



Timor-Leste Environmental and Climate Change Policy Brief

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This Environmental and Climate Change Policy Brief was carried out as a desk study in August-September 2008 and will be used as an input to the Swedish development cooperation strategy with The Democratic Republic of Timor-Leste. The policy brief is written by the Sida Helpdesk for Environmental Economics under the Environmental Economics Unit of University of Gothenburg with contributions from Stockholm Environment Institute.¹ In line with the Swedish development cooperation goals this Policy Brief aims to summarise the key environmental and climate change problems and opportunities facing Timor-Leste, related to poverty reduction and economic development. It should be noted that finding reliable data for such a young nation as Timor-Leste is difficult. Often data is either not available or when available, contradictory.

Contents

Executive Summary.....	2
Introduction	3
1. Key Environmental Problems and Opportunities.....	3
1.1 Key environmental problems and their causes	3
1.2 Opportunities	5
2. Effects of the Environmental Problems.....	6
2.1 Impacts on Poverty (Vulnerability, Security, Opportunity)	6
2.2 Impacts on Economic Development.....	8
2.3 Impacts on Health.....	9
3. Timor-Leste and Climate Change.....	9
3.1. Trends and future climate	9
3.2 Impacts of Climate Change	10
3.3. Response to Climate Change: Mitigation.....	10
3.4 Response to Climate Change: Adaptation	11
3.5 Capacity for Adaptation and Mitigation.....	12
4. Relationships between the Environmental Problems on Ongoing and Potential conflicts	13
5. What key actors are doing to manage the environmental problems?.....	13
6. How and to what extent are the responses to environmental problems implemented and followed-up?.....	16
7. Conclusions and implications for Sida	18
7.1 Conclusions	18
7.2 Issues for Sida to consider	18
References	21

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Executive Summary

Timor-Leste is one of the poorest countries in Asia. Food insecurity is high, health standards are low and the environment and natural resources, upon which the majority of the population depend, are rapidly being deteriorated. As a young nation the country faces many challenges in terms of lack of human capacity, weak institutions, and low levels of education and infrastructure. Still after independence in 2002, the country is fragile and highly vulnerable to conflicts. Vulnerability in Timor-Leste is associated with poverty and insecurity, compounded by high rates of unemployment and underemployment and the displacement brought on by the crisis in 2006. Longer-term vulnerabilities include food insecurity and low resistance to natural disasters and climate change. Moreover, food insecurity, lack of access to basic services, weak livelihood opportunities and lack of environmental stability are linked to the conflicts.

The most important environmental problems in Timor-Leste include land degradation, deforestation, environmental and natural disaster vulnerability due to climate variability, poor water quality and water scarcity, and indoor air pollution. Loss of biodiversity and ecosystem services are other concerns. Land degradation is associated with bad agricultural practices and overgrazing. Major drivers of deforestation and loss of ecosystems are households' conversion of forests and mangrove to agricultural land and fuelwood collection for energy. Climate variability frequently causes droughts and floods, which are likely to increase in frequency and intensity due to climate change. Indoor air pollution due to the heavy use of fuelwood as a primary source of energy is a very serious problem causing acute respiratory illnesses, particularly for poor women and children. Water scarcity is high in northern parts of the country and bad water quality is indicated to be a serious issue in many urban areas.

Poor environmental quality in Timor-Leste affects the poor the most. At the same time poverty is the main driver of environmental degradation and linked with deforestation, soil erosion and loss of fertile land. For a vast majority of the population agriculture is the main source of livelihood. The situation of food insecurity is exacerbated by the low agricultural productivity and by climate variability and change (e.g. droughts and floods), as well as the high price of cereals on the world market.

The peaceful election in 2007 was an important step towards future national political stability and security. The new Government needs to address a number of challenges, including alleviate widespread poverty, creating sustainable livelihoods and building human and institutional capacity. The newly gained petroleum reserves convey an important potential for economic growth. However, there is also a risk that volatile oil- and gas revenues, in combination with weak institutions, will lead to macroeconomic instability and is a potential breeding ground for mismanagement and corruption.

There is a link between conflict and food insecurity, lack of access to basic services, fragile livelihoods and lack of environmental sustainability in Timor-Leste. The high unemployment and over 100 000 Internally Displaced Persons (IDPs) poses a serious threat to the social and political stability in the country. During the violence of 1999, conflicts were a direct source of environmental degradation. Water facilities were destroyed and the forest sector got substantially damaged. Conflicts over internationally shared natural resources (oil and gas) also exist.

There is a pressing need to strengthening democratic institutions and improve environmental governance. Moreover, assisting reintegration and return of IDPs require access to land and implementation of a sound land tenure policy. Increasing productivity in agriculture and improving access to basic services such as water and sanitation are of utmost importance. Further, initiatives addressing equitable and sustainable use of the nation's natural resources are vital for Timor-Leste's prospects to reduce poverty, ensure human rights and sustain economic growth.

Introduction

The Democratic Republic of Timor-Leste is located in the eastern part of Timor Island, bordering the Republic of Indonesia, in Southeast Asia. Timor-Leste is a mountainous country and not ideal for agricultural production. The country can be divided into six ecological zones, from highland to lowland, and from arid to moist areas. After 460 years of Portuguese rule followed by some 25 years of Indonesian rule, Timor-Leste became independent in 2002. The struggle for independence was associated with conflicts and violence, human rights abuses and loss of almost 200 000 human lives. Still after independence the country is highly vulnerable to conflict. During the political and civil unrest in 2006 over 150 000 people were driven from their homes. Today there are still 100 000 Internally Displaced Persons (IDPs) in Timor-Leste as result of conflict.²

Timor-Leste is the poorest country in the region; life expectancy and education levels are low, and almost half of the population lives below the poverty line.³ The country is highly vulnerable to natural disasters and climate variability and change, and is subject to seasonal food insecurity, high levels of unemployment, and a lack of economic opportunities and basic infrastructure, among other factors. The population of Timor-Leste heavily relies on the country's natural resources (oil, agricultural land, marine resources and forests) for its livelihood. The population is growing rapidly, by over 3% per year – the current population of around one million people is expected to double in 17 years - which puts further pressure on the country's already degraded environment. Moreover, there has been a significant urban migration during the last five years, especially to the capital Dili. The population is heterogeneous; many ethnic groups and 30 different languages reside in the country. For almost 80% of the population, agriculture is the main source of livelihood. However, the soil is of poor quality and only 13% of the land is suitable for agriculture. Furthermore unemployment is high, especially among youths. Increasing natural resource revenues (from oil and gas) together with weak institutions and governance make corruption an area of growing concern.

