

# Can Timor-Leste Rely on its Endowments to Achieve the SDP Targets?

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## Key Findings and Policy Recommendations

- I. There is significant growth potential in the agriculture, tourism and petrochemical sectors. The Government of Timor-Leste should therefore prioritise these sectors by preparing sector specific short- and medium-term plans and investment strategies that are based on detailed cost-benefit assessments. Sector specific strategies should be coordinated to avoid conflicting results and budget allocations for these sectors should reflect the Government's priorities.
- II. Apart from the macroeconomic benefits outlined above, a more productive agriculture sector has the potential to lower malnutrition rates, reduce inflationary pressure on food items and control population migration from rural to urban areas. Agriculture should therefore be prioritised in the short-term.
- III. In line with experiences from other resource rich economies, the service sector (including tourism) is likely to play a key role in Timor-Leste's future economy for employment creation. Services are based on human capital. Education and training of the future labour force is therefore of utmost importance. Improving labour productivity will also determine whether Timor-Leste can diversify its economy in the long run.
- IV. The petrochemical projects provide high GDP income, but few employment opportunities. Timor-Leste should therefore invest in these projects only if they provide a positive net present value.
- V. To boost private investment, the Government should clarify property rights. Apart from providing collateral for the financial sector, a land law would enable on-shore oil/gas and mineral explorations. The sooner Timor-Leste knows how much natural resource wealth it can rely on to support its economy, the easier it will prove to plan accordingly.

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## Acronyms/Abbreviations

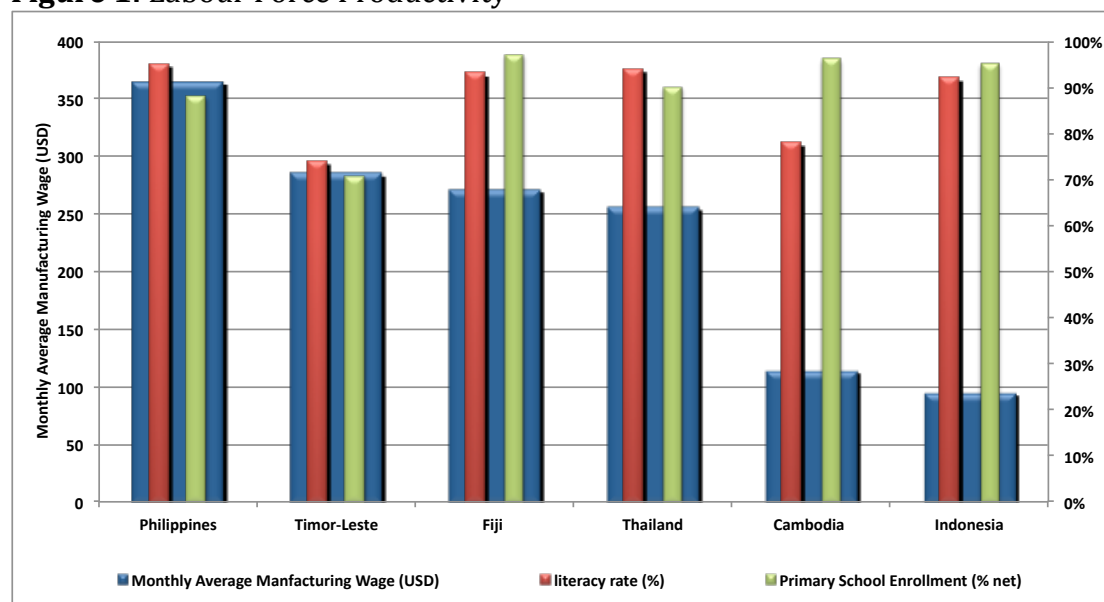
<b>ADB:</b>	Asian Development Bank
<b>ANP</b>	National Authority of Petroleum
<b>EEZ:</b>	Economic Exclusive Zone
<b>EI:</b>	Earth Institute
<b>EKKN:</b>	Elang, Kakatua and Kakatua North
<b>ESCAP:</b>	United Nations Economic and Social Commission for Asia and the Pacific
<b>FAO:</b>	Food and Agriculture Organisation of the United Nations
<b>GDP:</b>	Gross Domestic Product
<b>GNI:</b>	Gross National Income
<b>GovTL:</b>	Government of Timor-Leste
<b>JPDA:</b>	Joint Petroleum Development Area
<b>LFS:</b>	Labour Force Survey
<b>LNG:</b>	Liquefied Natural Gas
<b>MAFF:</b>	Ministry of Agriculture, Fisheries and Forestry
<b>OECD:</b>	Organisation of Economic Co-operation and Development
<b>PF:</b>	Petroleum Fund
<b>SDP:</b>	Strategic Development Plan
<b>TLEA:</b>	Timor-Leste Exclusive Area
<b>WB:</b>	World Bank
<b>WTTC:</b>	World Travel and Tourism Council
<b>UNICEF:</b>	United Nations Children's Fund
<b>UNMIT:</b>	United Nations Integrated Mission in Timor-Leste

## 1. Background and Rationale

The Government of Timor-Leste (GovTL) is currently using its oil revenues to 'front-load' Government expenditure by investing in much needed infrastructure and human capital. As set out in the Strategic Development Plan (SDP), the GovTL hopes that these expenditures will spur private sector investment and increase productivity<sup>1</sup>, which in turn will drive economic growth and provide employment in the future. The Earth Institute at Columbia University (EI) has been asked to support the GovTL in identifying potential opportunities for future private sector investment.

Timor-Leste is a resource-rich, small island economy with natural beauty located in a growing, highly competitive region. Based on experiences from other resource rich economies at similar development stages and Timor-Leste's labour force productivity (figure 1), it is logical to first determine the investment potential in the endowment-based sectors<sup>2</sup>.

**Figure 1: Labour Force Productivity**



Source: SDP 2010, Census 2010 & LFS 2010 (Timor-Leste), WB-WDI & UNICEF data (other countries)

Figure 1 shows that manufacturing wages are higher than average (left axis) and labour productivity proxies (right axis) are lower. While literacy rates<sup>3</sup> give a

<sup>1</sup> In economic terms, productivity measures how much total output is achieved per one unit of input.

<sup>2</sup> By endowments, this study refers to the geological, climatic and geographical resources that Timor-Leste has from the outset. Whereas in strict terms the downstream petrochemical sector is classified as manufacturing, it has been included in this study as its development is going to be dependent on the extraction of oil and gas and therefore geological endowments.

<sup>3</sup> See Romer, Paul M. (1990), *Human capital and growth: Theory and evidence*, Carnegie-Rochester Conference Series on Public Policy, Elsevier, vol. 32(1), pages 251-286, January

good indication of current human capital, primary school enrolment rates<sup>4</sup> provide an insight into future human capital/labour productivity. Similar trends were observed using secondary school and university enrolment rates. This will make it challenging for Timor-Leste to enter the low-skilled, highly competitive manufacturing sectors in the medium term, especially seeing that neighbouring Indonesia offers a relatively low-cost and well-educated labour force. With the exception of the potential petrochemical sector, the lack of developed industrial clusters and skilled labour also make it difficult to attract investments in technologically advanced manufacturing sectors.

The SDP has already identified endowment-based sectors as priorities, namely the agriculture, tourism and petrochemical sector. This study will analyse these and the mining sector in more depth by quantifying the potential income and employment these could generate. The study therefore aims to contribute to the discussion whether Timor-Leste can rely on its endowments to drive the economy in the next 20 years.

### 1.1. Methodology

GDP contribution and employment generation are the two macroeconomic variables chosen to determine the potential of each sector. While GDP provides a measure of total production, employment provides a measure of the quality of the growth process. Inclusive growth is preferred, as it spreads the benefits across the labour force. National accounts and the labour force survey (LFS) data serve as the 2010 baseline for the analysis.

To estimate the potential of the agriculture sector, Timorese crop yields are compared to those of Southeast Asian countries. For consistency reasons, all yields have been obtained from the FAO statistics division website. Apart from including crop productivity rates, the planted area targets set out in the SDP are used to calculate the production potential. Similar comparative productivity levels were used to determine the potential of the livestock and fisheries sector. Due to lack of productivity data on the forestry sector, a study looking at the Indonesia forestry sector was used for comparative purposes.

Based on consultations with the National Directorate of Tourism, Fiji and Vanuatu were chosen as comparative countries to estimate the potential of Timor-Leste's tourism sector. Both countries are small island economies that have successfully attracted tourists from the Australian continent. The World Travel and Tourism Council (WTTC) data was used to estimate possible GDP and employment contribution this sector could generate. Estimates for the mining and petrochemical sectors are based on information gathered from the Petroleum Fund Directorate, the Secretary of State for Natural Resources, the National Petroleum Authority and the National Oil Company – Timor Gap.

