: A cross sectoral assessment*. New York: Routledge, 195-209.
- Davis, K., & Blake, J. (1956). Social structure and fertility: an analytic framework. *Economic and cultural change*, 4(2), 211-235.
- De Haan, D. J. (2005). Exploring the frontier of livelihood research. *Development and Change*, 36(1), 27-47.
- De Haan, D. J. (2012). The livelihood approach: A critical exploration. *Erkunde*, 66(4), 345-357.
- de Sherbinin, A., Carr, D., Cassels, S., & Jiang, L. (2007). Population and environment. *Annual Review of Environment and Resources*, 32, 345-373.
- de Sherbinin, A., VanWey, L., McSweeney, K., Aggarwal, R., Barbieri, A., Henry,

- S., et al. (2008). Rural household demographics, livelihoods and the environment. *Global Environmental Change*, 18(1), 38-53.
- De Souza, R. M., Williams, J. S., & Meyerson, F. A. B. (2003). Critical links: Population, Health, and the Environment, *Population Reference Bureau Bulletin* 53(3), 1-43.
- Delgado, H., Martorell, R., & Klein, R. E. (1982). Nutrition, lactation, and birth interval components in rural Guatemala. *American Journal of Clinical Nutrition*, 35, 1468-1476.
- Democratic Republic of Timor-Leste. (2011). *The national biodiversity strategy and action plan of Timor-Leste (2011-2020)*. Dili: The Ministry of Economy and Development, UNDP and GEF.
- Department for International Development [DID]. (1999a). *Sustainable livelihoods and poverty elimination: Background briefing*. London: DFID. Retrieved from www.ids.ac.uk/livelihoods.html
- Department for International Development. (1999b). *Sustainable livelihoods guidance sheets*. London: DFID.
- Department for International Development, European Commission, United Nations Development Program, & World Bank. (2002). *Linking poverty reduction and environmental management, policy challenges and opportunities*. Washington: World Bank.
- Dolcemascola, G. (2003). *Climate risk and agriculture in Timor-Leste*. Paper Presented at Seminar on Climate Change and Severe Weather Events in Asia and the Caribbean, Barbados Washington DC: Inter-American Development Bank.
- Dunn, J. (1983). *Timor: A people betrayed*. Milton, Qld: Jacaranda Press.
- Durning, A. (1989). *Poverty and the environment: reversing the downward spiral* (Worldwatch paper Vol. 92). Washington D.C: Worldwatch Institute.
- Easterlin, R. (1975). An economic framework for fertility analysis. *Studies in Family Planning*, 6, 24-36.
- Eastwood, R., & Lipton, M. (2001). Demographic transition and poverty: effects via economic growth, distribution and conversion. In N. Birdsall, A. C. Kelley & S. W. Sinding (Eds.), *Population Matters: Demographic Change, Economic Growth, and Poverty in the Developing World*. New York: Oxford University Press.
- Eckholm, E. (1976). *Losing ground: Environmental stress and food problems*. New York: Norton.
- Ehrlich, P. R. (1968). *The population bomb*. New York: Ballantine Books.

- Ehrlich, P. R., & Ehrlich, A. (1990). *The population explosion*. New York: Simon and Schuster.
- Ehrlich, P. R., & Holdren, J. P. (1971). Impact of population growth. *Science*, *171*, 1212-1217.
- Elhawary, S., Foresti, M., & Pantuliano, S. (2010). *Development, security and transitions in fragile states*: Meeting Series Report: ODI.
- Ellis, S. C. (2005). Meaningful consideration? A review of traditional knowledge in environmental decision making. *Arctic*, *58*(1), 66-77.
- England, R. W. (1998). Should we pursue measurement of the natural capital stock? *Ecological Economics*, *27*(1), 257-266.
- Fairhead, J., & Leach, M. (1998). *Reframing deforestation: The local and the global: studies in West Africa*. London and New York: Routledge.
- Fennell, D. A., & Dowling, R. K. (2003). *Ecotourism policy and planning*: Wallingford: CABI Publishing.
- Filmer, D., & Pritchett, L. H. (2001). Estimating wealth effect without expenditure data or tears: An Application to educational enrollments in states of India, *Demography*, *38*, 115-132.
- Filmer, D., & Pritchett, L. H. (2002). Environmental degradation and the demand for children: searching for the vicious circle in Pakistan. *Environment and Development Economics*, *7*, 123-146.
- Fisher, M. (2004). Household welfare and forest dependence in Southern Malawi. *Environment and Development Economics*, *9*(2), 135-154.
- Fitzpatrick, D., McWilliam, A., & Barnes, S. (2013) *Property and social resilience in times of conflict: Land, custom and law in East Timor*. Ashgate.
- Foley, J. A., De Fries, R., Asner, G. P., Barford, C., & Bonan, G. (2005). Global consequences of land use. *Science*, *309*, 570-574.
- Food and Agriculture Organisation of the United Nations [FAO]. (2005). *Can non-wood forest products help contribute to achieving the Millennium Development Goals?* Rome: FAO.
- Food and Agriculture Organisation of the United Nations. (2008). *Timor-Leste national action programme to combat land degradation* Revised Draft. Dili: Timor-Leste.
- Food and Agriculture Organisation of the United Nations. (2010). *Global forest resources assessment country report Timor-Leste*. Rome: FAO.
- Food and Agriculture Organisation of the United Nations. (2011a). *Ecotourism can*

- play vital role in maintaining healthy forests*. Rome: FAO. Retrieved from <http://www.fao.org/news/story/en/item/90192/icode/>
- Food and Agriculture Organisation of the United Nations. (2011b). *Forest and poverty reduction*. Retrieved from <http://www.fao.org/forestry/livelihoods/en/>
- Food and Agriculture Organisation of the United Nations. (2013). *Advancing agroforestry on the policy agenda: A guide for decision-makers*. Rome: FAO.
- Food and Agriculture Organisation of the United Nations, & World Food Program. (2007). Crop and food supply assessment mission to Timor-Leste, *Global Information and Early Warning on Food and Agriculture*. Dili: FAO.
- Forsyth, T., Leach, M., & Scoones, I. (1998). Poverty and environment: Priorities for research and policy an overview study. *Prepared for the United Nations Development Programme and European Commission*.
- Fox, J. J. (2000). Tracing the path, recounting the past: historical perspectives on Timor. In James J. Fox & D. B. Soares (Eds.), *Out of the ashes: Destruction and reconstruction of East Timor*. Adelaide: Crawford House Publishing.
- Freedman, R. (1961/62). The sociology of human fertility: a trend report and bibliography. *Current Sociology*, 10-11(2), 35-119.
- Geist, H. J., & Lambin, E. F. (2001). What drives tropical deforestation? A meta-analysis of proximate and underlying causes of deforestation based on subnational case study evidence. Louvain-la Neuve: Belgium.
- Glover, I. (1986). *Archaeology in Eastern Timor 1966-67*. Canberra: The Australian National University.
- Godinho, L. (2009). Forest law enforcement and governance in Timor-Leste. Asia-Pacific Regional Workshop on Strengthening Forest Law Enforcement and Governance (FLEG). Kuala Lumpur, Malaysia.
- Goldenberg, S. (2014, March 31). Climate change: the poor will suffer most. *The Guardian*. Retrieved from <http://www.theguardian.com/environment/2014/mar/31/climate-change-poor-suffer-most-un-report>
- Goldstone, J. A. (1991). *Revolution and rebellion in the early modern world*. Berkeley and Los Angeles: University of California Press.
- Goldstone, J. A. (1999). Demography, domestic conflict and international order. In T. V. Paul & J. A. Hall (Eds.), *International Order and the Future of World Politics*. Cambridge: Cambridge University Press.
- Goldstone, J. A. (2001). Demography, environment, and security. In Paul F. Diehl &