1. Key Environmental Problems and Opportunities

1.1 Key environmental problems and their causes

Environmental problems in Timor-Leste are primarily related to poverty rather than more growth-related problems from industry and transportation (e.g. pollution). Below follows a

² WHO, Accessed 2008-09-10

³ Life expectancy was in 2004 estimated to be 54 years and 56.6 years for men and women respectively (UNDP, 2006a); The estimated adult literacy rate in 2001 was 43% (Government of Timor-Leste, 2004); In 2001 over 40% lived below poverty line and this number has likely increased since then (Government of Timor-Leste, 2008).

short description of the key environmental problems facing Timor-Leste (not in order of priority):

Land degradation: Land degradation is a serious problem in Timor-Leste and is driven mainly by “slash and burn” agriculture. Further, the steep terrain and shallow soils coupled with heavy rainfall during rainy season, causes severe soil erosion. Overgrazing (mainly by goats) adds to the land degradation. Furthermore, the lack of a sound property right system causes tenure insecurity⁴ which brings with it less investments and often unsustainable land management, exacerbating the problem. Land degradation is not only a threat to agricultural productivity and food security, but it is also likely to affect the water resources (via erosion affecting water bodies), biodiversity (via land habitat loss, coral reef and coastal fishery degradation) and soil (via soil loss).⁵

Deforestation: More than one third of the Timorese land is covered by forest. The forest is important as it provides a number of important ecosystem services including carbon sequestration, climate regulation and water purification, and it contributes to livelihoods and national income. Yet, the forest cover is rapidly being degraded. It has since the 1970s declined from a coverage of over 50%. Today the deforestation rate is equal to 1.3% annually.⁶ One major driver of deforestation is currently conversion of forest to agricultural land, mainly driven by the rural households’ efforts to increase their food security. Therefore, loss of forest area is driven by short-term household gains, but has significant long-term implications for both household and national incomes, as well as on water supplies and ecological balances. Land tenure rights for forests are unclear; nominally they are owned by the state but there is little enforcement and the perception of forests as an abundant, common resource supports their conversion to farmland. The anticipated population growth in rural areas pose a threat as it may lead to more land-clearance and could result in a 1.8% annual deforestation rate. Other causes of deforestation include fuel-wood collection, high levels of cultivation and over-grazing. In Timor-Leste there is a large demand for fuel wood⁷ for both households (98% of all households use firewood for fuel) and, according to anecdotal evidence, also for small scale industries.⁸

Water resources – pollution and scarcity: The northern parts of Timor-Leste experience short rainy seasons. These extreme conditions with little or no rain falling in the north of the island for almost eight months of the year is a constraint to agricultural production and a source of food insecurity and poverty. During the rainy season large-scale flooding is common, which erodes soil and washes pollution into the waterways. Water quality data is unavailable, although it is indicated to be a serious issue in many urban areas.⁹ Further, non-existing sewage systems and inadequate systems for the collection and disposal of wastewater and solid waste have resulted in widespread pollution of groundwater. In urban areas industrial wastewater processing and the limited regulations is also a cause of water pollution.¹⁰

⁴ World Bank, 2008-09-10

⁵ World Bank, 2007

⁶ World Bank, 2008. The deforestation rate for the three most tropical-forested countries are, 0.3% (Democratic Republic of Congo), 1.8% (Indonesia), 0.6% (Brazil), and the global mean deforestation rate is 0.5%.

⁷ The annual demand for fuel wood is about 1.6 million cubic meters which is equivalent to about 595 000 ha of forests. (WHO, 2008-08-20)

⁸ World Bank, 2007; UNDP, 2006a; and EU, 2007

⁹ Wateraid, Accessed 2008-08-20

¹⁰ World Bank, 2005a; and World Bank, Accessed 2008-09-10

Loss of biodiversity and ecosystem services: Timor-Leste has a combination of Australian and Asian flora and fauna and is known to have rare terrestrial, lake and marine ecosystems originating from unique geological and meteorological conditions. Many species are threatened with extinction, especially those that rely on the forest. Deforestation is a significant cause of biodiversity loss and loss of ecosystem services. Marine areas and a number of marine species are threatened. Lack of waste management poses a significant threat to marine ecosystems and nearby marine areas. Timor-Leste lies within the region of the Coral Triangle which contains over one-third of all known coral species on earth, over half the world's coral reefs, over 3,000 fish species, and the greatest extent of mangrove forests of any region in the world. The diverse ecosystems of the Coral Triangle are today threatened by over-fishing, pollution and coral bleaching exacerbated by climate change.¹¹ Key ecosystem services e.g. coastal zone protection against severe floods and storms are diminishing as coral reefs and mangroves are being degraded.

Air pollution: Although there is not sufficient information on air pollution in Timor-Leste,¹² the World Bank identifies outdoor air quality as relatively good due to continued low industrial activity and low amount of vehicles in urban areas. However, for indoor air pollution the situation is different as indoor air quality is affected by the heavy use of fuel wood as the primary source of energy.¹³

Natural disaster risks: Timor-Leste is at risk of and highly vulnerable to natural disasters. Annual heavy seasonal rain falling on steep slopes causes frequent flash flooding, landslides and erosion. The country is at risk of tropical cyclones and storms, and coastal flooding. Further, drought is a serious problem in large parts of the country as well as locust. Earthquakes are common and so are the associated phenomena such as Tsunamis.¹⁴ The disasters are causing crop damages leading to food insecurity and famine, infrastructure damages, house destruction which forces people to move, and high economic losses.¹⁵

Climate Change: Timor-Leste is highly vulnerable to climate change. Climate change is predicted to further aggravate the issues mentioned above. More information and a detailed analysis on climate change in Timor-Leste is found in section 3 below.

1.2 Opportunities

As a young nation with newly gained independence Timor-Leste faces great challenges including low levels of education, weak institutions, low human capacity, insecurity, and widespread poverty and vulnerability. But the new self determination also presents opportunities: control of its natural resources, possibilities to develop and implement integrated policies, and change the course from humanitarian assistance to long-term, sustainable and equitable development. The petroleum revenues present an opportunity for economic growth, if the country manages to balance short-term gains with long-term development efforts and maintain political and economic stability.

Overall access to safe and clean water in Timor-Leste is low. Most rural communities rely on springs and dug-wells. Rainwater harvesting could be an opportunity to improve water supply

¹¹ IRIN, 2008b Accessed 2008-09-11

¹² For example the statistical yearbook of 2007 on air and water pollution for Asia and the Pacific presented by UNESCAP do not contain any information about Timor-Leste.

¹³ World Bank, 2007; and World Bank, Accessed 2008-09-10

¹⁴ WHO, Accessed 2008-09-10

¹⁵ OCHA, 2008

and is being considered as an alternative for isolated communities. Studies from Africa show that rainwater harvesting not only has had positive effects on agricultural production by providing water for crops, but it has also helped recharge groundwater and reduce soil erosion.¹⁶

There are also interesting success stories from Asia. One example is the project from India's state of Rajasthan that have successfully recharged empty aquifers, rejuvenated dry wells and stopped soil erosion by introducing simple but efficient infrastructure to capture rainfall. Other beneficial impacts of these investments have been increased income from agriculture (both crops and livestock) as well as massive reforestation of previously barren areas. (See Appendix II)

The fishing potential in Timor-Leste is estimated to be high. At the same time daily protein intake of the majority of the population is low. By improving the fishing sector and developing fishing resources, the Government wants to make more people include fish in their diets. If managed in a sustainable way this poses an opportunity to decrease food insecurity in many communities.

The sustainable management of forest resources will be an important issue in Timor-Leste's continued economic and social development.

2. Effects of the Environmental Problems

2.1 Impacts on Poverty (Vulnerability, Security, Opportunity)

In 2001, nearly 40% of the Timorese population lived under the national poverty line and this number has likely increased since then. The Timorese population is highly dependent on agriculture (including forestry and fishery), which is the primary source of livelihood for over 80% of all households. Poverty is concentrated to rural areas (85% of all poor live in rural areas); the poorest groups are found in households with small scale land holdings or those headed by fishermen.¹⁷

Vulnerability is a reflection of human capacity to cope with risks or shocks. There are strong links between poverty and vulnerability to environmental concerns; another major factor contributing to vulnerability is inequality (see section on insecurity below). Vulnerability in Timor-Leste is compounded by high rates of unemployment and underemployment (especially for youths in urban areas), and the displacement brought on by the crisis in 2006¹⁸. Longer-term vulnerabilities include food insecurity and low resistance to natural disasters.¹⁹ The most vulnerable groups are the rural and urban poor, the IDPs, minority groups, and youth.