As quantifying future GDP and employment contributions by sector accurately is difficult, the study provides several scenarios based on different assumptions.

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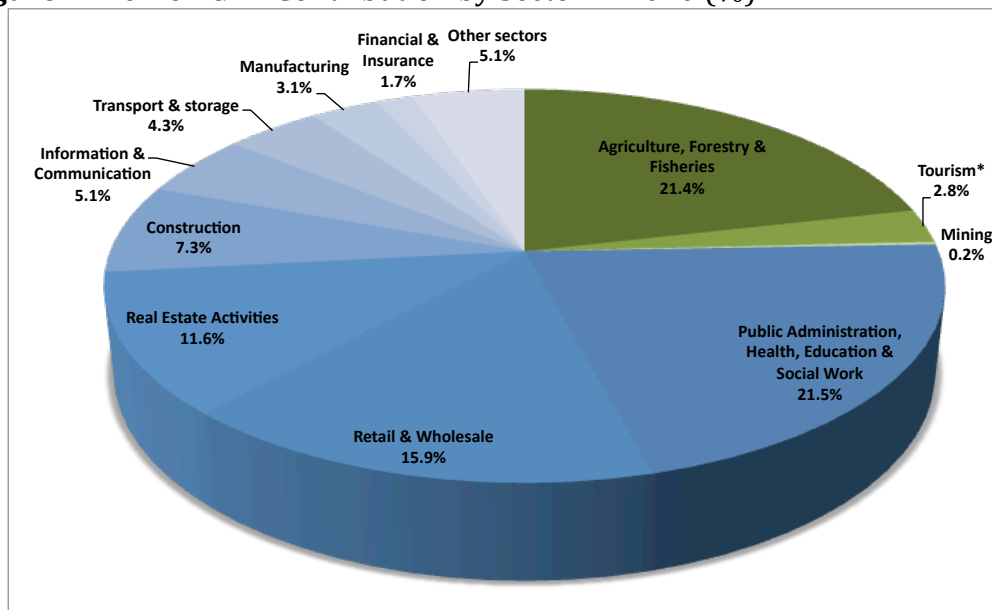
<sup>4</sup> See Barro, Robert and Jong-Wha Lee (2010), *A New Data Set of Educational Attainment in the World, 1950-2010*, NBER Working Paper No. 15902

Compounded growth rates are used to determine the feasibility of each sector achieving its potential by 2030, which coincides with the end date of the SDP.

## 1.2. Baseline

Between 2004 and 2010 Timor-Leste’s real non-oil GDP grew at a compounded rate of 8.5% to reach \$875.1 million. Figure 2 shows that in 2010 approximately one quarter of GDP was made up by the sectors that will be analysed in more depth in subsequent chapters (green sections in the pie chart)<sup>5</sup>. Within the agriculture sector, three quarters of the GDP contribution is made up by crop production. Livestock makes up approximately 16%, while fisheries and forestry make up 6% and 2% respectively.

**Figure 2: Non-oil GDP Contribution by Sector in 2010 (%)**

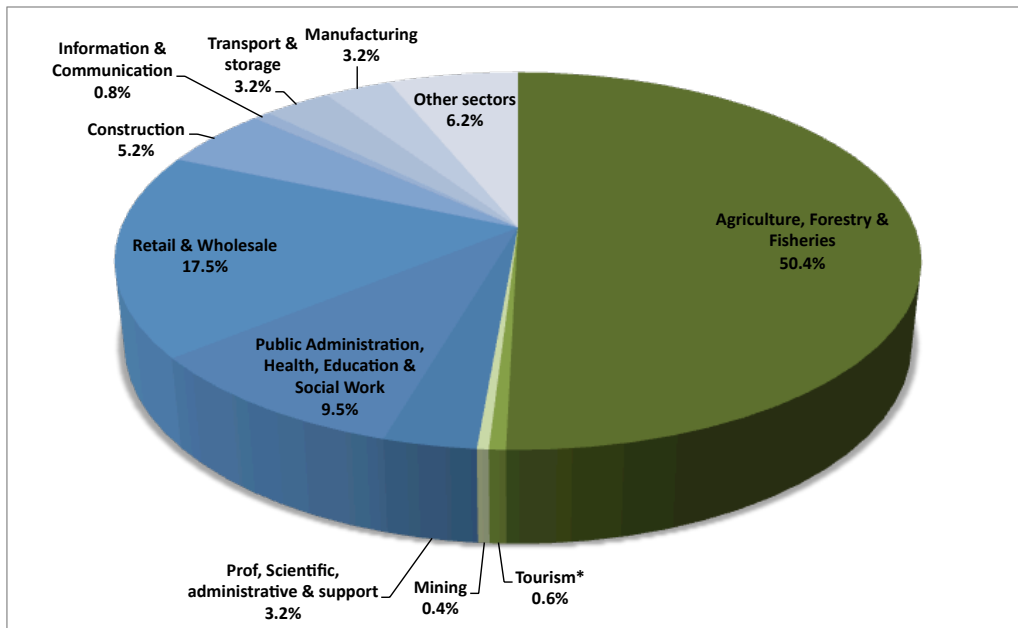


Source: National Accounts 2012 & Authors Estimates

The LFS estimates that in 2010 there were approximately 252,000 people employed in Timor-Leste. This makes up 96% of the total labour force. However, 70% of these were classified as ‘vulnerably employed’, likely to be own account workers without job security and a guaranteed monthly salary. Figure 3 shows that half of the labour force was working in the agriculture sector, which makes up a high proportion of the vulnerably employed.

\*The tourism GDP contribution is an estimate based on the UN’s Tourism Satellite Account methodology

**Figure 3: Employment Structure by Sector in 2010 (%)**

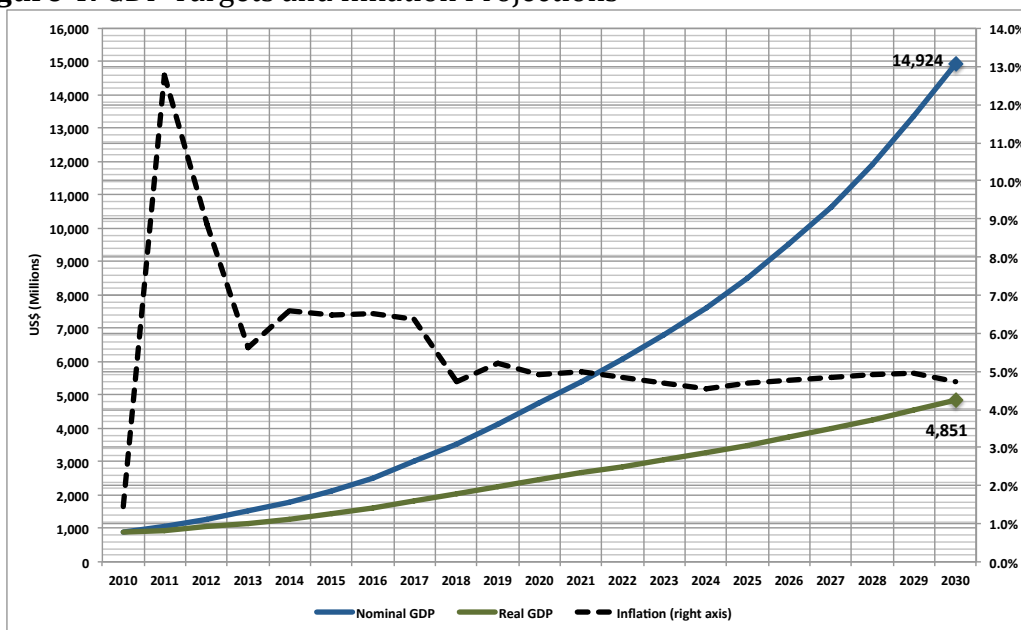


Source: Labour Force Survey 2012 & Author's Estimates

### 1.3. Macroeconomic Targets

The population projections and GDP targets set out in the SDP were recently updated to take into account the new national accounts, labour force and inflation data. Non-oil GDP was estimated to be 34% higher in 2010 compared to the figure published in the SDP. While this revision would ensure Timor-Leste achieving its SDP targets sooner, the new population growth projections have also increased, thereby lowering GDP per capita estimates. Figure 4 shows the updated nominal and real non-oil GDP growth targets (left hand axis), as well as short-term inflation projections and long-term targets (right hand axis).