- Nils Petter Gleditsch (Eds.), *Environmental Conflict*. CO: Westview: Boulder, 84-108.
- Goldstone, J. A. (2002). Population and security: How demographic change can lead to violent conflict. *Journal of International Affairs*, 56(1), 3-23.
- Govere, J., & Jayne, T. S. (1999). Effects of cash crop production and food crop productivity in Zimbabwe: Synergies or trade-offs? International Development Working Paper No 74: MSU.
- Government of Timor-Leste. (2002). *Constitution of the Democratic Republic of Timor-Leste*. Dili: GoTL.
- Government of Timor-Leste. (2008). *Behaviour change communication strategy for child health*. Dili: GoTL.
- Government of Timor-Leste. (2010a). *On the road to peace and prosperity: Timor-Leste's strategic development plan 2011-2030*. Dili: Office of the Prime Minister.
- Government of Timor-Leste. (2010b). *Population and housing census*. National Directorate for Statistic. Dili: GoTL.
- Government of Timor-Leste. (2010c). *Progress of Timor-Leste towards the Millennium Development Goals*. MDG Secretariat, Dili: GoTL.
- Government of Timor-Leste. (2010d). *Timor-Leste demographic and health survey 2009-2010: Preliminary report*. Maryland: ICF Macro Calverton.
- Government of Timor-Leste. (2012). *Sustainable development in Timor-Leste. National Report Submitted to the United Nations Conference on Sustainable Development*. Dili: Ministry of Economy and Development.
- Government of Timor-Leste. (2012b). *State Budget 2012. Budget Overview Book 1*. Dili: Ministry of Finance. Retrieved from <https://www.mof.gov.tl/wp-content/uploads/2012/02/Book-1-English-final.pdf>
- Government of Timor-Leste. (2013a). *Country gender assessment*. Draft Document. Dili: Secretary of state for the Promotion of Equality.
- Government of Timor-Leste. (2013b). *Petroleum fund annual review: Financial year 2012*. Dili, Timor-Leste: Ministry of Finance.
- Government of Timor-Leste, & UNFPA. (2009). *Country Programme of Action Plan Timor-Leste*. Dili.
- Gravetter, F. J., & Wallnau, L. B. (2004). *Essential of statistics for the behavioral sciences* (6th ed.). Belmont, CA: Wadsworth Publishing Company.
- Grazia, P. (2011, July 12). When we care for it....Preserving Cultural and Spiritual

- Values of Forests. International Institute for Environment and Development. [Web log post] Retrieved from <http://www.iied.org/when-we-care-for-impreserving-cultural-spiritual-values-forests>
- Grepperud, S. (1997). Poverty, land degradation and climatic uncertainty. *Oxford Economic Papers*, 49(4), 586-608.
- Grubb, W. N., & Lazerson, M. (2004). *The education gospel: The economic value of schooling*. Cambridge: Harvard University Press.
- Guha-Sapir, D., & D'Aoust, O. (2011). *Demographic and Health Consequences of Civil Conflict*. Washington DC: The World Bank.
- Gunn, G. C. (1999). *Timor Loro Sae: 500 years*. Macau: Livros do Oriente.
- Gurr, T. R. (1970). *Why men rebel*. Princeton, NJ: Princeton University Press.
- Hanifan, L. J. (1916). The rural school community center. *Annals of the American Academy of Political and Social Science*, 67(1), 130-138.
- Hanushek, E. A., & Kimko, D. D. (2000). Schooling, labor force quality, and the growth of nations. *American Economic Review*, 90(5), 1184-1208.
- Hardin, G. (1968). The tragedy of the commons. *Science*, 152, 1243-1248.
- Harrison, P. (1994). *The third revolution: Population, environment and a sustainable world*. London: Penguin.
- Harmadi, S. H. B., & Gomes, R. A. (2013). Developing Timor-Leste's non-oil economy challenges and prospects. *Journal of Southeast Asian Economies*, 30(3), 309-321.
- Harris-Rimmer, S. (2009). After the guns fall silent: Sexual and gender based violence in Timor-Leste. *Timor-Leste Armed Violence Assessment* (Vol. Issue Brief No. 5). Retrieved from <http://www.timor-leste-violence.org/pdfs/Timor-Leste-Violence-IB5-ENGLISH.pdf>
- Hausmann, R., Tyson, L. D., & Zahidi, S. (2010). *The global gender gap report: 2010*. Geneva: World Economic Forum.
- Haveman, R., & Wolfe, B. (1984). Schooling and economic well-being: The role of nonmarket effects. *The Journal of Human Resources*, 19(3), 377-407.
- Hayes, A. C. (1995). *On defining the problem of population and environment*. Paper presented at the Presented at Annual Meeting of Population Association, San Francisco, CA.
- Hayes, A. C. (2010). The status of family planning and reproductive health in Timor-Leste Paper presented at the UNFPA-ICOMP regional consultation: Family Planning in Asia and the Pacific Addressing the Challenges Bangkok,

- Thailand, 8-10 December.
- Health Alliance International [HAI]. (2008). *Improving maternal and newborn health in Timor Leste*. Seattle: HAI.
- Hedge, R., & Enters, T. (2000). Forest products and household economy: Case study from Mudumalai Wildlife Sanctuary, Southern India. *Environmental Conservation*, 27, 250-259.
- Hicks, C. (2012, December 5). Fundasaun Alola: Women's rights in Timor-Leste. *The Guardian*. Retrieved from <http://www.theguardian.com/global-development-professionals-network/2012/dec/05/womens-rights-in-timor-leste>
- Hicks, D. (2004). *Tetum Ghosts and Kins: Fertility and Gender in East Timor*. United States: Waveland Press.
- Higgins, M., & Williamson, J. (1997). Age structure dynamics in Asia and dependence on foreign capital. *Population and Development Review*, 23(2), 261-293.
- High Level Panel of Experts [HLPE]. (2012). *Food security and climate change*. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. Rome.
- Hill, C. (2013). Oil and water: natural resources and Timor-Leste's development challenges, Retrieved from http://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/FlagPost/2013/December/Oil_and_water_natural_resources_and_Timor-Lestes_development_challenges
- Hobcraft, J. N., McDonald, J. W., & Rutstein, S. O. (1983). Child spacing effects on infant and early child mortality. *Population Index*, 49(4), 585-618.
- Hogarth, N., Belcher, B., Campbell, B., & Stacey, N. (2013). The Role of Forest-related Income in Household Economies and Rural Livelihoods in the Border-region of Southern China. *World Development*, 43, 111-123.
- Holdren, J. P. (1991). Population and the energy problem. *Population and Environment*, 12(3), 231-255.
- Homer-Dixon, T. (1994). Environmental scarcities and violent conflict: Evidence from cases. *International Security*, 19(1), 5-40.
- Homer-Dixon, T. (1995). The ingenuity gap: Can poor countries adopt to resource scarcity? *Population and Development Review*, 21(3), 587-612.
- Hood, L. (2006). Missed opportunities: The United Nations, police service and defence force development in Timor-Leste, 1999–2004. *Civil Wars*, 8(2), 143-162.

- Hope, R. A. (2002). Wildlife harvesting, conservation and poverty: the economics of olive Ridley egg exploitation. *Environmental Conservation*, 29(3), 375-384.
- Horowitz, D. L. (1985). *Ethnic groups in conflict*. Berkeley, CA: University of California Press.
- Human Sciences Research Centre. (2002). Social Capital and Sustainable Livelihoods: Sustaining Livelihoods in Southern Africa.
- Huntington, S. P. (1996). *The clash of civilizations and the remaking of world order*. New York: Simon and Schuster.
- Iftikhar, U. A. (2003). NASSD Background Paper: Population, Poverty and Environment. Gilgit International Union for Conservation of Nature and Natural Resources (IUCN): Pakistan.
- Indonesian Central Bureau of Statistics. (1998). *Indonesia Demographic and Health Survey*. Jakarta: State Ministry of Population and National Family Planning Coordinating Board, Ministry of Health and Macro International Inc.,
- International Energy Agency [IEA]. (2006). World Energy Outlook 2006. Paris: IEA. Retrieved from <http://www.worldenergyoutlook.org/media/weowebiste/20081994/WEO2006.pdf>
- International Fund for Agricultural Development [IFAD]. (2004). Commerce et développement rural: enjeux et perspectives pour les ruraux pauvres. Rome: IFAD. Retrieved from <http://www.ifad.org/events/gc/27/panel/f.pdf>
- International Monetary Fund [IMF]. (2007). Democratic Republic of Timor-Leste: 2006 Article IV Consultation- Staff Report (February 2007 ed.): World Bank group and Asian Development Bank, Economic and Social Development Brief.
- International Monetary Fund. (2012). Democratic Republic of Timor-Leste: Staff Report for the 2011 Article IV Consultation- Debt Sustainability Analysis: IMF and International Development Association.
- International Labour Organisation [ILO]. (2008). Timor-Leste: Decent Work Country Programme 2008-2013. Dili: ILO.
- International Labour Organisation. (2012). Global Employment Trends For Youth 2012. Geneva: ILO.
- International Labour Organisation, AusAID, & Youth Employment Promotion. (2009). Timor-Leste National Youth Employment Action Plan (NYEAP) 2009. Dili: SEFOPE.
- International Labour Organisation, AusAID, & Youth Employment Promotion. (2010). Timor-Leste Labour Force Survey. Dili: SEFOPE.