The severe land degradation in Timor-Leste is closely linked with land clearance and bad agricultural practices, water availability (too much or too little) and deforestation; all which have significant impact on the present situation of food insecurity. The high population growth exacerbates deforestation and puts tremendous pressure on agricultural land. The

¹⁶ Government of Timor-Leste, 2005; and FAO, 2007 Accessed 2008-09-17

¹⁷ Government of Timor-Leste, 2008; and Government of East Timor, 2002

¹⁸ It is estimated that around 100 000 Internally Displaced Persons are living in Dili and the surrounding district in 58 camps.

¹⁹ Government of Timor-Leste, 2008

environmental degradation in Timor-Leste affects the poor people the most. The poor are highly dependent on natural resources for their livelihoods at the same time as they are highly vulnerable to, but have fewer coping strategies to manage, external shocks such as droughts, floods and soil erosion. Poverty is thus the main driver of environmental degradation in Timor-Leste; poor people often feel forced to over-exploit natural resources for their survival, thereby contributing to the environmental degradation.

Insecurity is one reason to the low agricultural productivity, due to i.a. massive displacements of populations and tenure insecurity, which results in low investment rates. In addition there is a situation of severe soil erosion and unsustainable land management practices, further inhibiting productivity. Conflicts, poverty and environmental degradation thus interact and negatively affect agricultural productivity, which results in food insecurity and poverty and exacerbates environmental degradation in a vicious circle.

IDPs comprise 10% of the population of Timor-Leste, and complicate government policies and efforts at building capacity. Community violence must be addressed before the IDPs will feel safe to return home; until then they remain very vulnerable and it will be difficult to introduce successful poverty reduction measures or build adaptive capacity for this group. Trust in the government and the security situation must be built before the government can effectively govern Timor-Leste and support the country's economic and social development whilst increasing its resilience to climate change and ensuring environmental protection.

Many rural households experience food shortages during November to February (months between maize and rice harvest), due to low agricultural output and very limited alternative means of earning income in rural areas. Food security is also threatened by adverse weather conditions (e.g. droughts and floods) and the high price of cereals on the world market. The IDPs are most severely affected and are reportedly dependant on food aid.²⁰ Currently, 64% of the population suffers from food insecurity and nearly 30% of the population received some support last year from the World Food Program.²¹

For households that rely on farming, land is the greatest asset. Average land holdings in Timor-Leste are small (1.2 ha per household²²) and inequality is high between households. The poorest half of the households only has access to less than 0.22 ha of land each, which is a quite a small area.²³ Besides land-holdings inequality, the income inequality is high in Timor-Leste (the Gini coefficient was 0.37 in 2001). According to formal legislation women have the same rights as men. However, women are often discriminated through inherence of local communities land systems.²⁴

Access to electricity is unevenly distributed²⁵ and in rural areas very limited, but plans are in place to improve rural electrification. In general, higher access to electricity improves health, education and resilience of households, with positive gender implications.

Although peace remains fragile and the human resources and capacity of institutions are weak, Timor-Leste has an **opportunity** for economic growth and human development,

²⁰ FAO, 2008

²¹ UNDP, 2006a ; and ADB, 2008a

²² USAID, 2005

²³ UNDP, 2006a

²⁴ USAID, 2004

²⁵ 92% of all households in Dili have access to electricity compared to 10% in rural areas. (UNDP,2006)

primarily due to its oil and gas reserves. Furthermore, there is an opportunity to increase agricultural productivity through integrated and sustainable management of its natural resources, including land, forests, fishery and water.

2.2 Impacts on Economic Development

For Timor-Leste environmental degradation is of major concern because of its impact on economic growth and poverty. Land degradation together with water pollution and scarcity leads to losses of agricultural productivity and to increased costs of water treatment and water supply systems. Moreover, water pollution and (indoor) air pollution leads to significant health costs. Loss of biodiversity has a large negative effect on ecosystem services, including food security and livelihood opportunities. Climate change and the risk of more natural disasters may cause severe economic damage and have significant economic implications on economic development in Timor-Leste.²⁶

Timor-Leste holds at its disposal large oil and gas reserves in the Timor Sea. Besides petroleum the country is relatively poorly endowed with natural resources. The petroleum revenues and saving arrangements²⁷ may ensure the country's economic future if carefully managed. This poses an economic and governmental challenge: international experience shows that poor countries with weak institutions and high capital of natural resources risks falling into the "natural resource curse". There is a risk that the volatile oil- and gas revenues, in combination with weak institutions, will lead to macroeconomic instability and is a potential breeding ground for mismanagement and corruption.

Economic activity rebounded in 2007 following the violent civil unrest in 2006. The crisis in 2006 damaged perception of the state and had severe economic effects. Per capita income in the non-oil economy is about 20% lower in real terms than in 2002, implying that poverty is increasing.²⁸

Due to poor people being primarily engaged in agriculture (including forestry and fishery) improving productivity in this sector is of high priority. Productivity in agriculture is today low contributing to only one fifth of GDP. Agricultural production is not enough for local needs leaving the country heavily dependent on imports. As a result, Timor-Leste is highly vulnerable to the rising world food prices. The food security situation has been negatively affected by reduced cereal production and rising cereal prices.²⁹

USAID identifies land issues as central to all aspects of economic growth and development in Timor-Leste. Land titling pose a serious challenge to promote pro-poor growth. Redistributing land and issuing land titles to provide security of tenure is critical to prevent further degradation of overused (and misused) land, which have significant negative effect on productivity. Moreover, lack of possible land ownership or leasing options discourages foreign and domestic investment. It also hinders development of smaller businesses in rural areas which is a constraint to off-farm job creation.³⁰

To increase growth there is a need to create a sustainable development and improving productivity in agriculture and at the same time focus on off-farm employment. This requires

²⁶ EU, 2007

²⁷ See section 6.2

²⁸ ADB, 2008a; and Government of Timor-Leste, 2008

²⁹ UNDP, 2006a; and FAO, 2008

³⁰ World Bank, 2005b

investments in better rural infrastructure, particularly road and irrigation network, along with facilities for clean water and sanitation.³¹

2.3 Impacts on Health

Access to quality housing, good nutrition and clean water and sanitation are vital basic needs for a healthy living. Health standards in Timor-Leste are low; life expectancy is low, respiratory and diarrhoeal diseases are widespread and malaria and dengue fever are endemic. Food insecurity has a severe impact on health, especially on small children. The high child mortality rate is significantly related to malnutrition. 43% of children under five are underweight. Over half of the population do not have access to safe drinking water and 60% do not have adequate sanitation. The situation is more severe in rural areas than in urban areas. Morbidity and mortality related to water born and sanitation diseases are high; a study from 2001 shows that diarrhoea, dysentery and lower respiratory infections stands for 30% of the deaths linked to water borne and sanitation related diseases. The major source of energy for rural residents is fuel wood. Wood burning does not only lead to environmental damages (e.g. deforestation) but also to health problems, in particular for the poor households. Insufficient burning of wood in poorly ventilated kitchens causes respiratory diseases, especially among children and women.³² There are about 70 000 malaria cases each year. Vector-borne diseases such as malaria and dengue fever are likely to increase due to climate change.