**Figure 4: GDP Targets and Inflation Projections**



Source: Macroeconomic Framework, Ministry of Finance

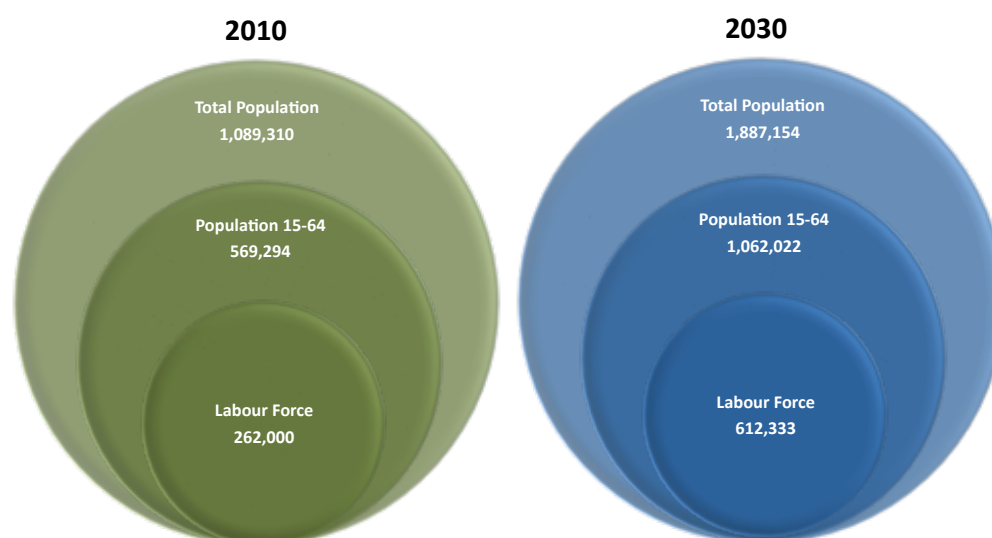


Timor-Leste experienced its highest average inflation rate since independence in 2011, with the Consumer Price Index (CPI) averaging 13.1%. International food price increases, the depreciation of the US dollar and increased recurrent Government expenditure (such as transfers and public sector wages) have been identified as the three major drivers of inflation.<sup>6</sup> Government expenditure ‘front-loading’ is expected to keep inflation above the 4-6% target until 2018.

Figure 5 compares the 2010 population and labour estimates with the projections for 2030. The population is expected to grow at an annual average of 2.8% between 2010 and 2030. Higher growth rates for the working age population can be expected, as Timor-Leste currently has a very young population with 41.4% under the age of 15. Labour force participation is expected to grow at a slower rate in the early years, but then accelerates and passes population and working age population growth rates as more educated Timorese join the labour force.

Using these GDP and population growth statistics, the real non-oil per capita GDP is expected to reach US\$2,571 by 2030, which corresponds to an average increase of 6% per annum.

**Figure 5: Population and Labour Force Projections<sup>78</sup>**



<sup>6</sup> Ministry of Finance of Timor-Leste (2012), *Analysis of Inflation in Timor-Leste*

<sup>7</sup> The 2010 Census published the enumerated population of Timor-Leste (1.066 million). However, for the purpose of the macroeconomic framework the total population was used.

<sup>8</sup> The labour force survey data was used for the 2010 labour force participation rate.

## 2. Agriculture

The following section will estimate the potential of the four agricultural sub-sectors, namely crops, livestock, fisheries and forestry before combining the results in section 2.5.

### 2.1. Crops

Productivity in agriculture is measured by the yield, which is the farmers' total output per unit of land. New farming technologies, the use of fertilizers, pesticides and herbicides, as well as the use of higher yielding crop varieties can increase yield levels. Table 1 shows that Timor-Leste has relatively low crop yield levels in comparison to its East Asian neighbours and below the region's average in all listed crops/crop groupings. The average East Asian coffee yield, for example, is four times higher than that of Timor-Leste. These yields were not a result of a bad harvest in 2010, but are consistent with previous years.<sup>9</sup>

**Table 1:** Southeast Asian yield levels for a selection of crops (t/ha) in 2010

Country	Coffee, green bean	Rice, paddy	Maize	Roots and Tubers	Vegetables	Fruits
Cambodia	1.09	2.97	4.27	20.13	6.03	7.21
Indonesia	0.69	5.01	4.43	18.31	8.78	22.43
Lao PDR	0.90	3.46	4.92	9.89	9.94	8.99
Malaysia	0.39	3.78	5.70	9.87	17.53	12.35
Myanmar	0.70	4.12	3.64	12.28	13.09	5.44
Philippines	0.77	3.62	2.55	8.02	8.79	14.00
Thailand	0.85	2.88	3.97	18.68	7.67	9.97
Viet Nam	2.15	5.32	4.09	15.03	11.42	12.34
Timor-Leste	0.24	3.09	2.12	3.85	3.03	8.45
<b>Average (excl. TL)</b>	<b>0.94</b>	<b>3.90</b>	<b>4.20</b>	<b>14.03</b>	<b>10.41</b>	<b>11.59</b>

Source: FAO (Excluded Singapore and Brunei due to lack of data availability)

Apart from improving yield levels (intensification), the area planted can be increased to raise agricultural production (extensification). Using these two variables, table 2 provides estimates for the potential GDP contribution of the agricultural crops. The baseline row shows current production and GDP figures<sup>10</sup>. The GDP potential is determined by increasing the yield levels to the East Asian average (scenario 1) and by increasing the hectares planted to the SDP targets (scenario 2). Where SDP targets were not stated, harvested hectares are based on discussions with relevant entities. The coffee exporter Timor-Global Ltd, for example, stated that up to 100,000 hectares of coffee could be planted in Timor-Leste. While rice, maize and coffee have been listed independently due to their importance in Timor-Leste, the remaining crops have been grouped according to the national accounts methodology. The last row shows the compounded yearly increase in production needed to fulfil the potential by 2030.

<sup>9</sup> Similar margins between the Southeast Asian average and Timor-Leste yields are obtained when averaging the yield levels over the last five years

<sup>10</sup> Strictly speaking the national accounts measures value added. However, with taxes and subsidies only making up 0.4% of total GDP, this difference is negligible for the purpose of this study.

**Table 2: Crop Production Potential<sup>1112</sup>****Coffee**

Scenario	Area Harvested (Ha)	Yield (t/Ha)	Quantity produced (t)	Contribution to GDP (\$m)	Compounded growth rate over 20 years(%)
Baseline in 2010	53,832	0.24	12,653	22.26	-
1. Increase yeald rate to regional average	53,832	0.94	50,666	89.14	7.18%
2. Increase yield rate to regional average and increase planted hectares	100,000	0.94	94,119	165.58	10.55%

FAO item code 656

**Rice Paddy**

Scenario	Area Harvested (Ha)	Yield (t/Ha)	Quantity produced (t)	Contribution to GDP (\$m)	Compounded growth rate over 20 years(%)
Baseline in 2010	36,548	3.09	112,925	17.18	-
1. Increase yeald rate to regional average	36,548	3.90	142,375	21.66	1.17%
2. Increase yield rate to regional average and increase planted hectares	70,000	3.90	272,689	41.49	4.51%

FAO item code 27

**Maize**

Scenario	Area Harvested (Ha)	Yield (t/Ha)	Quantity produced (t)	Contribution to GDP (\$m)	Compounded growth rate over 20 years(%)
Baseline in 2010	70,255	2.12	148,891	23.62	-
1. Increase yeald rate to regional average	70,255	4.20	294,800	46.77	3.47%
2. Increase yield rate to regional average and increase planted hectares	87,000	4.20	365,064	57.91	4.59%

FAO item code 56

**Roots and Tubers**

Scenario	Area Harvested (Ha)	Yield (t/Ha)	Quantity produced (t)	Contribution to GDP (\$m)	Compounded growth rate over 20 years(%)
Baseline in 2010	24,910	3.85	95,800	12.68	-
1. Increase yeald rate to regional average	24,910	14.03	349,409	46.25	6.68%
2. Increase yield rate to regional average and increase planted hectares	28,000	14.03	392,751	51.98	7.31%

FAO item code 1720

<sup>11</sup> The FAO production and yield rate figures reflect the official figures published by the Ministry of Agriculture. However, these figures are based on rough estimates and it is recommended for the Government to commission an extensive agriculture survey in order to provide policymakers with improved statistical agriculture data.

<sup>12</sup> It is unlikely for Timor-Leste to achieve a coffee yield rate of 0.94T/ha if it aims to continue producing organic coffee without the use of chemical fertilizers.