- International Organisation for Migration [IOM], & United Nations Department for Economic and Social Affairs [UNDESA]. (2012). Migration and human mobility: Thematic Think Piece, UN System Task Team On the Post 2015 UN Development Agenda. Geneva: IOM. Retrieved from http://www.un.org/millenniumgoals/pdf/Think%20Pieces/13_migration.pdf
- International Panel for Climate Change [IPCC]. (2013). Summary for Policymakers. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. In T. F. Stocker, G. K. D. Qin, M. Plattner, S. K. Tignor, J. Allen, A. Boschung, Y. Nauels, V. B. Xia & P. M. Midgley (Eds.). Cambridge, United Kingdom and New York, USA: Cambridge University Press.
- International Union for Conservation of Nature [IUCN]. (2012). *The basis for a partnership to support the functions and work programme of IPBES*. A document prepared for the second session of a plenary meeting on the intergovernmental science-policy Platform on Biodiversity and Ecosystem Services. Panama City.
- IRIN. (2012, February 14). Indonesia: Bid to revitalize community-based healthcare. Retrieved from <http://www.irinnews.org/report/94946/indonesia-bid-to-revitalize-community-based-healthcare>
- Jeffery, M. J. (2005). Environmental governance: A comparative analysis of public participation and access to justice. *Journal of South Pacific Law*, 9(2).
- Joekes, S., Green, C., & Leach, M. (1996). Integrating gender into environmental research and policy. IDS: Brighton: IDS Working Paper.
- Jolly, C. L. (1994). Four theories of population change and the environment. *Population and Environment*, 16(1), 61-90.
- Jones, R., & Palloni, A. (1990). Effects of infant mortality and weaning on the onset of postpartum menstruation: Hazard model analysis. Working paper 90-06. Madison: Center for Demography and Ecology, University of Wisconsin.
- Joshi, S., & Schultz, T. P. (2007). Family planning an investment in development: Evaluation of a program's consequences in Matlab Bangladesh *Economic Growth Center Discussion Paper No. 951*. New Haven CT: Yale University.
- Kabubo-Mariara, J. (2007). Land conservation and tenure security in Kenya: Boserup's hypothesis revisited. *Ecological Economics*, 64(1), 25-35.
- Kahl, C. (2002). Demographic Change, Natural Resources and Violence: The Current Debate. *Journal of International Affairs*, 56(1), 257-282.
- Kasperson, J., Kasperson, R., & Turner II, B. L. (1996). Regions at risk: exploring environmental criticality. *Environment*, 38(10), 6-27.

- Kaufmann, C. (1996). Possible and impossible solutions to ethnic civil wars. *International Security*, 20, 136-175.
- Kelley, A. C. (2001). The population debate in historical perspective: revisionism revised. In N. Birdsall, A. C. Kelley & S. W. Sinding (Eds.), *Population Matters: Demographic Change, Economic Growth, and Poverty in the Developing World*. New York: Oxford University Press.
- Kelley, A. C., & Schmidt, R. M. (1996). Saving, dependency and development. *Journal of Population Economics*, 9(4), 365-386.
- Kelley, A. C., & Schmidt, R. M. (2005). Evolution of recent economic-demographic modeling: A synthesis. *Journal of Population Economics*, 18(2), 275-300.
- Keyfitz, N. (1991). Population and development within the ecosphere: One view of the literature. *Population Index*, 57(1), 5-22.
- Kiernan, B. (2003). The demography of genocide in Southeast Asia: The death tolls in Cambodia 1975-79, and East Timor, 1975-80. *Critical Asian Studies*, 35(4), 585-597.
- Kimberly, K., & Homer-Dixon, T. (1996a). *Environmental scarcity and violent conflict: The case of Gaza*. Washington, DC: University of Toronto.
- Kimberly, K., & Homer-Dixon, T. (1996b). *Environmental scarcity and violent conflict: the case of Pakistan*. Washington, DC: University of Toronto.
- King, M. (1963). *Eden to paradise*. London: Travel Book Club.
- Kirono, D. (2010). *Climate change in Timor Leste-A brief overview on future climate projections: 28*. Aspendale: CSIRO National Research Flagships.
- Kleinn, C., Yang, Y., Weyerhäuser, H., & Stark, M. (2006). The Sustainable Harvest of Non-Timber Forest Products in China: Strategies to balance economic benefits and biodiversity conservation. Sino-German Symposium Proceedings. Beijing: World Agroforestry Centre.
- Knodel, J., Napaporn, H., & Werasit, S. (1990). Family size and the education of children in the context of rapid fertility decline. *Population and Development Review*, 16(1), 31-62.
- Kohan, S., Simbar, M., & Taleghani, F. (2012). Women's experience regarding the role of health centers in empowering them for family planning. *Iranian Journal of Nursery and Midwifery Research*, 17(2), 150-156.
- Krantz, L. (2001). The sustainable livelihood approach to poverty reduction: An introduction. Swedish International Development Cooperation Agency. Retrieved from http://www.forestry.umn.edu/prod/groups/cfans/@pub/@cfans/@forestry/documents/asset/cfans_asset_202603.pdf

- Krishna, A. (2007). The stages-of-progress methodology, assets, and longitudinal trends: Results from five-year study in 236 communities of five countries, *Caroline Moser, ed.*,. Brookings Institution Press.
- Kuznets, S. (1967). Population and economic growth. *Proceedings of the American philosophical society*, 111(3), 170-193.
- Laipson, E. (2007). Demography and conflict: How are they connected? Retrieved March, 2013, from <http://www.stimson.org/spotlight/demography-and-conflict-how-are-they-connected/>
- Lao Hamutuk. (2011). Timor-Leste's Economy and General State Budget for 2011. Retrieved from <http://www.laohamutuk.org/econ/OGE11/10OJE2011.htm>
- Leach, M. (1992). Gender and the environment: Traps or opportunities?. *Development in Practice*, 2(1), 12-22.
- Leach, M., & Mearns, R. (1991). *Poverty and environment in developing countries: An overview study*. Report to the Economic and Social Research Council Society and Politics Group and the Global Environmental Change Initiative Programme, and the Overseas Development Administration (DFID). Brighton: IDS.
- Leach, M., Mearns, R., & Scoones, I. (1997). Environmental entitlements: a framework for understanding the institutional dynamics of environmental change *IDS Discussion Paper No. 359*. Brighton: IDS.
- Leahy, E., Engelman, R., Vogel, C. G., Haddock, S., & Preston, T. (2007). The shape of things to come: Why age structure matters to a safer, more equitable world. Washington: Population Action International.
- Lee, D. (2014). *Measuring poverty using asset ownership: Developing a theory-driven asset index incorporating utility and prices*. Job Market Paper. University of Berkeley. California.
- Leete, R., & Schoch, M. (2003). Population and poverty: Satisfying unmet need as the route to sustainable development. Population and Development Strategies Series 8. New York: UNFPA.
- Lepers, E., Lambin, E. F., Janetos, A. C., DeFries, R., & Achard, F. (2005). A synthesis of information on rapid land-cover change for the period 1981-2000. *BioScience*, 55(2), 115-124.
- Lindstrom, D. P., & Berhanu, B. (1999). The impact of war, famine, and economic decline on marital fertility in Ethiopia. *Demography*, 36(2), 247-261.
- Lopez, R. (1992). Environmental degradation and economic openness in LDCs: The poverty linkage. *American Journal of Agricultural Economics*, 74(5), 1138-1143.