3. Timor-Leste and Climate Change

3.1. Trends and future climate

The main climatic hazards in Timor-Leste are floods, landslides and tropical cyclones, with drought a hazard in the North of the country. Specific information on trends in climate and hazards for Timor-Leste is scarce due to a complete lack of meteorological data and observations during the period of Indonesian rule from 1975-2000. Experience from farmers suggests that there is increasing variability of climate and traditional planting cycles no longer fit with current seasons, and mountain communities report that temperatures have been rising³³. This fits the pattern for the rest of the Indonesian archipelago, where data show that the timing of the rainy season has changed, and temperatures have risen by 0.3C since 1990. There is some indication that the south of the Indonesian archipelago has experienced a drying trend, however it is unclear whether this has occurred in Timor-Leste. Projections for temperature increases to 2100 are in line with the global average, with a range of 1.5-3.7C by 2100, and a mean increase across models of 2.5C³⁴. Changes in precipitation are less clear, in particular because of uncertainty over future changes in the Australian monsoon and El Niño, and their effect on regional precipitation. In general, climate models show increased rainfall intensity in the wet season, but a more prolonged dry season³⁵.

El Nino has a strong effect on the climate of Timor-Leste, with reduced rainfall and drought common, for example the 2007 El Nino contributed to a 30% reduction in cereal yields in the country³⁶. It is difficult to assess the impact of climate change on El Niño, but the number and

³¹ UNDP, 2006a

³² UNDP, 2006a

³³ IRIN, 2008a Accessed 2008-09-01

³⁴ IPCC, 2007a

³⁵ IPCC, 2007b

³⁶ OneWorld, Accessed 2008-08-29

intensity of events has increased over the last 100 years, so possible El Nino induced droughts may become more frequent in the future. It is not possible to say what effect climate change will have on tropical cyclones, but it is clear they will continue to be a major hazard.

3.2 Impacts of Climate Change

Little work has been done on the impacts of climate change specifically for Timor-Leste but using studies for Indonesia, and the national circumstances of Timor-Leste, several potential impacts can be identified. According to the World Food Programme, 20% of the population is food insecure, and an additional 24% are vulnerable to food insecurity. This is largely due to political unrest, poverty, poor quality soil and inefficient farming techniques, but increased climate variability and extreme events may make the situation worse and food insecure groups, including IDPs will be among the most vulnerable to any additional stresses from climate change³⁷. Any increase in intense precipitation will increase problems related to the erosion of topsoil on steep deforested mountain slopes, which leaves them unsuitable for growing crops and increases the risk of landslides.³⁸

Rising sea-level, projected to increase by 18-59cm by 2100, could threaten the capital city Dili with flooding, especially during storm surges. Warmer ocean temperatures may damage biologically diverse coral reefs and disrupt fishing patterns. An increase in El Nino activity or length of the dry season may cause more frequent droughts in the North of the country, where they already cause decreases in crop yield, although it is unclear how the situation with regards national water resources will change. Given the degraded state of water supply in Timor-Leste, improving the water infrastructure, for example reducing leaks and strengthening the water management system would probably counteract any reduction in overall resources due to climate change. Warmer temperatures are likely to increase the incidence of vector-borne diseases such as Malaria and Dengue Fever.

3.3. Response to Climate Change: Mitigation

Mitigation refers to anthropogenic actions to reduce the emissions of greenhouse gasses to the atmosphere, and thus reduce the magnitude of future climate change.³⁹ Emissions of carbon dioxide in Timor-Leste are 0.2tonnes/capita and 0.1kg/\$GDP, both of which are negligible when compared to the 2005 world averages of 4.22 tonnes/capita and 0.75kg/\$GDP.⁴⁰ Under any proposed international agreement to agree a global per capita emissions target, such as the 2 tonnes/capita suggested by Sir Nicholas Stern and the London School of Economics, Timor-Leste would be allowed to significantly increase its carbon dioxide emissions.⁴¹ A pilot project by the UN department of economic and social affairs (UNDESA) in Aleiu district showed that with the right support solar lanterns are a viable source of electricity for rural communities, highlighting the opportunity for the spread of low carbon technologies which support rural development.

Forests provide key ecosystem services, including regulating climate, reducing flood risk by slowing run-off and maintaining habitat and biodiversity. The protection of these services can reduce the impacts of climate change, increase the ability of communities to adapt to climate change, and support rural livelihood activities thus aiding poverty alleviation efforts.

³⁷ WFP, 2007

³⁸ UNDP, 2006b

³⁹ IPCC 2007b

⁴⁰ IEA, 2008 Accessed 02/09/08

⁴¹ Stern, N., 2008

Potential exists for projects under the Clean Development Mechanism⁴² (CDM) in Timor-Leste which would support the introduction of low-carbon technologies with benefits for national development, although capacity would need to be built to attract and implement these projects. Although at an early stage, the Reducing Emissions from Deforestation and Degradation (REDD) proposal currently being discussed in international climate negotiations, whereby developing countries would receive compensation for preventing deforestation, also has great potential to contribute to sustainable forest management in Timor-Leste. Any assessment on benefits of a REDD programme in Timor-Leste should however consider effects on local communities and poor people, and strive to ensure a fair sharing of benefits.

3.4 Response to Climate Change: Adaptation

Adaptation can be seen as adjustments in human or physical systems in response to current or expected climate changes in order to cope with the impacts of climate change and take advantage of any new opportunities⁴³. Whilst there will be some specific adaptation measures that should be taken in Timor-Leste, at present the greatest factors in increasing ability to adapt climate change will be continued economic and social development, including infrastructure, institutional capacity, the economy, and poverty reduction efforts. Poverty is the main driver of environmental degradation in Timor-Leste and also a major contributing factor to vulnerability to climate change, and must be addressed in order to improve livelihoods, increase resilience to climate change and protect the island's biodiversity.⁴⁴

Reforestation of steep slopes will stabilise the slope and topsoil, as would the spread of various indigenous soil conservation methods which are practiced in some upland areas. The improvement of agricultural knowledge and techniques, for example through watershed management, training agricultural extension officers, or improved seed varieties is not a direct adaptation to climate change, but improving

Box 1. Biodiversity and adaptation to climate change

Sound management and of biodiversity and ecosystem services is often a highly cost-effective way to adapt to climate change:

Agriculture: Maintaining diversity of local varieties, crops and agricultural systems contributes to risk distribution, decreased vulnerability, and increases the ability of the agricultural system to adapt. Increased level of organic matter in soils contribute to increased harvests and improved ecosystem services, such as nutrient cycling and water retention.

Coastal zones: Conservation of mangrove forests and coral reefs is a cost-efficient measure to protect coastal zones against weather-related catastrophes (storms and typhoons). It also benefits biodiversity and fisheries since spawning grounds for fish are preserved, and it is favourable for tourism.

Forested mountain areas are important as water sources, but also for their capacity to absorb and moderate the consequences of flooding (and increased water flows from glacial melting).

Wetlands have a buffering effect (e.g. against drought and flooding), as well as a rich species diversity, and also contribute to other ecosystem services such as removal of nitrogen from agricultural runoff.

⁴² The Clean Development Mechanism (CDM) was set up under the Kyoto Protocol and allows industrialised countries to receive 'carbon credits' for investing in projects that reduce greenhouse gas emissions in developing countries. To qualify as a CDM project, however, the emissions reductions must be shown to be 'additional to those that would have taken place without the project. These credits then count towards the industrialised countries' obligations on emissions reductions under the Kyoto Protocol.

⁴³ IPCC, 2007b

⁴⁴ IRIN, 2008a, Accessed 2008-09-01

food security will greatly improve the resilience of communities reliant on subsistence agriculture to adapt to climate change. Similarly, increasing the number of households with access to safe water and sanitation, and projects on community water management will also increase resilience to the impacts of climate change⁴⁵. (For information on biodiversity and adaptation to climate change see Box 1).

The Asian Disaster Preparedness Centre is developing a system for the delivery and interpretation of climate information to mitigate disasters through training in the use of seasonal forecasts and responses to climatic hazards, communication of climate risks to farmers, and demonstration of the advantages of climate forecast information to reduce the impact of hydro-meteorological hazards⁴⁶. Providing this information will be valuable in reducing the vulnerability of farmers to climatic variability and extremes, such as the droughts of 1997-98 and 2006-7.