### Vegetables

Scenario	Area Harvested (Ha)	Yield (t/Ha)	Quantity produced (t)	Contribution to GDP (\$m)	Compounded growth rate over 20 years(%)
Baseline in 2010	7,801	3.03	23,616	42.51	-
1. Increase yeald rate to regional average	7,801	10.41	81,172	146.11	6.37%
2. Increase yield rate to regional average and increase planted hectares	10,000	10.41	104,053	187.30	7.70%

FAO item code 1800

### Fruits

Scenario	Area Harvested (Ha)	Yield (t/Ha)	Quantity produced (t)	Contribution to GDP (\$m)	Compounded growth rate over 20 years(%)
Baseline in 2010	1,760	8.45	14,874	16.75	-
1. Increase yeald rate to regional average	1,760	11.59	20,402	22.97	1.59%
2. Increase yield rate to regional average and increase planted hectares	3,000	11.59	34,776	39.16	4.34%

FAO Item code 1801

Coffee is Timor-Leste's main non-oil export worth \$16m in 2010<sup>13</sup>. Export earnings could be increased significantly while reducing poverty in the coffee-growing regions. Productivity levels can be raised by rehabilitating old coffee plantations, pruning old trees, promoting pest management techniques and improving the coffee value chain. While an annual 10.55% average growth rate is difficult to achieve over a 20-year period, Viet Nam's experience shows that it is possible. According to FAO production data, Viet Nam's coffee output grew on average above 20% per annum between 1987 and 2007. During this time, the Government of Viet Nam incentivised export crops with favourable credits, subsidised inputs and provided low cost land for coffee farmers. Along with the liberalisation of the agricultural input markets, this led to Viet Nam having some of the highest yields in the world<sup>14</sup>. However, Viet Nam has used very large applications of fertilizers to grow its yield rates. It would be useful for the Government to analyse the costs and benefits of continuing its current organic coffee policy or encourage the use of fertilizers.

Production of the two main staple foods, namely rice and maize, could be more than doubled. To achieve this by 2030 an average annual growth rate of 4.5% and 4.6% respectively would be necessary. This is well below the annual average output growth rates achieved in the last 10 years in Timor-Leste, but this is expected, as yield levels started growing from a very low base. Lao PDR sustained maize production increases averaging above 15% between 1987 and 2007. Similarly, Cambodia experienced an average annual rice output growth rate of above 6.7% in the same timeframe. This was partly due to increased land cultivation resulting from farmers moving back to rural areas after the war, but yields were also substantially improved by expanding the nation's irrigation

<sup>13</sup> Ministry of Finance of Timor-Leste (2011), *External Trade Statistics: Annual Report 2010*

<sup>14</sup> World Bank (2004), *Vietnam Coffee Sector Report*, Giovannucci, Daniele, Bryan Lewin, Rob Swinkels, Panos Varangis; Washington DC

infrastructure, increasing the use of fertilizers and high yielding rice varieties, as well as intensifying the crop cycle by ‘double-cropping’ during the wet season<sup>15</sup>.

For the remaining crop groupings there is plenty of evidence that the compounded annual growth rates estimated in figure 2 can also be achieved. Cambodia, for example, saw an average yearly cassava output growth of above 20% between 1990 and 2010. In 2007 cassava was identified to have large export potential and today it is one of Cambodia’s main exports<sup>16</sup>. Similarly, Lao PDR saw its vegetable output grow by an annual average rate of above 13% between 1982 and 2002 and Indonesia’s fruit output grew by an average of 6.2% between 1989 and 2009.

## 2.2. Livestock

While 86% of households in Timor-Leste are rearing livestock, the herd and flock sizes are relatively small. Only 3.8 chickens, 1.8 pigs, 0.9 cattle and 0.5 buffalos were reared per household in 2010.<sup>17</sup> Table 3 shows that Timor-Leste’s meat and milk productivity rates are below the regional average.

**Table 3:** Southeast Asian productivity for a selection of livestock products in 2010

Country	Beef and Buffalo Meat (Hg/An)	Sheep and Goat Meat (Hg/An)	Pig Meat (Hg/An)	Poultry Meat (01.Gr/An)	Eggs (100Mg/An)
Brunei Darussalam	1,765	115	350	9,032	42,353
Cambodia	1,242	n/a	500	11,100	36,942
Indonesia	2,256	98	550	7,521	58,042
Lao PDR	1,153	140	271	8,848	56,925
Malaysia	1,211	101	498	17,616	83,873
Myanmar	1,542	100	660	11,508	54,025
Philippines	2,230	175	665	9,770	52,977
Singapore	3,750	197	651	18,750	74,343
Thailand	2,967	150	1,413	12,707	87,545
Viet Nam	1,729	150	700	11,157	48,964
Timor-Leste	1,000	100	400	8,000	80,000
<b>Average (excl. TL)</b>	<b>1,985</b>	<b>136</b>	<b>626</b>	<b>11,801</b>	<b>59,599</b>

Source: FAO

Gearing up productivity to the regional average, scenario 1 in table 4 provides an estimate of the possible GDP contribution in the livestock sector. The second scenario also uses the regional average productivity and increases livestock numbers by 20% by 2020 (as the stated SDP target) and by a further 20% by 2030 (assumed).

<sup>15</sup> USDA (2010), *Cambodia: Future Growth Rate of Rice Production Uncertain*, United States Department of Agriculture, Commodity Intelligence Report

<sup>16</sup> CDRI (2009), *Agricultural Trade in the Greater Mekong Sub-Region: The Case of Cassava and Rubber in Cambodia*, Hing Vutha, Thun Vathana, Working Paper 43

<sup>17</sup> MoF and UNFPA (2011), *Population and Housing Census of Timor-Leste 2010*

**Table 4: Potential of the Livestock Sector****Bovine Cattle**

Scenario	Producing Animals/ Slaughtered	Yield (Hg/An)	Quantity produced (t)	Contribution to GDP (\$m)	Compounded growth rate over 20 years (%)
Baseline in 2010	10,700	1000	1,070	12.46	-
1. Increase yeald rate to regional average	10,700	1985	2,123	24.73	3.49%
2. Increase livestock numbers to SDP target	15,408	1985	3,058	35.62	5.39%

FAO Item code 1757

**Sheep and Goats**

Scenario	Producing Animals/ Slaughtered	Yield (Hg/An)	Quantity produced (t)	Contribution to GDP (\$m)	Compounded growth rate over 20 years (%)
Baseline in 2010	50,400	100	504	1.73	-
1. Increase yeald rate to regional average	50,400	136	687	2.35	1.56%
2. Increase livestock numbers to SDP target	72,576	136	989	3.39	3.43%

FAO Item code 1807

**Pigs**

Scenario	Producing Animals/ Slaughtered	Yield (Hg/An)	Quantity produced (t)	Contribution to GDP (\$m)	Compounded growth rate over 20 years (%)
Baseline in 2010	244,000	400.00	9,760	5.94	-
1. Increase yeald rate to regional average	244,000	625.80	15,270	9.29	2.26%
2. Increase livestock numbers to SDP target	351,360	625.80	21,988	13.37	4.14%

FAO Item code 1035

**Poultry**

Scenario	Producing Animals/ Slaughtered	Yield (0.1Gr/An)	Quantity produced (t)	Contribution to GDP (\$m)	Compounded growth rate over 20 years (%)
Baseline in 2010	1,000,000	8,000	800	6.33	-
1. Increase yeald rate to regional average	1,000,000	11,801	1,180	9.33	1.96%
2. Increase livestock numbers to SDP target	1,440,000	11,801	1,699	13.44	3.84%

FAO Item code 1808

**Eggs**

Scenario	Laying animals	Yield (100Mg/An)	Quantity produced (t)	Contribution to GDP (\$m)	Compounded growth rate over 20 years (%)
Baseline in 2010	315,000	80,000	2,520	2.47	-
1. Increase yeald rate to regional average	315,000	59,599	1,877	1.84	-1.46%
2. Increase livestock numbers to SDP target	453,600	59,599	2,703	2.65	0.35%

FAO Item code 1783

With the exception for egg production, there is a potential to more than double livestock output for all products by increasing livestock numbers and productivity.

For meat production the potential is likely to be higher than that stated in figure 4. The yield per animal rate only provides a partial measure of productivity. It does not account for productivity gains in terms of the rate at which animals grow and gain weight. It also does not account for animal death rates and the inputs used to rear the animal. These factors, however, have been identified as the main bottlenecks to increase livestock production in Timor-Leste. Mortality rates are high and there is little knowledge of livestock management and animal health. It is therefore reasonable to assume that a higher contribution to GDP could come from the livestock sector in 2030. Especially poultry and swine meat production can grow at higher rates. Between 1990 and 2010 the annual poultry production of the Philippines and swine meat production of Myanmar increased by an annual average of 13% and 11% respectively.