- Lucas, D., & Meyer, P. (1994). *Beginning population studies*. Canberra: Australian National University.
- Ludi, E., & Slater, R. (2007). Using the sustainable livelihoods framework to understand and tackle poverty: Briefing note for the poverty-wellbeing platform. London: ODI.
- Ludwig, D., Hilborn, R., & Walters, C. (1993). Uncertainty, resource exploitation, and conservation: Lessons from history. *Science*, 20(5104), 17-36.
- Lundahl, & Sjöholm. (2008). The oil resources of Timor-Leste: curse or blessing? *The Pacific Review*, 21(1), 67-86.
- Lundahl, M., & Sjöholm, F. (2012). Improving the lot of the farmer: Development challenges in Timor-Leste during the second decade of independence. Working Paper No. 929: IFN.
- Lutz, W., & Scherbov, S. (1999). *Quantifying vicious circle dynamics: The PEDDA model for population, environment, development and agriculture in African countries*. IIASA Interim Report IR-99-049. Laxenburg, Austria: International Institute for Applied Systems Analysis.
- Malthus, T. R. (1798). *An essay on the principle of population*. London: Oxford World Classics reprint.
- Mangobay. (2005). Timor-Leste Forest Cover 2005. Retrieved from <http://rainforests.mongabay.com/deforestation/archive/Timor-Leste.htm>
- Marques, C. P., Fonseca, T., Ferreira, M., & Laranjeira, P. (2010). First forest inventory of Timor-Leste: Districts of Bobonaro and Covalima 2008-2009. Portugal: Lda Vila Real.
- Mascitelli, L., Pezzetta, F., & Sullivan, J. L. (2006). Why women live longer than men: Sex differences in longevity. *Gender Medecine*, 3(2), 79-92.
- Mason, A. (2003). Capitalizing on the demographic dividend in *Population and Poverty, Population and Development Strategies* (Vol. 8). New York: United Nations Population Fund, 39-48.
- Masozera, M. K., & Alavalapati, J. R. R. (2004). Forest dependency and its implication for protected areas management: A case study from Nyungwe Forest Reserve, Rwanda. *Scandinavian Journal of Forest Resources* 19(4), 85-92.
- Mather, A. S., & Needle, C. L. (2000). The relationships of population and forest trends. *Geography Journal of Population Economics*, 166(1), 2-13.
- Mayers, J., & Vermeulen, S. (2002). Company-Community Forestry Partnerships: From Raw Deals to Mutual Benefits? *Instruments for sustainable private sector forestry series*. London, UK: International Institute for Environment

and Development.

- McAlpine. (2012). Creating visibility for forests worldwide. An interview with UNFF Director about the International Year of Forests. *DESA News* Volume 16, No.01.
- McDonald, S., & Mair, C. A. (2010). Social capital across the life course: Age and gendered patterns of network resources. *Sociological Forum*, 25(2), 335-359.
- McGuigan, C., Reynolds, R., & Wiedmer, D. (2002). Poverty and climate change: Assessing Impacts in developing countries and the initiatives of the international community. London: The Overseas Development Institute.
- McMahon, W. W. (1999). *The impact of human capital on growth and social development: techniques for measurement and estimates of impacts in OECD member countries*. Paris: Background Paper Prepared for the OECD.
- McNicoll, G. (1991). *Mediating factors linking population and the environment*. Paper presented at the UN Expert Group Meeting Population Environment and Development 20-24 Jan, New York.
- McWilliam, A. (2001). Prospects for the sacred grove: valuing lulic forests on Timor. *Asia Pacific Journal of Anthropology*, 2(2), 89-113.
- McWilliam, A. (2002). *Paths of Origin, Gates of Life: A study of place and precedence in southwest Timor*. Leiden, Netherlands: KITLV Press.
- McWilliam, A. (2003). New beginnings in East Timorese forest management. *Journal of Southeast Asian Studies*, 34(2), 307-327.
- Meadowcroft, J., & Pennington, M. (2007). *Rescuing social capital from social democracy*. London: Institute of Economic Affairs.
- Meadows, D. H., Meadows, D. L., Randers, J., & Behrens, W. W. (1972). *The limits to growth: A report for the club of rome's project on the predicament of mankind*. New York: Universe Books.
- Meadows, D. H., Meadows, D. L., Randers, J. (1972). *The limits to growth*. New York: Universe Books.
- Mearns, R. (1991). *Environmental implications of structural adjustment: Reflections on scientific method*. IDS Discussion Paper 284. Brighton, England: Institute of Development Studies.
- Meinzen, R., Jain, D. D., & Di Tommaso, M. L. (2012). Review of gender and green governance: The political economy of women's presence within and beyond community forestry by Bina Agarwal, New York Oxford University Press 2010. *Feminist Economics*, 18(3), 141-143.

- Mendelsohn, R. (2009). The impact of climate change on agriculture in developing countries. *Journal of Natural Resources Policy Research*, 1(1), 5-19.
- Mercy Corps. (2009). Climate Change Unit Addressing Energy Poverty in Timor-Leste: Full Report. Retrieved from <http://www.mercycorps.org/sites/default/files/TimorLesteEnergyPovertyAssessmentLong.pdf>
- Mercy Corps. (2011). Energy for All Program in Timor-Leste: Baseline Assessment Report. Dili: Mercy Corps.
- Merrick, T. (2001). Population and poverty in households: a review of reviews. In N. Birdsall, A. C. Kelley & S. W. Sinding (Eds.), *Population Matters: Demographic Change, Economic Growth, and Poverty in the Developing World*. New York: Oxford University Press.
- Merrick, T. W. (2002). Population and poverty: New views on an old controversy. *International Family Planning Perspectives*, 28(1), 41-46.
- Metzner, J. (1977). *Man and environment in Eastern Timor: A geo-ecological analysis of the Baucau-Viqueque area as a possible basis for regional planning*. Monograph No. 8. Canberra: Australian National University.
- Millennium Ecosystem Assessment. (2005). *Ecosystems and human well-being: Synthesis, millennium ecosystem assessment synthesis reports*. Washington DC: Island Press.
- Miller, G. (2010). Contraception as development? New evidence from family planning in Colombia. *Economic Journal of Population Economics*, 120(545), 709-736.
- Ministry of Agriculture Forestry and Fisheries [MAFF]. (2007). First National Report: Land Degradation in Timor-Leste. Retrieved from http://www.sprep.org/att/IRC/eCOPIES/Countries/Timor_Leste/3.pdf
- Ministry of Finance. (2010). Suco Reports. Dili: Ministry of Finance. Retrieved from <https://www.mof.gov.tl/about-the-ministry/statistics-indicators/sensus-fo-fila-fali/download-suco-reports/>
- Ministry of Health [MoH]. (2004). National Family Planning Policy. Dili: Democratic Republic of Timor-Leste, Ministry of Health.
- Ministry of Health. (2009). Timor-Leste Breast Feeding Promotion Policy. Dili: Democratic Republic of Timor-Leste, Ministry of Health.
- Ministry of Health. (2011). SISCa Health Service. Dili: Ministry of Health. Retrieved from <http://www.moh.gov.tl/?q=node/82>
- Ministry of Health and National Statistics Office Timor-Leste, University of Newcastle, The Australian National University & ACIL Australia Pty Ltd.