3.5 Capacity for Adaptation and Mitigation

After the destruction of up to 70% of its infrastructure in the violence in 1999, Timor-Leste is working hard to rebuild its infrastructure and strengthen government and civil institutions. Whilst great strides have been made, the government has been hampered by further violence in 2006 and an assassination attempt on the president in February 2008⁴⁷. Government revenues from petroleum products are rising, and financially Timor-Leste is in a good position considering its situation, however underdeveloped management structures and a lack of trained staff make it difficult for ministries to execute the initiatives proposed in the budget and this is the major limitation to economic and social development at present.⁴⁸

Understandably, given its pressing economic and security concerns, climate change is not seen as a priority in Timor-Leste, and is not mentioned on the government website. However, Timor-Leste is a member of the UNFCCC, signed the Kyoto protocol in March 2008 and has begun the initial process of self-assessment which will lead to the production of an Initial National Communication on Climate Change.⁴⁹ The Ministry of Development and Environment and Ministry of Agriculture, Forestry and Fisheries are the relevant government departments to address climate change.⁵⁰ General awareness remains low. Potential exists for Timor-Leste to address climate change as part of its development strategy by introducing low carbon technologies throughout its infrastructure; however, this will require a great deal of international support, capacity building and cooperation.⁵¹ A lack of monitoring and data for environmental issues, related to the Indonesian occupation and the destruction of infrastructure in 1999 hinders environmental protection, and environmental and meteorological monitoring and observation systems will need to be established.⁵²

⁴⁵ ADB, 2008b Accessed 2008-08-29

⁴⁶ ADPC, 2007 Accessed 2008-09-01

⁴⁷ CIA, 2008 Accessed 2008-08-29

⁴⁸ World Bank, 2008

⁴⁹ UNDP, 2008

⁵⁰ UNDP, 2006b Accessed 2008-09-01

⁵¹ UNDP, 2006b Accessed 2008-09-01

⁵² IRIN, 2008a Accessed 2008-09-01

4. Relationships between the Environmental Problems on Ongoing and Potential conflicts

Environmental factors are rarely the sole factor of conflict although research shows that environmental stress and the exploitation of natural resources can increase the severity and duration of conflict and complicate its resolution.

FAO identifies that food insecurity, lack of access to basic services, fragile livelihoods and lack of environmental sustainability, are linked to conflict in Timor-Leste. The growing youth population and the high rate of unemployment in this group pose a threat of insecurity and violence. Creating jobs and income earning opportunities will be critical to maintain stability, stimulating economic growth and reducing poverty.⁵³ Still 100 000 displaced people live in camps which poses a serious threat to the social and political stability in the country. Insecurity and unresolved land and property issues prevent the repatriation of many IDPs.⁵⁴

Conflicts can also be a direct source of environmental degradation. In Timor-Leste, during the violence of 1999 the forest sector got substantially damaged. Large areas of mountain forests where resistance groups sheltered were deforested and now comprise of degraded scrubland. Further, as a result of the violence and destruction, agricultural output dropped by around 50%. Existing water facilities was also severely damaged, if not destroyed.⁵⁵

Attempt to control or gain access to scarce or extractive natural resources can contribute to outbreak of conflict. The independence of Timor-Leste brought up former water boundary issues that had been between Indonesia and Australia. The dispute between Timor-Leste and Australia was primarily about the large resources of oil and gas in the Timor Sea. Today, the relations with Australia are improving following an agreement on the sharing of oil and gas resources in the Timor Sea.⁵⁶

As in many other countries water is used for many purposes that create different kinds of demand for the same resource, which can be a source of competition and even conflict. Timor-Leste is no exception and there is not yet an integrated management of the water resources.⁵⁷

5. What key actors are doing to manage the environmental problems?

5.1 National development plans

Timor-Leste's First National Development Plan 2002-2007 (NDP) and the Stability Program (SP) developed in 2001 still remain the Government's vision for national development and represent the country's poverty reduction strategy. Reducing poverty through rapid, equitable and sustainable economic growth is one of the main identified priorities of the Timorese National Development Plan (2002). The NDP is aligned to the MDGs. The NDP states that "natural resource development, environmental interventions, and the primary goals of poverty reduction and economic growth are inextricably linked. These are addressed within the sector plans that include: i) improvement in people's health due to poor access to resources; ii) enhancement of the livelihoods of poor people, particularly in rural areas where they depend

⁵³ Government of Timor-Leste, 2008

⁵⁴ EU, 2007

⁵⁵ World Bank, 2005a; UNDP, 2006a; and Government of Timor-Leste, 2008

⁵⁶ EU, 2007

⁵⁷ EU, 2007

on land, water, forests and biodiversity; and iii) reduction of vulnerability to natural disasters such as violent storms, floods and fires.”⁵⁸ Vision 2020 formulated alongside the NDP sets out the 20-year vision for the country. The Government of Timor-Leste (GoTL) has also established 17 Sector Investment Programs (SIPs), one being the Sector Investment Program for the Natural Resources and Environment.

The GoLT’s main goal for protecting and managing the environment are; i) To manage extractive activities in an environmentally appropriate fashion, ii) To protect and enhance the natural environment, iii) To raise community awareness about the importance of protecting the environment, iv) To integrate environmental consideration into policies, programs and plans, and v) To ensure accountability to the government and the community for environmental aspects of the extractive industries.⁵⁹

Earlier this year the GoLT identified its National Priorities for 2008 which are grouped into six areas: (i) Public Safety and Security; (ii) Social Protection and Solidarity; (ii) Addressing the Needs of Youth; (iv) Employment and Income Generation; (v) Improving Social Service Delivery; and (vi) Clean and Effective Government. Natural resource management (specifically oil, gas and minerals) together with agriculture and food security are identified as key priorities under Employment and Income Generation. The goal for these priorities during 2008 is capacity development in the natural resource sector and enhanced agricultural productivity and improved food security.⁶⁰

5.2 Environmental mainstreaming

The NDP and the National priorities focus on some poverty-reduction aspects that have a clear bearing on the environment including increasing agricultural productivity, job-creation related to petroleum extraction, infrastructure development, and provisioning of basic services including water and sanitation. Here, it will be important to balance the need between rapid economic growth and sustainable development. Other national priorities, such as building institutions and striving towards human empowerment and good governance, are likely to have positive effects also on environmental management. Besides the above, environmental concerns are not apparently mainstreamed throughout the national development plan or national priorities in Timor-Leste.

The executive branch of the state, the Government, has been successful in establishing core planning and resource management functions. However, other institutions such as the Parliament, the Judiciary, and oversight institutions remain weak in general.⁶¹ This is likely the case also for environmental monitoring and enforcement of environmental laws. Specifically, there is a need to integrate issues of land degradation and sustainable land management into other sector policies.⁶²

5.3 Key actors

The institution responsible for coordinating environmental issues in Timor-Leste is the State Secretariat for the Coordination of the Environment, the Arrangement of the Territory and the Physical Development (SSECTOPD). The SSECTOPD is an institution under the Prime

⁵⁸ Government of Timor-Leste, 2002

⁵⁹ MAFF, 2007a

⁶⁰ Government of Timor-Leste, 2008

⁶¹ World Bank, April 2006.