### 2.3. Fisheries

Timor-Leste has 735km of coastline and exclusive economic zone waters (EEZ) of 72,000km<sup>2</sup>. While no in-depth research has been undertaken on the fish resources, there is evidence of high-value species in Timorese waters, including tuna, skipjack, snapper, mackerel and prawns.<sup>18</sup> The Fisheries Department estimates that in 2008 approximately 18,000 tonnes of fish worth US\$36 million were fished illegally in Timorese waters<sup>19</sup>. Fish production in neighbouring countries also point to the high potential of this sector.

Table 5 shows that Timor-Leste's fish productivity rates when compared to its EEZ is only 1% of the regional average. Apart from providing income and employment opportunities to the local economy, the fisheries sector could also play a key role in improving nutrition standards. According to the Survey of Living Standards in 2007, the average Timorese only consumes 5.19kg of fish per year, far below the recommended 13kg/pp/pa, the world average of 17.1kg/pp/py<sup>20</sup> and the Indonesian average of 24.67kg/pp/pa

**Table 5: Southeast Asian fishing productivity in 2010**

Country	Exclusive Economic Zone (sqkm)	Fish production (t)	Yield rate (t/sqkm)
Brunei Darussalam	25,427	2,772	0.11
Cambodia	47,827	550,094	11.50
Indonesia	6,079,377	11,662,342	1.92
Malaysia	201,720	2,018,550	10.01
Myanmar	520,262	3,914,169	7.52
Philippines	2,265,684	5,161,720	2.28
Singapore	823	5,231	6.36
Thailand	306,365	3,113,321	10.16
Viet Nam	1,396,299	5,127,600	3.67
Timor-Leste	77,256	4,677	0.06
Average (excl. TL)	N/A	N/A	5.95

excluded Lao PDR due to lack of data

Source: Sea around us project, FAO

Source: FAO, Sea Around Us Project

Table 6 provides two scenarios for the potential of the fisheries sector. The first shows that if fish consumption per capita is increased to world average levels and is supplied by locally produced fish, production would have to six fold. Using the Asian average annual production per fisherman of 2.4 tonnes<sup>21</sup>, this scenario would provide 12,750 employment opportunities. If the yield level methodology explained above is used, the second scenario shows that the fishing sector could

<sup>18</sup> Helder da Costa (2003), *The evolution of agriculture policies in East Timor*, UNTL

<sup>19</sup> Ministry of Economy and Development (2012), *Sustainable Development in Timor-Leste*

<sup>20</sup> OECD-FAO (2011), *Agricultural Outlook 2011-2020*

<sup>21</sup> FAO (2010), *The State of World Fisheries and Aquaculture*, Fisheries and Aquaculture Department, Rome

play an even larger role in the future. This is assuming that Timor-Leste's sea is as fish abundant as that of the neighbouring countries.

**Table 6: Potential of the Fisheries Sector**

Scenario	Yield (t/sqkm)	Production (t)	Contribution to GDP (\$m)	Potential Employment creation	Compounded growth rate over 20 years(%)
Baseline in 2010	0.06	4,677	10.67	-	-
1. Increase domestic per capita fish consumption to world average	0.40	30,600	69.81	12,750	9.85%
2. Regional average productivity	5.95	459,483	1,048.26	191,451	25.78%

Between 1990 and 2010 Myanmar saw some of the highest production growth rates of the fisheries sector in the region growing at an annual average of 8.7%. While Myanmar's experience shows that it might be possible to reach the first fish production scenario by 2030, the compounded growth rate needed for the second scenario is too high.

## 2.4. Forestry

The forestry sector provides a long-term niche opportunity for Timor-Leste. Indonesia, with similar climatic and geographical properties, is the biggest tropical hardwood exporter in the world. In the past, sandalwood was one of the main high-value export commodities. Prices have risen from about US\$9,500/t in 1990 to US\$40,000/t in 2005<sup>22</sup> and continue to increase. Teak plantations were introduced during Indonesian times. Today, however, most high value trees have been cut down and new planting campaigns are needed to provide export earnings in the future. Apart from offering export and employment potential, a well-managed forestry sector could also help combat land degradation. According to the SDP, 70% of Timor-Leste's land area has a slope of over 26% making landslides and flash floods a common occurrence during the rainy season.

Due to the lack of data on Timor-Leste's forestry sector, the ITS (2011) study, which provides an overview of the economic contribution of Indonesia's forestry sector was used to calculate the GDP contribution and employment creation per hectare. These figures were then geared to the assumed area available for forestry in Timor-Leste. Approximately half of the total landmass of Timor-Leste was covered by forest in 2010<sup>23</sup>. The Directorate of Forestry aims to expand the protected area network to 200,000 hectares in the future. Assuming that half of the remaining forest area is available for forestry purposes, this would leave about 275,000 hectares.<sup>24</sup> Table 7 shows two scenarios. The first only includes the GDP and employment contribution from silviculture – i.e. forestry, logging and related services, while the second includes wood manufacturing.

<sup>22</sup> Australian Sandalwood Network (2008), *WA Sandalwood Industry development plan 2008-2020*

<sup>23</sup> UNDP (2011), *National Ecological Gap Assessment for Timor-Leste 2010*, CNRM solutions, New South Wales

<sup>24</sup> Crop and forestry expansion need to be coordinated to avoid conflicting results



**Table 7: Potential of the Forestry Sector**

Scenario	Land area (Ha)	Contribution to GDP (US\$m)	Compounded growth rate over 20 years(%)	Potential Employment creation
Baseline in 2010	-	3.78		
1. Silviculture	247,104	25.18	9.95%	6,231
2. Silviculture plus wood manufacturing	247,104	69.62	15.68%	12,820

Sources: National Accounts, ITS (2011)

As these estimates show, the forestry sector is relatively labour intensive, especially if the wood is processed locally. The timeframe to achieve this potential should be viewed with care. While the Indonesian forestry sector's average annual GDP contribution grew by 11.6% between 2000 and 2009<sup>25</sup>, these rates are unlikely to be reached by Timor-Leste. A 12-35 year time period is necessary for hardwoods such as teak, sandalwood and mahogany to reach commercial size. Suitable fast-growing species could be planted in parallel to support the fast growing construction sector and reap the rewards from forestry products in the medium term.

## 2.5. Total agriculture contribution

Based on the above estimates, table 8 provides an overview of the potential GDP and employment contribution of the agriculture sector as a whole.

**Table 8: Potential of the Agriculture Sector**

Scenario	Contribution to GDP (\$m)	Employment
2010 productivity	187.5	127,000
1. Regional average productivity	537.9	108,361
2. Regional average productivity and quantity increase	738.6	148,794

The first row represents current GDP and employment contribution of the agriculture sector. The second row GDP estimate is the sum of all preceding crop, livestock, fisheries and forestry first scenario estimates. The third row GDP estimate is the sum of each sector's second scenario estimates (with the exception for fisheries and forestry sub-sectors where the first scenario estimates were used, due to the exceptionally high compounded growth rates needed to reach the second scenario). To estimate the employment potential in agriculture, the Southeast Asian average value added per worker<sup>26</sup> was calculated and divided by the respective GDP contribution in row two. In more simplistic terms, these estimates give an indication of how many people would be employed in agriculture if average worker productivity increases to the Southeast Asian average. For this to happen, average value added per worker in the agriculture sector would have to triple.

<sup>25</sup> ITS Global (2011), *The Economic Contribution of Indonesia's Forest-Based Industries*, Melbourne

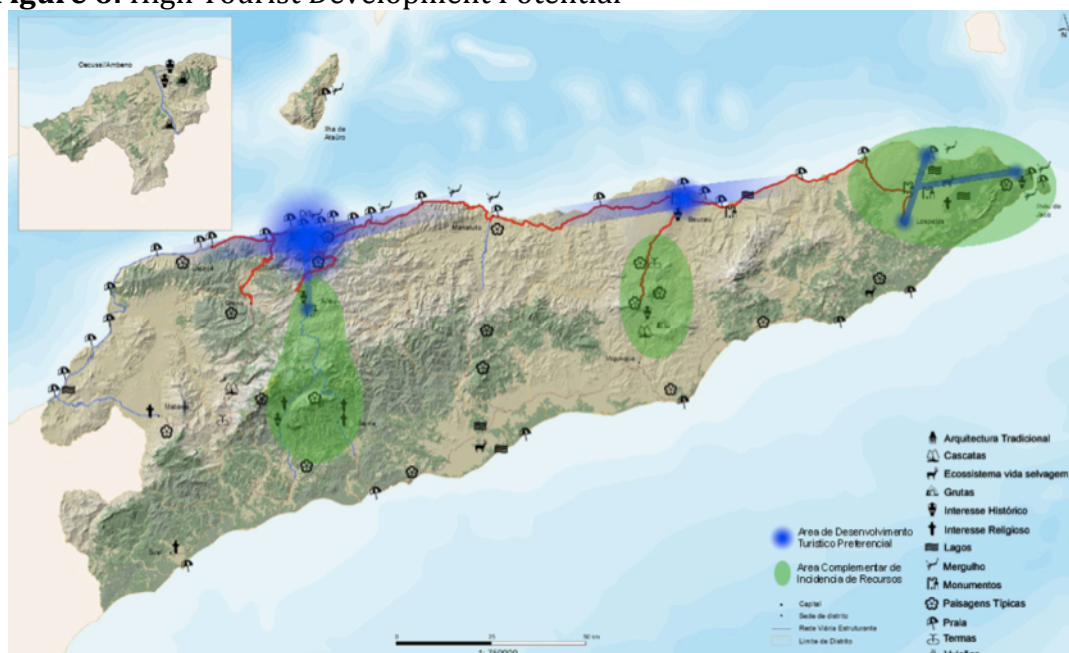
<sup>26</sup> World Bank (2012) – World Development Indicators