- (2004). Timor-Leste 2003 Demographic and Health Survey: Key Findings. New Castle: University of Newcastle.
- Mink, S. (1993). Poverty and the environment. *Finance and Development*, 30(4), 8-10.
- Miyazawa, N. (2010). *Role of Customary Law and Communities in Natural Resource Management in Post-Conflict East Timor*. Paper presented at the CAPRI Workshop on Collective Action, Property Rights, and Conflict in Natural Resources Management.
- Molyneux, N., da Cruz, G. R., Williams, R. L., Andersen, R., & Turner, N. C. (2012). Climate change and population growth in Timor Leste: Implications for food security. *AMBIO*, 41(8), 823-840.
- Mongabay. (2009). Timor-Leste. Retrieved from <http://www.mongabay.com/403.shtml>
- Morse, S., & McNamara, N. (2013). *Sustainable Livelihood Approach: A Critique of Theory and Practice*. Dordrecht: Springer.
- Moser, C. O. N. (2006). *Asset-based approaches to poverty reduction in a globalized context: An introduction to asset accumulation policy and summary of workshop findings*. Washington: The Brookings Institution Press.
- Murray, W. (2004). 'Mass' media- The influence of Catholic Church on reproductive health policy in Timor-Leste: (Unpublished paper) Flinders University of South Australia.
- Narayan, D. (2002). Bonds and bridges: social capital and poverty. In S. Ramaswamy (Ed.), *Social Capital and Economic Development: Well-being in Developing Countries*. Cheltenham, UK: Edward Elgar, 58-81.
- Nath, V. (2001). *White Collar Invasion: developed country policies leading to environmental degradation in South*. London: London School of Economics. Retrieved from <http://www.cddc.vt.edu/knownet/lse-whitecollar-paper.pdf>
- National Academy of Sciences. (1971). *Rapid population growth: Consequences and policy implications*. Baltimore: Johns Hopkins University Press.
- National Academy Science. (1963). *The growth of world population*. Washington, DC: National Academy Science.
- National Directorate of Forestry and Water Resources. (2004). *Policy and strategy forestry and watershed subsector*. Díli: Ministry of Agriculture, Forestry and Fisheries (MAFF).
- National Research Council. (1986). *Population growth and economic development: Policy questions*. Washington D.C: National Academy Press.

- National Statistics Directorate. (2004). *Timor-Leste population projections 2004-2050: Analysis of census results*. Dili: National Statistics Directorate.
- National Statistics Directorate. (2006). *Timor-Leste 2004. Census of population and housing atlas*. Dili, Timor-Leste: NSD.
- National Statistics Directorate. (2007). *The 2007 Timor-Leste survey of living standard*. Dili: Government of Timor-Leste.
- National Statistics Directorate, General Directorate of Policy Analysis and Research, & Ministry of Finance Democratic Republic of Timor-Leste (2010). *Population and Housing Census 2010- Preliminary Results*. Dili: United Nations Population Fund.
- National Statistics Directorate, & Ministry of Finance Democratic Republic of Timor-Leste Dili. (2010). *Timor-Leste demographic and health survey 2009-2010: Preliminary report*. ICF Macro Calverton: Maryland, U.S.A.
- National Statistics Directorate, & Ministry of Finance Timor-Leste. (2011). *Timor-Leste household income and expenditure survey 2011*. Dili: General Directorate for Analysis & Research. Retrieved from http://dne.mof.gov.tl/TLSLS/HIES/HIES_2011/HIES_%202011/HIES2011_Report%20-%20Final.pdf
- National Statistics Directorate, & UNFPA. (2012a). *2010 Timor-Leste Population and Housing Census: Population Projection Monograph*. Population Projections by Age and Sex based on the 2010 Population and Housing Census. National level (2010 to 2050) and district level (2010-2030) (Vol. 8). Dili: NSD and UNFPA.
- National Statistics Directorate, & UNFPA. (2012b). *Timor-Leste population and housing census 2010: Analytical report on migration and urbanization*. Dili: Government of Timor-Leste.
- Natural Capital Committee. (2013). *The State of Natural Capital: Towards a framework for measurement and valuation*. Retrieved from <http://www.defra.gov.uk/naturalcapitalcommittee/>
- Nelson, G. C., Rosegrant, M. W., Palazzo, A., Gray, I., Ingersoll, C., Robertson, R., (...), You, L. (2010). *Food security, farming, and climate change to 2050: Scenarios, results, policy options*. Washington DC: International Food Policy Research Institute.
- Neupert, R., & Lopes, S. (2006). *Demographic component of the crises in Timor-Leste. Political Demography: Ethnic, National and Religious Dimensions*. Association for the Study of Ethnicity and Nationalism. London: London School of Economics.
- Newell, N. D., & Marcus, L. (1987). Carbon dioxide and people. *Society for Sedimentary Geology*, 2(1), 101-103.

- Nimpuno-Parente, N. S. (2006). Building natural resource-based assets in Southern Africa: Workable Scenarios. Retrieved from <http://www.brookings.edu/global/assets06/conference.htm>
- Notestein, F. W. (1945). Population: the long view. In T. W. Schultz (Ed.), *Food for the world* (pp. 36-57). Chicago: Chicago University Press.
- O'Neill, B. C., MacKellar, F. L., & Lutz, W. (2001). *Population and climate change*. New York: Cambridge University Press.
- Ora, T. (2013, March 13). Young people are heading to Korea for work: Changing Timor Leste's fortunes from afar. Retrieved from <http://www.ucanews.com/news/young-people-are-heading-to-korea-for-work/67706>
- Organisation for Economic Co-operation and Development [OECD]. (2001a). The DAC guidelines: Poverty reduction. Paris: OECD.
- Organisation for Economic Co-operation and Development. (2001b). The well-being of Nations: The role of human and social capital. Paris: OECD.
- Organisation for Economic Co-operation and Development. (2007). Principles for good international engagement in fragile states and situations. Paris: OECD.
- Organisation for Economic Co-operation and Development. (2013). Ensuring fragile states are not left behind, fragile states 2013: Resource flows and trends in a shifting world. Paris: OECD. Retrieved from <http://www.oecd.org/dac/incaf/factsheet%202013%20resource%20flows%20final.pdf>
- Ormeling, F. J. (1956). The Timor problem: A geographical interpretation of an underdeveloped island. The Netherlands and Jakarta: J. B. Wolters.
- Osoimehin, B. (2013). *Opening speech at IUSSP Conference*. Paper presented at the XXVII IUSSP International Population Conference, Busan, South Korea, 26-31 August.
- Ospina, S. (2006). *Participation of women in politics and decision making in Timor-Leste: A recent history*. Dili: UNIFEM.
- Ostrom, E., Burger, J., Field, C. B., Norgaard, R. B., & Policansky, D. (1999). Revisiting the commons: Local lessons, global challenges. *Science*, 284(5412), 278-282.
- Oxley, L., Le, T., & Gibson, J. (2008). Measuring human capital: Alternative methods and international evidence. *The Korean Economic Review* 24(2), 283-344.
- Pacific Association of Technical Vocational Education and Training [PATVET]. (2011). Partnership for a Secure and Prosperous Pacific Community.

- Retrieved from
http://www.spc.int/patvet/index.php?option=com_content&view=article&id=127&Itemid=82
- Painet. (unknown). Timor-Leste Women Cooking Open Fire in Traditional Kitchen Uma. Retrieved from <http://www.painetworks.com/previews/jq/jq4043.html>
- Palloni, A., & Millman, S. (1986). Effects of interbirth intervals and breastfeeding on infant and early childhood mortality. *Population Studies*, 40(2), 215-236.
- Palloni, A., & Rafalimanana, H. (1997). The effects of infant mortality on fertility revisited: Some new evidence. CDE Working Paper No. 96-27. Madison, Wisconsin: University of Wisconsin.
- Palloni, A., & Tienda, M. (1986). The effects of breastfeeding and pace of childbearing on mortality at early ages. *Demography*, 23(1), 31-53.
- Palmer, L., & Carvalho, D. A. (2008). Nation building and resource management: The politics of 'nature' in Timor-Leste. *Geoforum*, 39, 1321-1332.
- Palmer, C. A., & Lush, L. (1999). The emerging international policy agenda for reproductive health services in conflict settings. *Social Science and Medicine*, 49(12), 1689-1703.
- Palsson, G. (1998). Learning by fishing: Practical engagement and environmental concerns. In F. Berkes & C. Folke (Eds.), *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience*. Cambridge: Cambridge Univ. Pres, 48-66.
- Panayotou, T. (1993). *Empirical tests and policy analysis of environmental degradation at different stages of economic development*. Working Paper 238. Geneva: International Labor Office.
- Panayotou, T. (1994). The population, environment, and development nexus. In R. Cassen (Ed.), *Population and Development: Old Debates, New Conclusions*. Policy Perspectives Volume, New Brunswick: Transaction Publishers, 148-180.
- Panayotou, T. (2000). Population and environment. CID Working Paper No. 54. Cambridge, MA: Harvard Institute for International Development.
- Panayotou, T., & Sungsuwan, S. (1992). An econometric study of the causes of tropical deforestation: The case of Northeast Thailand (Vol. Development Discussion Paper No. 284). Cambridge, MA: Harvard Institute for International Development.
- Pannell, S. (2011). Struggling geographies: Rethinking livelihood and locality in Timor-Leste. In A McWilliam & E. G. Traube (Eds.), *Land and life in Timor-Leste: Ethnographic essays*. Canberra: The Australian National University.