⁶² MAFF, 2007a

Minister's office and refers directly to the Prime Minister.⁶³ The National Directorate of Environment (NDE), established under the SSECTOPD, is responsible for environmental management and coordinating with all other Ministries and agencies environmental policies and implementation of the three Rio Conventions. The Ministry of Natural Resources, Minerals and Energy Policy (MNRMEP) is responsible for the development of management of natural resources, including minerals and energy sources.⁶⁴

Other key ministries include Ministry of Agriculture, Forestry and Fisheries (MAFF), Ministry of Transportation, Communication and Public Works (MTCPW)⁶⁵, Ministry of Education, Youth and Culture, and Ministry of Health.⁶⁶ The National Directorate of Water and Sanitation (DNAS) is responsible for developing and providing water supply and sanitation throughout Timor-Leste.⁶⁷

5.4 Gaps and overlaps

Overall, the main gap is the weak human capacity and institutions in Timor-Leste. Furthermore, cross-sectoral cooperation and coordination among have to a large extent been informal and under-developed.⁶⁸ Currently, most draft regulations in the environment and natural resource sector are based on other country laws and adopted without being critically analysed whether or not they are appropriate for Timor-Leste's needs, which implies low national ownership. An example of this is the Law on Environmental Impact Assessment which as a result has become a burdensome regulation and complex process. In other areas e.g. forest, water and land there are significant regulation gaps.⁶⁹ Most of the policies developed by the government focused on forest- or agriculture land are of very general nature.⁷⁰ Few studies have been done on state of the environment, including causes of land degradation, air pollution, forest depletion and fish stocks to mention some.

5.5 Other actors

Donors have provided financial contributions amounting to up to 40% of recurrent expenditure and more than US\$ 100 million per year for investment programmes and projects.⁷¹ The support to environment is provided by the different donors through the different Ministries concerned with the sector. Rehabilitation and improvement of water supply and sanitation facilities have since 2000 mostly been funded by donors.⁷² The Government relies on and encourage civil society, NGOs and donors to provide basic services including water supply and sanitation.⁷³

Donors active in Timor-Leste include⁷⁴:

- World Bank, Australia, EU, Portugal, Japan, New Zealand, UNDP, FAO and WFP work in agriculture and food security.
- World Bank and Australia support fisheries.

⁶³ EU, 2007

⁶⁴ MAFF, 2007a

⁶⁵ One important department under this ministry is the Department of Water and Sanitation.

⁶⁶ UNDP, 2004

⁶⁷ World Bank, 2007

⁶⁸ UNDP, 2004

⁶⁹ World Bank, 2007

⁷⁰ MAFF, 2007a

⁷¹ EU, 2007

⁷² World Bank, 2007

⁷³ Government of Timor-Leste, 2002

⁷⁴ USAID, 2005

- Portugal , UNCTAD, Australia support sanitary standards
- USaid is lead agency for land tenure
- Norway work in the power sector
- World Bank, Norway, IMF and ADB work in the petroleum sector.

Sweden (Sida) has been and is active in Timor-Leste through⁷⁵:

- support to the strengthening of Parliamentary Democracy through UNDP-led support
- support to elections through UNDP's program Support the Timorese Electoral Cycle
- primary education support through UNICEF
- customs support by providing financial support to ASYCUDA⁷⁶
- support to the justice sector through the UNDP-led Justice System Program
- humanitarian support (e.g. during the 2006 crisis)

6. How and to what extent are the responses to environmental problems implemented and followed-up?

6.1 Governance and enforcement

In 2002 Timor-Leste became a member-state of the United Nations (UN) and thereby formally adopted the MDGs with the goal to halve poverty by 2015. Although gradual progress has been made since the restoration of independence, Timor-Leste lags behind the rest of the region in achieving the Millennium Development Goals (MDG).⁷⁷

Since independence, progress has been made on the overall strategies to manage natural resources and the environment. Efforts have been focused on developing laws, and policies establishing and strengthening institutions, and training and capacity building. The Government has also begun establishing a strong regulatory and management framework for environmental protection.⁷⁸ For the coming years the Government is proposing a significant increase in spending on natural resources and the environment.⁷⁹

Petroleum and mineral: the strategy on petroleum and minerals is to manage extractive activities in a consistent, fair, environmentally sustainable, transparent and timely fashion as mandated in the NDP. The Government has created a strong governing framework and private investment laws. The Government has also, assisted by Norwegian advisers, set up a fund with the basic design to guarantee that the expected oil revenues over the next 20-30 years are spent wisely, in the interest of a stable macro-economic development of the country. Timor-Leste is also implementing the Extractive Industries Transparency Initiative (EITE), which aims to strengthen governance by improving transparency and accountability in the extractive sector. The EITE sets a global standard for companies to publish what that they pay and for governments to disclose revenues.⁸⁰ This is important for enhanced accountability.

Energy: Timor-Leste has one of the most costly electricity supply systems in the world as it is entirely dependent on imported diesel fuel. Current electricity prices do not cover the cost

⁷⁵ Hallenborg *et al*, 2008

⁷⁶ Automated System for Custom Data

⁷⁷ EU, 2007

⁷⁸ EU, 2007

⁷⁹ EU, 2007

⁸⁰ EU, 2007 ; Lundahl *et al*, 2006 ; and EITtransparency, Accessed 2008-09-15

and the Government give significant subsidise to the energy sector.⁸¹ At present Timor-Leste lacks a National Energy Policy, which is essential for a stable and secure energy supply.⁸² Improved reliability of the power generation system is expected with a new generator at the Comoro Power Station. However, there is still much work needed to improve power supply services and increase rural electrification. Institutional capacity is still weak and there is a need to enhance financial sustainability.⁸³ The Government is committed to improve the collection system for energy payments and allocate budgetary subsidies to ensure energy availability and create a sustainable energy program.⁸⁴

Agriculture, fisheries and forestry: Enhancing productivity, developing markets and improve the private investment climate in rural areas, including improved infrastructure, transportation, electricity and access to credits, are important. Managing environmental degradation poses further challenge. Currently Government resources and efforts are concentrated on strengthening institutional capacity in service delivery. At present only some part of land legislation structure has been put into place. Land registration and titling as well as initiating a sound land reform are key areas requiring attention.⁸⁵

Water Supply and Sanitation: Currently there is limited Government capacity to manage, and deliver both rural and urban water supply and sanitation. Data on water supply and sanitation coverage and levels on services is unreliable. Urban waste water management is almost entirely a private responsibility. There is no sewage system nor Government owned or managed communal septic tanks. There is a lack of human resources as there are no qualified planners, engineers or technicians for water supply and sanitation. There is a need to increase financial sustainability and maintain water supply and sanitation services.⁸⁶ The Government is currently in progress of developing water usage and sanitation legislation, rehabilitate existing water treatment and sanitation facilities and build new ones and enhance capacity through training and preparation of human resources.⁸⁷

Disaster risks: Policies and legislation on emergency preparedness and response are inadequate, and there are difficulties in coordinating work, which limits aid and responses to the country's needs during crisis.⁸⁸ The Government will promote studies and identification of disaster risk areas, create warning systems and train and prepare human resources for immediate response when disasters occur.⁸⁹

The National recovery strategy aims to create an enabling environment for reintegration and return of IDPs.⁹⁰

6.2 Capacity constraints

Institutional capacity remains weak in Timor-Leste. The most significant constraint is perhaps the lack of skilled human resources. During the Indonesian rule few people with Timorese

⁸¹ UNDP, 2006a

⁸² EU, 2007

⁸³ UNDP, 2006a

⁸⁴ MAFF, 2007b

⁸⁵ World Bank, 2007

⁸⁶ World Bank, 2007

⁸⁷ MAFF, 2007b

⁸⁸ WHO, Accessed 2008-09-10

⁸⁹ MAFF, 2007b

⁹⁰ Government of Timor-Leste, 2008

nationality had the opportunity to participate in public services. When 7,000 Indonesian public servants fled in 1999 a vacuum was created. In many areas there is still a shortage of skilled personnel. An example is the agricultural sector, where there are too few agricultural extension workers to support farmers and boost agricultural development. Further low levels of education and professional experience have led to a shortage of technical skills.⁹¹

7. Conclusions and implications for Sida

7.1 Conclusions

Timor-Leste is a young nation emerging from a history of foreign rule and conflicts, which have led to low human resources capacity, widespread poverty, and massive displacement of people. After the peaceful elections in 2007 there is room for cautious optimism, although the government has to build trust and legitimacy in the eyes of the population through increasing security and the provision of basic services; to achieve “freedom from fear and freedom from want”.