### 3. Tourism

Unspoilt beaches, rich history and spectacular interior landscapes provide the basis for a promising tourism industry. Timor-Leste is part of the Coral Triangle with some of the most diverse coral reefs in the world. Wilkinson (2004) estimates that the potential value of coral reef tourism in Southeast Asia is estimated to be 50% of the global total of US\$9.6 billion. According to the WTTC, growth of the travel and tourism sector is set to outpace that of the global economy in the next decade. Annual sector growth is forecasted to average between 3.0% and 3.5% until 2030. While Timor-Leste's tourism sector might experience a dip in tourist expenditure in 2013 if the United Nations Integrated Mission in Timor-Leste (UNMIT) leave as planned in December 2012, the country could benefit from the global tourism growth thereafter.

While still in its nascent phase, tourist arrivals in Timor-Leste have increased at an annual average rate of 30% since 2007 and reached 36,643 in 2011<sup>27</sup>. Figure 6 sets out the tourism sites and preferential areas for tourism development in blue and green. Sites and activities are diverse ranging from hiking in the mountainous region around Mount Ramelau to beach holidays with scuba diving on Jaco Island and historical site tours in the Bobonaro district.

**Figure 6:** High Tourist Development Potential



Source: IPAD (2007)

To project potential GDP and employment contribution from this sector, Fiji and Vanuatu have been used as examples. Both are similarly sized remote island economies in the region, which have a relatively developed tourist sector. In 2010 Fiji and Vanuatu attracted close to 550,000 and 240,000 tourists respectively. Table 9 provides potential direct and total GDP and employment contribution estimates if Timor-Leste's tourism sector would grow to that of

<sup>27</sup> Ministry of Tourism Trade and Industry data (2012)

Vanuatu’s (scenario 1) and Fiji (scenario 2). Total contribution estimates include the direct travel and tourism spending as well as induced contributions such as capital investment spending that support the tourism industry<sup>28</sup>.

**Table 9: Potential of the Tourism Sector**

Scenario	Direct Contribution to GDP (\$m)	Total Contribution to GDP (\$m)	Direct Contribution to Employment	Total Contribution to Employment	Compounded growth rate over 20 years(%)
Baseline in 2010	24.40	n/a	1,430	n/a	
1. Timor-Leste's tourism sector grows to the size of Vanuatu's	161	453	10,800	31,000	9.89%
2. Timor-Leste's tourism sector grows to the size of Fiji's	461	1,245	38,300	104,300	15.83%

Source: National Accounts, WTTC databas, Author's estimates

High growth rates in the tourism sector have been achieved in countries that have prioritised the tourism sector in the past. In 1989, Vanuatu’s direct tourism contribution to GDP started at a similar base to that of Timor-Leste and grew at an annual average rate of 9.3% over the next 20 years. Several factors contributed to this development, including the liberalisation of air travel, rapidly increasing private sector loans for tourism development and continued marketing efforts by the Government. Cambodia, Laos PDR and Viet Nam experienced above 14% tourism sector growth rates over the same time period.

## 4. Non-renewable Natural Resources

### 4.1. Minerals

Insufficient information is currently available to quantify the potential mineral resources in Timor-Leste. Copper, gold, silver, chromite, manganese, phosphorites and marble have been identified as potential mineral resources to be explored. However, without a mining law in place, in-depth analysis on the economic viability to extract these deposits by mining companies has not yet taken place.

ESCAP (2003) highlights the chromite occurrence in Hili Manu. Outcrops with exposure of up to 36sqm and mineralization along 2.5km have been observed. These indicate a potential economic sized chromite deposit. Marble has also been identified in 10 districts with Manatutu reported to have well over 100 million cubic meters.

Dino Gandara (2011) has identified 9 manganese occurrences in Vemassee, Dauderem, Mahinaa, Uatu Carabau, Lamanu, Bimanu, Weisei, Maza and Kudawai. Manganese was already extracted and shipped to Japan during World War II. Vemassee is thought to be the largest deposit with an estimated area of 400,000sqm. Its proximity to road infrastructure and the port of Cairabela increase the likelihood of a commercially viable deposit.

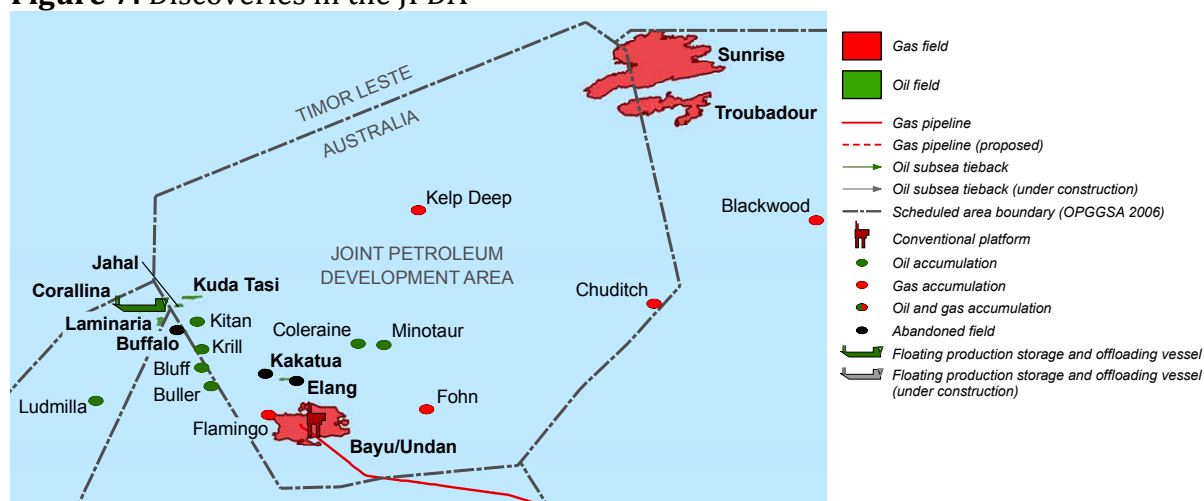
<sup>28</sup> Based on the UN’s Tourism Satellite Account methodology

## 4.2. Upstream Oil & Gas

Large oil and gas deposits have been discovered in Timor-Leste's Joint Petroleum Development Area (JPDA), in which 90% of the revenues are attributed to Timor-Leste and 10% to Australia. Figure 7 gives an overview of the discoveries. Bayu-Undan is the largest operational field. It was discovered in 1995 and came on stream in 2004. About 500 million recoverable barrels of oil equivalent (mmboe) are yet to be extracted until 2024, when the field is expected to be exhausted. Close to 70% of the production is liquid natural gas (LNG), which is piped to Darwin for processing purposes. Kitan, the second operational field is much smaller. It came on stream in the fourth quarter of 2011. At the time, the low production case estimated the recoverable reserves of 26.8 million barrels of oil (mmbbl)<sup>29</sup>.

The Government's share of the petroleum receipts from the above fields is transferred to the Petroleum Fund (PF), which was set up in 2005 to manage the oil and gas revenues. The Fund surpassed the \$10bn mark in the end of the first quarter of 2012.

**Figure 7: Discoveries in the JPDA**



Source: Government of Australia (2010), *Regional Geology of the Bonaparte Basin*

In the future, Timor-Leste is expecting a high contribution from Greater Sunrise. The field, composed of Sunrise and Troubadour, is projected to hold 7.67 trillion cubic feet of gas (TCF) and 298 mmbbl of condensate<sup>30</sup>. Located at the perimeter of the JPDA, 20.1% fall under JPDA jurisdiction and 79.9% under Australian jurisdiction. Under the CMATS agreement<sup>31</sup>, upstream revenues are agreed to be shared 50/50%. While these prospects are promising, the development of the field has been on hold due to negotiations dragging on regarding the location of the downstream beneficiation LNG plant.