- Petersen, W. (1972). *Readings in population*. New York: Macmillan.
- Pfaff, A. S. (1999). What drives deforestation in the Brazilian Amazon? Evidence from satellite and socioeconomic data. *Journal of Environmental Economic Management*, 37(1), 26-43.
- Piaskowy, A. (2013). USAID Assists Timor-Leste in Developing Land Policies, Ending Conflict. Retrieved from <http://blog.usaid.gov/2013/01/usaaid-assists-timor-leste-in-developing-land-policies-ending-conflict/>
- Pichón, F. J. (1997). Colonist land-allocation decisions, land use, and deforestation in the Ecuadorian Amazon frontier. *Economic Development and Cultural Change*, 45(4), 707-744.
- Po, J. Y. T., Finlay, J. E., Brewster, M. B., & Canning, D. (2012) Estimating household permanent income from ownership of physical assets. Program on the Global Demography of Aging. Harvard University Center for Population and Development Studies Working Paper No.97. Retrieved from <http://www.hsph.harvard.edu/pgda/working.htm>
- Poffenberger, M. (1999). *Communities and Forest Management in Southeast Asia*. Gland: IUCN.
- Pomagalska, D., Putland, C., Ziersch, A., Baum, F., Arthurson, K., Orchard, L., House, T. (2009). *Practical Social Capital: a Guide to Creating Health and Wellbeing*: Flinders University.
- Population and Sustainability Network [PSN]. (2010). *Population dynamics and poverty reduction: A PSN briefing paper*. London: Population and Sustainability Network.
- Population and Sustainability Network. (2012). *Population dynamics and fragile states: A PSN briefing paper*. London: Population and Sustainability Network.
- Population Reference Bureau [PRB]. (2011). *World Population Data Sheet: The world at 7 billion*. Washington, DC: PRB.
- Posen, B. (1993). The security dilemma and ethnic conflict. *Survival*, 35(1), 27-47.
- Productivity Commission. (2003). *Social capital: Reviewing the concept and its policy implications*. AusInfo Research Paper. Canberra: Commonwealth of Australia, 1-23; 53-68.
- Putnam, R. (1993). *Making democracy work: Civic traditions in modern Italy*. Princeton: Princeton University Press.
- Putnam, R. (2000). *Bowling alone: The collapse and revival of American community*. New York: Simon and Schuster.

- Quintao, C. J. d. C. (2006). *Increasing the low rates of exclusive breastfeeding in Timor-Leste: Addressing traditional practices which interfere with exclusive breastfeeding: A literature review of lessons learned from other countries*. (Unpublished masters thesis), University College London, United Kingdom.
- Reardon, T., & Vosti, S. A. (1995). Links between rural poverty and the environment in developing countries: Asset categories and investment poverty. *World Development*, 23(9), 1495-1506.
- Reddy, S. R. C., & Chakravarty, S. P. (1999). Forest dependence and income distribution in a subsistence economy: Evidence from India. *World Development*, 27(7), 1141-1149.
- Rede Ba Rai. (2013). Land Registration and Justice in Timor-Leste: Culture, power and justice. Dili: Haburas Foundation. Retrieved from <http://haburas.org/Land%20registration%20and%20land%20justice%20in%20Timor-Leste.pdf>
- Redman, S., Spencer, E. A., & Sanson-Fisher, R. W. (1990). The role of mass media in changing health-related behaviour: A critical appraisal of two models. *Health Promotion International*, 5(1), 85-101.
- Regulation No. 2000/17: On the Prohibition of Logging Operations and the Export of Wood from East Timor (Timor-Leste) (2000a).
- Regulation No. 2000/19: On Protected Areas (Timor-Leste) (2000b).
- Robbins, R. H. (2002). *Global problems and the culture of capitalism*. Boston, MA: Allyn and Bacon.
- Rocheleau, D., Thomas-Slayter, B., & Wangari, E. (1996). *Feminist political ecology: Global issues and local experiences*. London: Routledge.
- Romer, P. M. (1989). *Human capital and growth: theory and evidence*. Working Paper No. 3173. Cambridge, MA: National Bureau of Economic Research.
- Rosegrant, M. W., Paisner, M. S., Meijer, S., & Witcover, J. (2001). *Global food outlook: Trends, alternatives and choices 2020*. Washington, DC: International Food Policy Research Institute.
- Rosenzweig, M., & Wolpin, K. I. (1980). Testing the quantity-quality fertility model: The use of twins as a natural experiment. *Econometrica*, 48(1), 227-240.
- Rosero-Bixby, L., & Palloni, A. (1998). Population and deforestation in Costa Rica. *Population and Environment*, 20(2), 149-178.
- Rothstein, B. (2003). Social capital, economic growth and quality of government: The causal mechanism. *New Political Economy*, 8(1), 49-71.
- Rudel, T., & Horowitz, B. (1993). *Tropical Deforestation: Small Farmers and Land*

- Clearing in the Ecuadorian Amazon*. New York: Colombia University Press.
- Rutstein, S. O. (2011). Trends in birth spacing: DHS comparative reports No. 28. Maryland, USA.
- Saikia, U., & Hosgelen, M. (2010). Timor-Leste's demographic destiny & its implications for the health sector by 2020. *Journal of Population Research*, 27(2), 122-146.
- Saikia, U., & Hosgelen, M. (2011). Timor-Leste in 2020: The demographic future of Asia's newest nation. In Vandra Harris & Andrew Goldsmith (Eds.), *Security, development and nation-building in Timor-Leste: A cross sectoral assessment*. New York: Routledge, 210-223.
- Saikia, U., Hosgelen, M. & Chalmers, J. (2011). An investigation into the population growth and its implications for primary schooling in Timor-Leste by 2020. *Asia Pacific Viewpoint*, 52(2), 194-206.
- Saikia, U. S., Dasvarma, G. L., & Wells-Brown, T. (2009). *The world's highest fertility in Asia's newest nation: An investigation into reproductive behaviour of women in Timor-Leste*. Paper presented at the IUSSP, Morocco.
- Saint, L., Smith, M., & Hartmann, P. E. (1984). The yield and nutrient content of colostrum and milk of women from giving birth to one month post-partum. *British Journal of Nutrition*, 52(91), 87-95.
- Salamon, L. M. (1991). Overview. Why human capital? Why now? In D. W. Hornbeck & L. M. Salamon (Eds.), *An economic strategy for the 90s Human capital and America's future*. Baltimore: Johns Hopkins University Press, 1-39.
- Scherr, S. J. (2000). A downward spiral? Research evidence on the relationship between poverty and natural resource degradation. *Food Policy*, 25(4), 479-498.
- Schultz, T. P. (1993). Sources of fertility: Is Aggregate evidence on the demographic transition credible? New Haven, Conn: Yale University.
- Schultz, T. W. (1982). *Investing in people: The economics of population quality*. Berkeley and Los Angeles, California: University of California Press.
- Sciubba, J. D. (2011). *The future faces of war population and national security*. Santa Barbara California: Praeger.
- Sen, A. (1981). *Poverty and famines: An essay on entitlements and deprivations*. Oxford, UK: Oxford University Press.
- Sen, A. (2003). The importance of basic education: Full text of Amartya Sen's speech