Many of the developmental challenges identified in Timor-Leste (including high levels of poverty and vulnerability, food insecurity, land-tenure insecurity and ill-health) can be associated with unsustainable management of natural resources and the environment. There are strong links between food insecurity and environmental problems such as land degradation, deforestation, and climate change; poverty, vulnerability and environmental degradation go hand in hand in Timor-Leste. Therefore, a pro-poor economic growth, in combination with sustainable management of natural resources (including land, water, fisheries, and forests) and a general increase human capacity may well contribute to improved environmental quality and enhance capacity for climate change adaptation. Furthermore, the oil and gas resources can form a solid economic growth and poverty reduction, if managed transparently and effectively with adequate attention to environmental and social concerns.

A suggested “road map” for sustainable management of the natural resources and ecosystem services of Timor-Leste is the findings and recommendations of the Millennium Ecosystem Assessment (MA) (see Appendix I) that can be put to good use.

7.2 Issues for Sida to consider

Appointing a rights-based and conflict sensitive approach is especially important in a country like Timor-Leste. The Timorese population has the right to security, to work, to food and shelter, etc.; issues which are all related to (sustainable) utilisation of natural resources and poverty. Given the current situation in Timor-Leste and the high focus on human rights, security and democracy by the Swedish development cooperation, the issues for Sida to consider are divided into two phases: i) Issues to consider in the first phase, with respect to human rights, security and democracy; and ii) Issues to consider in a second phase, to create a long-term sustainable development in Timor-Leste.

Issues for Sida to consider in a first phase, with respect to human rights, security and democracy

- ❖ ***Support to strengthening democratic institutions.*** Good governance (including rule of law, accountability, transparency, non-discrimination and participation) and credible

⁹¹ EU, 2007; UNDP, 2004; and UNDP, 2006a

institutions capable of monitoring and enforcement will not only have a positive outcome in terms of a human rights and democracy but is also likely have a positive “spill-over” effect on environmental governance.

Increasing stability and security and the reintegration and return of IDPs is a National Priority. The IDPs must have a place to return to and feel safe enough to do so. Furthermore, there must be conditions for the IDPs to improve their quality of life through access to housing, and basic services such as water and sanitation.

- ❖ IDPs are a visible evidence of violation to human rights in Timor-Leste and failure to provide security. They were forced to leave their properties during time of conflict, and cannot presently return to their homes. Destroyed and damages houses and property ownership conflicts together with the fear of further violence prevent the return of many IDPs. Assisting the reintegration of IDPs would require access to enough land. In order to improve both land-tenure security and land management, Sida may want to consider support to development and implementation of a ***sound land tenure policy***, including redistribution of land and issuing land titles. Research from other parts of the world have shown that with more tenure security follows more investments in land which in turn improves land management, decreases further degradation and also with clear land titles follows less conflicts over land and natural resources. Further, a sound land tenure policy can empower women by ensuring that women do not lose their rights to land and gain more equitable land rights by issuing women holding rights in their own name. Perhaps Sida’s experience from the support to post-conflict western Balkan can be utilised.

Considering the high unemployment rate, the most likely livelihood opportunity for returning IDPs (and other rural poor) is through agriculture, including fishery and forestry.

- ❖ ***Increasing agricultural productivity*** and reducing land degradation is critical for food security and reducing vulnerability. Therefore, agricultural policies should integrate land and water management issues, e.g. supporting improved farming practices through extension services, and enable access to markets and credits. Sida may consider supporting extension services, development of structures for access to credits, or supporting access to markets through improved access to information or infrastructure development such as roads. Support to the agricultural should also promote sustainable productivity e.g. improve risk distribution and protect ecosystem services, by building on a diversity-based agriculture which includes local varieties and crops (with traits such as drought and heat resistance), does not contribute to drainage of wetlands, and encourages locally adapted agricultural systems.
- ❖ ***Improved access to basic services***, such as water and sanitation, is important for good health as well as for sustained security and trust in the government’s ability to run the country. Sida may want to consider improved basic needs support through either NGO’s or support through utilities to improve quality, effectiveness and cost recovery of municipal services.
- ❖ Multi-donor coordination on the establishment of an ***environmental observation and monitoring network*** in Timor-Leste would lay the foundations for future environmental protection. For example there is a need to monitor the link between environmental degradation and health issues through more data analyses. Increased knowledge and

understanding about the high correlation between environmental degradation and human health is also needed.

- Increasing knowledge of the links between e.g. health and water/sanitation, land degradation and food security is important. This could be done through the regular education system. Therefore, if Sweden will be supporting the *education sector*, Sida could recommend *inclusion of issues of environment, health and sustainability aspects* into the curriculum.
- Fish may well be an important source of protein and livelihood, but there seem to be little information available on fish stocks. It could be beneficial for Timor-Leste to cooperate with other countries in the region to *monitor fish stocks*, and start the process to set up *transboundary structures* to utilise the marine resource in an equitable and sustainable manner.

Issues for Sida to consider in a second phase, to create a long-term sustainable development in Timor-Leste

- ❖ Sida could support development projects which also have climate benefits, such as the spread of simple low carbon technologies e.g solar lamps (mitigation), or rehabilitation of irrigation facilities (adaptation).
- ❖ Sida could support projects to test how REDD could be implemented in Timor-Leste. The possible REDD-mechanism should consider effects on local communities and poor people, and strive to ensure a fair sharing of benefits.
- ❖ Support to building capacity to attract CDM projects would have both development and mitigation benefits.
- ❖ An important aspect to include in dialogue is the *promotion of Strategic Environmental Assessment (SEA)*. SEA could be used as a tool to integrate environmental and natural resources concerns into decision-making.
- ❖ For a pro-poor growth and sustainable future other important aspects to include in dialogue include; i) promotion of pro-poor measures that reduce deforestation and forest degradation, including support of effective and ecologically *sustainable forest management* which respects local and informal rights and social structures, ii) support to coastal zone management and maintaining of mangrove forests and coral reefs as a strategic and cost-effective measure for *coastal zone protection*.
- ❖ Link the successful *rainwater harvesting* programmes in India with local governments, farmer associations, NGOs etc. in order to introduce this method as a sustainable and efficient tool to combat deforestation, groundwater depletion and low agricultural yields. Swedish NGOs, like the Swedish Society for Nature Conservation who runs a cooperation program with CSE and other Indian NGOs active in local rainwater harvesting projects could act as “brokers” for this initiative.

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Appendix I : The Millennium Ecosystem Assessment

The Millennium Ecosystem Assessment in brief

The Millennium Ecosystem Assessment (MA) was called for by the United Nations Secretary-General Kofi Annan in 2000. Initiated in 2001, the objective of the MA was to assess the consequences of ecosystem change for human well-being and the scientific basis for action needed to enhance the conservation and sustainable use of those systems and their contribution to human well-being. The MA has involved the work of more than 1,360 experts worldwide. Their findings, contained in five technical volumes and six synthesis reports, provide a state-of-the-art scientific appraisal of the condition and trends in the world's ecosystems and the services they provide (such as clean water, food, forest products, flood control, and natural resources) and the options to restore, conserve or enhance the sustainable use of ecosystems.