<sup>29</sup> Ministry of Finance of Timor-Leste (2011), *Book 1 for 2012 budget*

<sup>30</sup> ANP (2010) Information Booklet

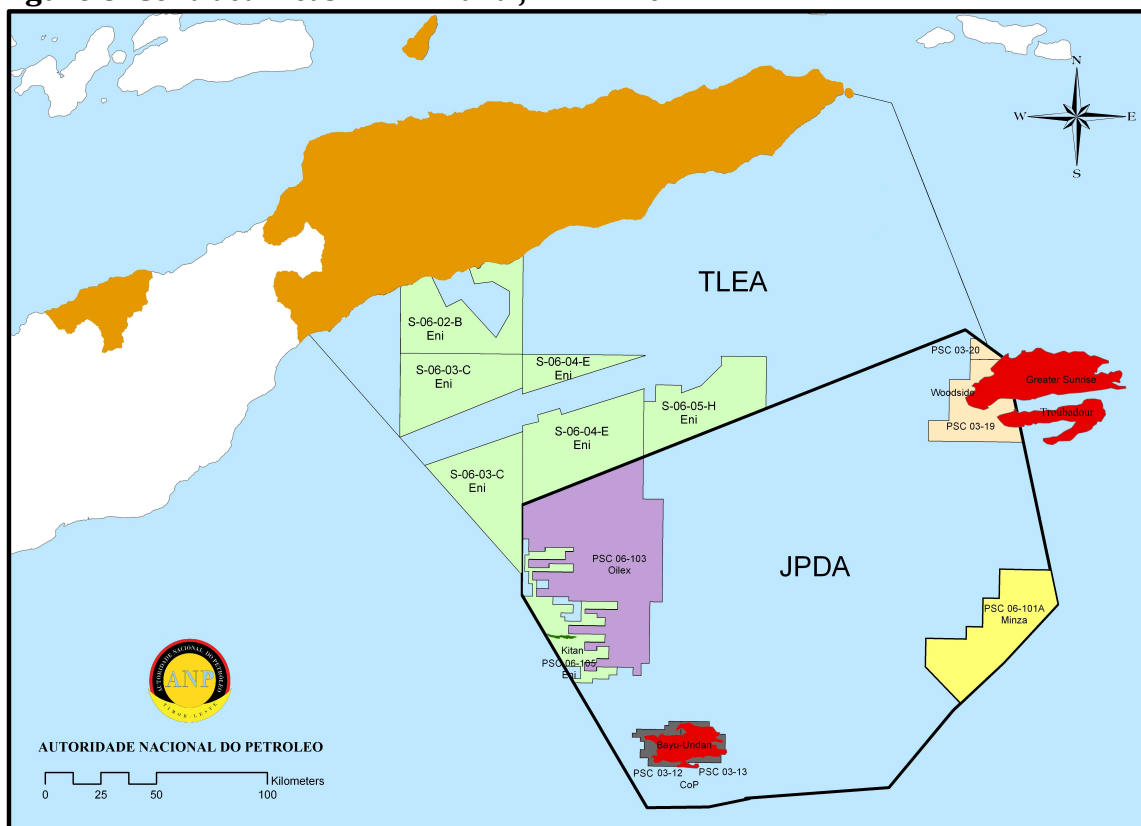
<sup>31</sup> The 'Certain Maritime Arrangements in the Timor Sea' treaty provides for the equal distribution of revenue from the Greater Sunrise gas field, signed by Timor-Leste and Australia on the 12<sup>th</sup> of January 2006.

Apart from Greater Sunrise, ANP reported that four further fields have been discovered in the JPDA. With higher oil/gas prices and improved technology these fields might become commercially viable in the future.

- EKKN is expected to contain a further recoverable 1mmbbl. It was abandoned by Conoco Phillips in 2007, but might be attractive for smaller operators;
- Chuditch has an estimated reserve of 0.7 TCF of gas. It was discovered in 1998. With significant carbon dioxide content, this field is currently considered to be marginal. Further exploration activities are on-going;
- Jahal and Kuda Tasi have estimated reserves of 20mmbbl. These were discovered in 1996 and 2001 respectively, but are deemed too small to be commercially viable without nearby infrastructure in place;
- Kelp Deep has an estimated recoverable reserve of 13 TCF. ExxonMobil discovered the field in 1997, but has not followed up on the development due to its deep location associated with high capital costs and carbon dioxide contamination. The field is currently situated in open acreage.

The Timor-Leste Exclusive Area (TLEA) is less explored. ENI with its joint venture partners have been granted a total of six exploration licenses for 2D and 3D seismic surveys. Figure 8 shows ENI concessions in green. Up to now, no significant discoveries have resulted from these surveys.

**Figure 8:** Contract Areas in TLEA and JPDA in 2012



Source: ANP

Little is known about the onshore potential for oil and gas. ANP has reported a total of 24 gas and 16 oil seeps that have attracted interest from international oil companies for further exploration. Acreage release is only expected once a comprehensive land law is passed and onshore extractive industry regulation is in place.

Based on the above, table 10 provides 2 scenarios how the upstream oil and gas sector might develop. GDP contributions were omitted from this exercise since the study focuses on non-oil GDP. Potential undiscounted government revenues and employment estimates were included. A word of caution is necessary here. The figures are only indicative and subject to great uncertainty. The oil and gas sector is exposed to large price fluctuations. Even the base scenario, which only includes on-stream fields and is based on detailed projections by the PF Directorate, should be seen as indicative. For future projects several unforeseeable factors such as contract negotiations outcomes, technological advances, further discoveries, quality of reserves and technical aspects can determine project outcomes and affect costs and revenues. Future scenarios are therefore subject to even larger uncertainty.

**Table 10: Upstream Oil and Gas Potential**

Scenario	Reserves (mmbob)	Government Revenues (\$bn)	Upstream employment
Baseline in 2012 (Bayu-Undan + Kitan)	515	15.97	450
1. Baseline + Greater Sunrise	2,194	30.97	800
2. Scenario 1 + discovered fields	4,681	51.38	1,750

Source: ANP, Petroleum Fund, author's estimates

The first scenario shows that Greater Sunrise would approximately double government revenues. These estimates result from using the model developed by Sandbu (2008) with updated capital and operational costs, updated sales prices and including condensate sales. The second scenario includes reserves from EKKN, Chuditch, Jahal, Kuda Tasi and Kelp Deep. Kitan's government revenue of \$7.6 per tonne was used to estimate government revenues for these fields (this compares to an estimated \$8.7/tonne for Greater Sunrise and \$32/tonne for Bayu-Undan).

Including sub-contractors, the Bayu-Undan and Kitan field employed 350 and 100 Timorese respectively in 2011. Scaling up these numbers in the proceeding scenarios show that although the upstream oil and gas sector generates large revenues for the Government, it does not provide many jobs. This is partly due to the industry being capital intensive and because the highly skilled jobs needed on oilrigs are subject to international competition.

### 4.3. Downstream Beneficiation

To add value to its upstream oil and gas resources, the GoTL has embarked on the ambitious Tasi Mane project, which foresees the development of the Southern coast. Three clusters composed of the Suai supply base, the Betano refinery/petrochemical hub and the Beaço Liquefied Natural Gas (LNG) plant are

planned to be developed in 4 phases and connected by a highway as indicated in figure 9.

**Figure 9:** Tasi Mane Project Proposal



Source: Strategic Development Plan

Timor Gap, which is the recently formed National Petroleum Company, will be the Government stakeholder in these projects. Table 10 provides the GDP contribution and employment estimates that Timor Gap predicts each of the above projects may generate based on similar projects in other countries. The last column includes direct and indirect job opportunities. The tax revenues and GDP contribution estimates are per annum averages over a 10-30 year time period (depending on the project). They do not include the construction period.