- to the Commonwealth education conference, Edinburgh. Retrieved from <http://www.theguardian.com/education/2003/oct/28/schools.uk4>
- Sen, A. K. (1999). *Development As freedom*. Oxford: Oxford University Press.
- Sen, G., Germain, A., & Chen, L. C. (1994). *Population policies reconsidered: Health, empowerment, and rights*. Boston: Harvard University Press.
- Sharma, K. (2013). Gender and green governance: The political economy of women's presence within and beyond community. *Journal of Human Development and Capabilities: A Multi-Disciplinary Journal for People-Centered Development* 14(2), 314-316.
- Sicherman, N. (1991). Over-education in the labour market. *Journal of Labour Economics*, 9(2), 101-122.
- Simon, J. (1981). *The ultimate resource*. Princeton: Princeton University Press.
- Simonis, U. (1992). Poverty, environment and development. *Intereconomics*, 27(2), 75-85.
- Singh, N., & Gilman, J. (1999). Making livelihoods more sustainable. *International Social Science Journal*, 51(162), 539-545.
- Singh, S., Casterline, J. B., & Cleland, J. G. (1985). The proximate determinants of fertility: sub-national variations. *Population. Studies*, 39(1), 113-135.
- Smith, M. K. (2007). Social capital *the encyclopedia of informal education*. Retrieved from <http://infed.org/mobi/social-capital/>
- Soares, D. B. (2001). *East Timor: Perceptions of culture and environment*. Paper presented at the Sustainable Development and the Environment in East Timor 25-31 January, Dili.
- Son, H. H. (2012). On measuring human capital: A case study of Vietnam (No. 311). Manila: Asian Development Bank. Retrieved from <http://adbdev.org/sites/default/files/publications/30022/file/economics-wp311.pdf>
- Stangeland, C. E. (1904). *Pre-Malthusian doctrines of population; a study in the history of economic theory*. New York: Columbia University Press.
- Steward, F., & Brown, G. (2009). *Fragile States*. Centre for Research on Inequality, Human Security and Ethnicity (CRISE), Oxford.
- Stokes, C. S. (1984). Access to land and fertility in developing countries. In W. Schutjer & C. Stokes (Eds) *Rural development and human fertility* (pp. 195-215). New York: Macmillan.
- Stone, G. D. (2001). *Theory of the square chicken: Advances in agricultural*

- intensification theory. *Asia Pacific Viewpoint*, 42(2/3), 163-180.
- Sunderland, T. C. H., Achdiawan, R., Angelsen, A., Babigumira, R., Ickowitz, A., Paumgarten, F., et al. (2014). Challenging perceptions about men, women, and forest product use: A global comparative study. *World Development*. doi: 10.1016/j.worlddev.2014.03.003
- Sundland et al. (2001). Assessing environmental needs and priorities in East Timor: Final report. Dili: UNDP and Norwegian Institute for Nature Research.
- Sunderlin, W. D., Dewi, S., Puntodewo, A., Müller, D., Angelsen, A., & Epprecht, M. (2008). Why forests are important for global poverty alleviation: A spatial explanation. *Ecology and Society*, 13(2), 24.
- Swinton, S. M., & Quiroz, R. (2003). Is poverty to blame for soil, pasture and forest degradation in Peru's altiplano? *World Development*, 31(11), 1903-1919.
- Swiss Federal Institute of Technology [ETZ]. (2007). *Poverty and livelihood in development cooperation* Version 1.1. Retrieved from <http://www.poverty-wellbeing.net/media/sla/index2.htm>
- Thang, H. C. (2008). *A review of the institutional arrangements and organizational structures of the forestry sector in Timor-Leste*: FAO Consultancy Report. Bangkok, Thailand: FAO.
- Theisen, O. M. (2008). Blood and Soil? Resource Scarcity and internal armed conflict revisited. *Journal of Peace Research*, 45(6), 801-818.
- Therik, T. (2000). *The role of fire in swidden cultivation: a Timor case study*. Paper presented at the An international workshop 13-15 April, Northern Territory University, Darwin, Australia.
- Thu, M. P., Scott, S., & Niel, K. P. V. (2007). Gendered access to customary land in East Timor. *GeoJournal*, 69(4), 239-255.
- Thua, P. M. (2012). Access to land and livelihoods in post-conflict Timor-Leste. *Australian Geographer*, 43(2), 197-214.
- Tieguhong, J. C., & Zwolinski, J. (2008). *Unrevealed economic benefits from forests in Cameroon*. Paper presented at the IUFRO: Emerging needs of society from forest ecosystems, University of Ljubljana, Slovenia.
- Tiffen, M., Mortimore, M., & Gichuki, F. (1994). *More people less erosion: Environmental recovery in Kenya*. Chichester, UK: Wiley.
- Timor-Leste National Directorate of Meteorology and Geophysics, Australian Bureau of Meteorology, & CSIRO. (2013). Current and future climate of Timor-Leste. Retrieved from http://www.pacificclimatechangescience.org/wpcontent/uploads/2013/06/5_PCCSP_East_Timor_8pp.pdf

- Tongpan, S., & Panayotou, T. (1990). *Deforestation and poverty: Can commercial and social forestry break the vicious circle*. Bangkok: Thailand Development Research Institute.
- Torres, M. M., & Anderson, M. (2004). *Fragile states: defining difficult environments for poverty reduction*. PRDE Working Paper 1. London: DFID.
- Turner, B. L., Clark, W. C., Kates, R. W., Richards, J. F., Mathews, J. T., & Meyer, W. B. (1990). *The earth as transformed by human action: Global and regional changes in the biosphere over the past 300 years*. Cambridge, UK: Cambridge University Press.
- United Nations [UN]. (1987). Report of the World Commission on Environment and Development *General Assembly Resolution 42/187*.
- United Nations. (1992). Rio Declaration on Environment and Development *Report of the United Nations Conference on Environment and Development (A/CONF.151/26 (Vol. I))*.
- United Nations. (1995). *Report of the international conference on population and development*, Cairo 5-13 September 1994. New York: United Nations.
- United Nations. (2004). A more secure world: Our shared responsibility: Report of the UN Secretary General's High-Level Panel on Threats, Challenges and Change, *UN General Assembly document A59/565*. Retrieved from <http://daccessddsny.un.org/doc/UNDOC/GEN/N04/602/31/PDF/N0460231.pdf?OpenElement>
- United Nations. (2007). Handbook on rural households' livelihood and well-being: Statistics on rural development and agriculture household income. Rome: United Nations.
- United Nations. (2008). *United Nations development assistance framework Timor-Leste 2009-2013*. Dili: UNDAF.
- United Nations. (2009a). *Millennium development goals report 2009*. New York: United Nations.
- United Nations. (2009b). Report of the secretary-general on the United Nations integrated mission in Timor-Leste (for the period from 21 January to 23 September 2009) (Doc S/2009/504): UN Security Council.
- United Nations. (2010). World Population Prospects: The 2010 Revision: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat.
- United Nations. (2011a). *World population prospects: The 2010 revision*. New York: Department of Economic and Social Affairs Population Division.