The overall aims of the MA were to contribute to improved decision-making concerning ecosystem management and human well-being, and to build capacity for scientific assessments of this kind. A substantial adoption of the MA conceptual framework, approaches, and methods in donors' ongoing initiatives and programs to support natural resources management could "fast-track" the process for a sustainable development in Timor-Leste.

There is a growing understanding of the fundamental role ecosystems and the services they provide play for human welfare, see Fig 1. describing the linkages between biodiversity, ecosystem services and human well-being.

Key findings of the Millennium Ecosystem Assessment⁹², finalised in 2005 and the so far most comprehensive survey of the ecological state of the planet, include:

- 60% of world ecosystem services have been degraded
- Of 24 evaluated ecosystems, 15 are being damaged, see Table 1.
- About a quarter of the Earth's land surface is now cultivated.
- People now use between 40 percent and 50 percent of all available freshwater running off the land. Water withdrawals has doubled over the past 40 years.
- Over a quarter of all fish stocks are overharvested.
- Since 1980, about 35 percent of mangroves have been lost
- Nutrient pollution has led to eutrophication of waters and coastal dead zones
- Species extinction rates are now 100-1,000 times above the background rate

The degradation of ecosystem services is hence already a significant barrier to achieving the Millennium Development Goals, contribute to growing inequities and disparities across groups of people, and is sometimes the principal factor causing poverty and social conflicts.

Figure 1. Links between biodiversity, ecosystem services and human well-being

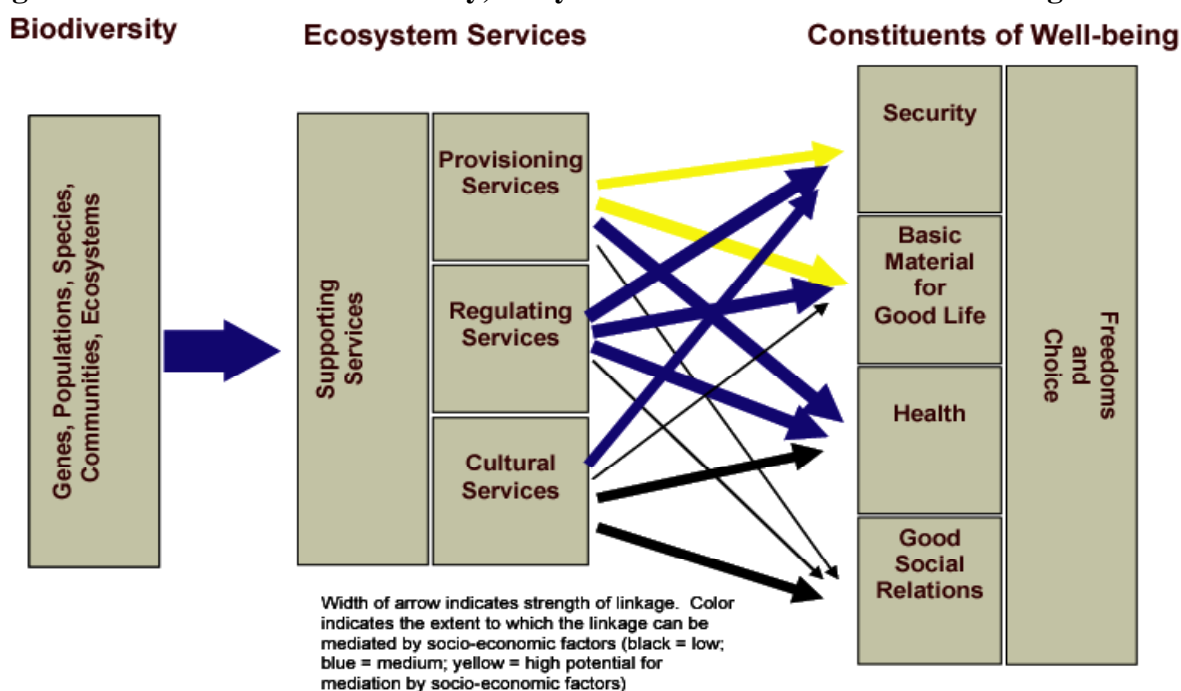


Table 1: Global condition of Ecosystem Services Examined by the Millennium Ecosystem Assessment

Ecosystem Services	Enhanced	Mixed	Degraded
Provisioning	Crops Livestock Aquaculture Carbon	Timber Fiber	Capture fisheries Wild foods Wood fuel Genetic resources Biochemicals Fresh Water
Regulating	Carbon sequestration	Water regulation Disease regulation	Air quality regulation Regional & local climate regulation Erosion regulation Water purification Pest regulation Pollination Natural Hazard regulation
Cultural		Recreation & ecotourism	Spiritual & religious Aesthetic values

For additional information on the MA including presentation materials etc, go to

<http://www.millenniumassessment.org/en/index.aspx>

APPENDIX II: Rainwater harvesting, an example from India

Rainwater harvesting is promoted primarily by the Indian think-tank/NGO Centre for Science and Environment (www.cseinida.org) who runs an extensive research and education programme on this important “development tool” aimed at both Indian and non-Indian institutions.

CSE has put together a useful “toolbox” for development practitioners on rainwater harvesting on their website that can be accessed at www.cseindia.org

Example of a successful rainwater harvesting project in India, village of Laporiya in Rajasthan:

The system of Laporiya Squares

Range management in near-desert conditions is a significant challenge. The GVNML, a local NGO, and the village council are confronting the challenge in an innovative, effective way.

The nearly flat (1-2% slope) community pastureland on the upper reaches of the village form starting points. This large patch is divided into rectangular units of varying sizes (the average being 66 metres x 132 metres). Each unit is enclosed by 1.5-metre-high dykes, built from soil within the square, along the three sides that lie towards the lower part of the gradient.

Called *chauka* (square), this zigzag pattern on the land allows rainwater to enter the square and fill it up. Excess rainwater then flows into the next square, and so on. Apart from allowing the collected water to percolate, different moisture levels within a square add to the diversity of grass that grows here -- providing fodder security (via diversification) to the 2,900 large and small animals in the village.

This low-tech, high-intelligence irrigation strategy manages limited flows of water in a highly optimal fashion: the thin layer of surface flow is collected and guided to its best use in each square before the cumulative outflow reaches its final destination -- the village tank. The village tank then has more and better quality water to distribute to other pastures and farmlands.

Laporiya Squares are a distinct departure from the trenches that range managers regularly suggest, along contour lines, for soil conservation and moisture retention. In addition to being effective and adaptable, these squares are cost-effective. In contrast to the \$130 per hectare required for a conventional system, Laporiya Squares can be implemented at one-third the cost.

Counting the economic impact

Taking a control village (where there has been no intervention) and comparing it with the Laporiya intervention, the GVNML has calculated the economic benefits of its pastureland development strategy. At an investment of roughly Rs 250,000 (= 5 900 USD) the squares technique was implemented on 90 hectares of pastureland in Laporiya. Slightly smaller pastureland of similar quality, in the nearby village of Doria, was left untreated.

Five years after the intervention, in terms of milk yields, the total income from pastureland in Laporiya worked out to roughly Rs 10.5 lakh (roughly 24 500 USD), versus Rs 3.75 lakh (roughly 8 700 USD), in Doria. Per hectare income from the land was twice as much, and the cost-benefit ratio of the investment in Laporiya was an impressive 1:4.

Adapted from <http://www.indiawaterportal.org/tt/rwh/>