- United Nations. (2011b). *World population prospects: The 2010 revision*. In Dept. of Economic and Social Affairs Population Division (Ed.).
- United Nations. (2012a). *World Contraceptive Use 2012*: UNDESA, Population Division, Fertility and Family Planning Section.
- United Nations. (2012b). *World Population Prospects: The 2012 Revision: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat*.
- United Nations Department of Economic and Social Affairs [UNDESA]. (2011a). *World population prospects: The 2010 revision*. New York: Population Division.
- United Nations Department of Economic and Social Affairs. (2011b). *World urbanisation prospects: The 2011 revision*. United Nations: Department of Economic and Social Affairs.
- United Nations Development Program [UNDP]. (1990). *Human development report 1990*. New York: UNDP.
- United Nations Development Program. (2006). *Human development report 2006 Timor-Leste. The Path out of Poverty: Integrated Rural Development*. Dili: United Nations Development Programme.
- United Nations Development Program. (2010). *Beyond the mid-point: Achieving the Millennium Development Goals*. New York: UNDP.
- United Nations Development Program. (2011a). Community seals deal to halt conflict. Dili. UNDP. Retrieved from http://www.th.undp.org/content/timor_lesste/en/home/ourwork/crisispreventionandrecoverysuccessstories/TL_Metinaro_peace/
- United Nations Development Program. (2011b). *Human development report 2011. Sustainability and equity: A better future for all*. New York: United Nations Development Programme.
- United Nations Development Program. (2011c). *Timor-Leste Country briefing: Multidimensional Poverty Index (MPI) at a glance*. Oxford Poverty & Human Development Initiative (OPHI), Multidimensional Poverty Index Country Briefing Series. Retrieved from <http://www.ophi.org.uk/wp-content/uploads/Timor-Leste.pdf>
- United Nations Development Program. (2011d). *Human development report Timor-Leste*. Dili, Timor-Leste.
- United Nations Development Program. (2013a). *The 2013 human development report - 'The Rise of the South: Human Progress in a Diverse World'*. New York: United Nations Development Program.

- United Nations Development Program. (2013b). *Human development report 2013. Technical Notes*. Retrieved from http://hdr.undp.org/en/media/HDR_2013_EN_TechNotes.pdf
- United Nations Environment Program [UNEP]. (2007). *Global environment outlook GEO4: Environment for development*. Malta: United Nations Environment Programme.
- United Nations Environment Program. (2012). Natural capital declaration. Retrieved from <http://www.naturalcapitaldeclaration.org/wpcontent/uploads/2012/04/NaturalCapitalDeclaration.pdf>
- United Nations Environment Program, Economic and Social Commission for Asia and the Pacific, & Asian Development Bank. (2012). *Green growth resources and resilience: Environmental sustainability in Asia and the Pacific*. Bangkok: United Nations.
- United Nations Integrated Mission in Timor-Leste [UNMIT]. (2008). *Timor-Leste District Atlas: Profiling Districts of Timor-Leste Second Edition*, OCHA/UNMIT Integrated Humanitarian Coordination Team.
- United Nations International Children's Emergency Fund [UNICEF]. (2002). *Timor-Leste multiple indicator cluster (MICS) report*. Dili: UNICEF.
- United Nations International Children's Emergency Fund. (2013). *Child Info: Monitoring the Situation of Children and Women*. New York: UNICEF.
- United Nations Population Fund [UNFPA]. (2012). *Impacts of population dynamics. Reproductive health and gender on poverty*. New York: UNFPA.
- United Nations Population Fund, & The Government of Democratic Republic of Timor-Leste. (2009). *Country programme action plan (CPAP) Timor-Leste 2009-2013*. Dili, Timor-Leste.
- United Nations Population Division. (2007). *World Population Prospects: The 2006 Revision*. New York: United Nations.
- United States Agency for International Development [USAID]. (2008). *Timor-Leste Economic Recovery Assessment*. Washington: USAID. Retrieved from http://pdf.usaid.gov/pdf_docs/PNADL723.pdf
- unknown, J. (2006). *Culture and Daily Life in Timor-Leste*. Retrieved from <http://www.timortreasures.com/julie/culture.htm>
- Urdal, H. (2006). A clash of generations? Youth bulges and political violence. *International Studies Quarterly*, 50(3), 607-630.
- Urdal, H. (2011). *A clash of generations? Youth bulges and political violence*. New York: Population Division Department of Economic and Social Affairs

United Nations Secretariat.

- Valenzuela, E., & Anderson, K. (2011). *Climate change and food security to 2030: A global economy-wide perspective*. Centre for International Economic Studies Adelaide University.
- Veenstra, G. I., Luginaah, S., Wakefield, S., Birch, J. E., & Elliott, S. (2005). Who you know, where you live: Social capital, neighbourhood and Health. *Social Science and Medicine*, 60(12), 2799-2818.
- Vittachi, T. (1990). Two approaches to health promotion in the mass media. *World Health Forum*, 11, 143-164.
- Weiner, M., & Russell, S. S. (2001). *Demography and National Security*: Berghahn Books.
- Williamson, J., & Higgins, M. (1997). *The accumulation and demography connection in East Asia*. Paper presented at the Conference on Population and the East Asian Miracle, Honolulu, USA.
- Williamson, J. G. (2001). Demographic change, economic growth, and inequality. In N. Birdsall, A. C. Kelley & S. W. Sinding (Eds.), *Population Matters: Demographic Change, Economic Growth, and Poverty in the Developing World*. New York: Oxford University Press, 106-136.
- Wolfgram, A. F. (2005). Population, Resources and Environment: A survey of the Debate. Retrieved from <http://www-rohan.sdsu.edu/faculty/dunnweb/rprnts.2005.10.10Malthus.pdf>
- Wollenberg, E., & Nawir, A. S. (1998). Estimating incomes of the people who depend on forests. In E. Wollenburg & A. Ingles (Eds.), *Incomes from the Forests. Methods for development*.
- Woolcock, M. (2001). The Place of Social Capital in Understanding the Social and Economic Outcomes. *Canadian Journal of Policy Research ISUMA*, 2(1), 11-17.
- Woolcock, M., & Narayan, D. (2000). Social Capital: Implications for Development Theory, Research, and Policy. *World Bank Research Observer*, 15(2), 225-249.
- World Bank. (2005). *Environmental Matters at the World Bank. Annual Review*. Washington DC: World Bank.
- World Bank. (2006a). Expanding job opportunities for Pacific Islanders through labour mobility at home and away. Retrieved from <http://archives.pireport.org/archive/2006/August/08-16-rp.htm>
- World Bank. (2006b). Sustaining the World's Forests: Managing Competing Demands for a Vital Resource, from

<http://siteresources.worldbank.org/EXTABOUTUS/Resources/Ch16.pdf>

- World Bank. (2006c). World Development Report - Indicators 2006. Washington: World Bank
- World Bank. (2007). Timor-Leste: CSP Mission - February and March 2007, Draft. 1. Washington, DC.
- World Bank. (2008). Policy note on population growth and its implications in Timor-Leste. Washington, D.C: The World Bank.
- World Bank. (2009a). Poverty Analysis: Recent Estimates and Outlook. Washington: World Bank.
- World Bank. (2009b). Fragility and Conflict, Definition of Fragility and Conflict. Washington: World Bank.
- World Bank. (2009c). A 2009 Update of Poverty Incidence in Timor-Leste using the Survey-to-Survey Imputation Method. Dili: World Bank.
- World Bank. (2009d). Timor-Leste: Country Environmental Analysis: Sustainable Development Department East Asia & Pacific Region. Washington: World Bank.
- World Bank. (2010). Asia Sustainable and Alternative Energy Programme: Timor-Leste Key Issues in Rural Energy Policy. Washington: World Bank.
- World Bank. (2011). Fragile and Conflict-affected Countries: Fragile State List. Washington: World Bank.
- World Bank. (2013a). Labor Market issues in Timor- Leste: Current state, prospects and challenges. Washington: World Bank.
- World Bank. (2013b). The Role of Information and Communication Technology in Post-Conflict Timor-Leste. Washington: World Bank.
- World Bank. (2013c). Twenty Fragile States Make Progress on Millennium Development Goals (Vol. 2013/374/EXT): The World Bank Press Release.
- World Bank. (2013d). *World development indicators: Population dynamics*. Washington: World Bank.
- World Commission on Environment and Development [WCED]. (1987). Our common future: the report of the World Commission on Environment and Development. Oxford: Oxford University Press.
- World Health Organisation [WHO]. (2012). Trends in Maternal Mortality: 1990 to 2010. Geneva: World Health Organisation.
- World Health Organisation. (2013). Global Health Observatory Data Repository.

Geneva: World Health Organisation.

Yemiru, T., Ross, A., Campbell, B. M., & Bohlin, F. (2010). Forest incomes and poverty alleviation under participatory forest management in the Bale Highlands, Southern Ethiopia. *International Forestry Review*, 12(1).