**Table 11:** Downstream Beneficiation Potential

**Suai Supply Base**

Scenario	Tax Revenues (\$m)	Contribution to GDP (\$m)	Direct Jobs created	Total jobs created
1. Supply Bayu-Undan + Kitan + Greater Sunrise	3.25	8.22	300	1,500
2. Supply scenario 1 + 7 further fields in the region	5.66	13.21	450	2,250

**Betano Refinery**

Scenario	Tax Revenues (\$m)	Contribution to GDP (\$m)	Direct Jobs created	Total jobs created
1. 30,000 barrels of condensate per day	20	76.73	200	1,000
2. 50,000 barrels of condensate per day	23	93.32	220	1,100

**Beaço LNG Plant**

Scenario	Tax Revenues (\$m)	Contribution to GDP (\$m)	Direct Jobs created	Total jobs created
1. 5 mtpa	291	1,016.00	250	1,250
2. 10 mtpa	436	1,524.00	375	1,875

Source: Timor Gap

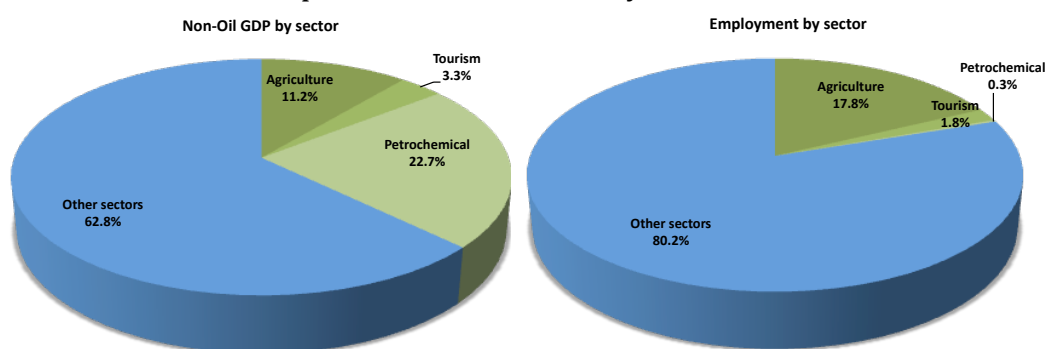
Especially the LNG plant has the potential to significantly contribute to GDP once it comes on stream. The employment potential in the petrochemical sector, on the other hand, is relatively limited. However, Timor Gap estimates that the industrial park that the GovTL is planning to integrate into the supply base at Suai could provide an additional 30,000 jobs (based on a typical ratio of 40 jobs per hectare). Furthermore, the GovTL hopes to attract a petrochemical hub at Betano once the refinery is operational. Industries could include an ethane cracking plant and a PVC complex. Such hub could create an additional 10,000 to 15,000 jobs. These two projects have not been included in the analysis, because there is no further data available yet.

It is important to keep in mind that the above estimates do not give an indication of the economic profitability of the projects. GDP does not include capital expenditures, which are known to be significant for downstream beneficiation projects. Similarly, the employment estimates do not take into account the short-term jobs created during the construction phase. Timor Gap estimates that approximately 250, 3000 and 2000 direct jobs will be created during the construction phase of the supply base, the refinery and the LNG plant respectively.

## 5. Findings and Policy Recommendations

Combining the GDP and direct employment estimates from previous chapters, figures 10 (scenario 1) and 11 (scenario 2) provide an indication of the potential agriculture, tourism and petrochemical sector’s direct contribution to GDP and employment if the macroeconomic targets set out in section 1.3 are achieved. That is, if real GDP grows to reach US\$4.85bn and the labour force grows to reach 612,333 people by 2030.

**Figure 10:** Scenario 1 – Potential GDP and employment contribution of the agriculture, tourism and petrochemical sectors by 2030



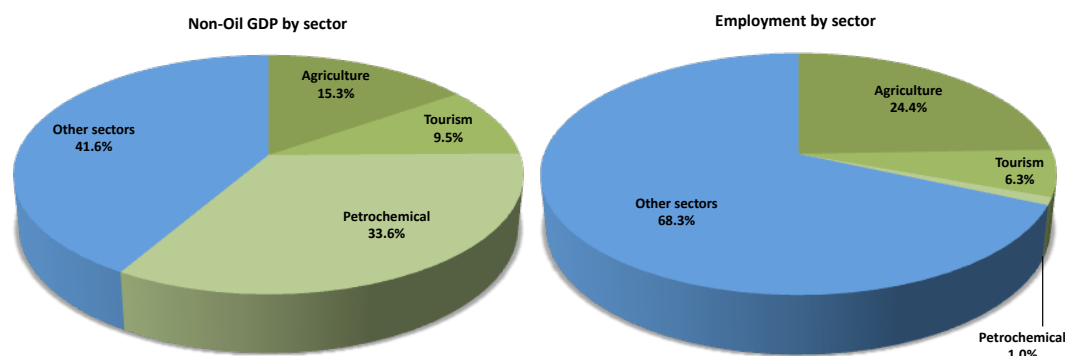
### Scenario 1 Estimates

	Target	Agriculture	Tourism	Petrochemical*	Percentage of Total
GDP (\$ millions)	4,851	541	161	1,101	37%
Employment	612,333	109,041	10,800	1,550	20%

\*Including upstream employment



**Figure 11:** Scenario 2 – Potential GDP and employment contribution of the agriculture, tourism and petrochemical sectors by 2030\*



**Scenario 2 Estimates**

	Target	Agriculture	Tourism	Petrochemical*	Percentage of Total
GDP (\$ millions)	4,851	742	461	1,631	58%
Employment	612,333	149,475	38,300	6,225	32%

\*Including upstream employment

If the 2030 targets are achieved, the three analysed sectors have the potential to contribute to 37–58% of GDP – more than double the contribution of the three sectors in 2010 (figure 2). While the agriculture sector shrinks in relative terms, the tourism and especially the petrochemical sector expand significantly. As explained in the previous section, this can largely be traced back to the large GDP contribution of the LNG plant if it comes on stream.

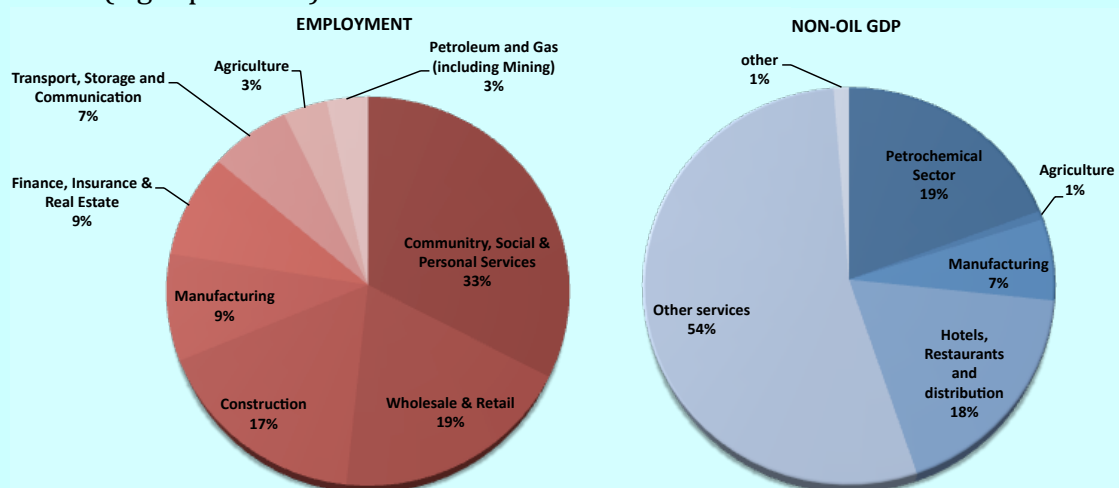
Labour force growth is projected to outpace the jobs that these sectors can create, thereby lowering the relative employment opportunities of these three sectors from 52% (figure 3) in 2010 to 20-32%. In the optimistic scenario, the number of people working in agriculture is estimated to stay constant with output increases achieved through higher labour productivity. Medium to higher skilled jobs are likely to be available in the tourism and petrochemical sectors, but they are not going to accommodate the estimated labour force by 2030.

This leads to the question about the development of the remaining sectors. Due to current labour productivity constraints set out in figure 1, the non-oil manufacturing sector is unlikely to grow significantly. Construction and services, on the other hand, are expected to expand rapidly as a result of public spending and as income from the agriculture, petrochemical and tourism sectors is spent. These are the often-cited linkages and multiplier effects. The economic structure of Timor-Leste could therefore resemble that of many resource rich countries, primarily relying on the energy sector for income generation and a large service sector for employment creation. The case of Trinidad and Tobago shows that such structure can lead to high per capita incomes with low unemployment rates (box 1). That there is significant room for improvements to support the development of these ‘other’ service sectors is exemplified by the financial sector (box 2).

**Box 1: Trinidad and Tobago: An economy based on the energy and services sectors**

Trinidad and Tobago provides an interesting comparative case study. It is a small island economy with 1.3 million inhabitants, a labour force of 618,000 and an unemployment rate of 5.8% in 2010<sup>32</sup>. The country has been blessed with natural resources and has successfully attracted downstream beneficiation projects. The sugar based economy of the 19<sup>th</sup> century became an oil based one in the 20<sup>th</sup> century. Since the 1950's GDP growth has been closely linked to energy market developments. Today, several petrochemical downstream beneficiation projects are contributing to national income, including the processing of crude oil, LNG, steel, methanol and nitrogenous fertilisers. With the highest GDP per capita in the Caribbean, the OECD recently removed the country from its list of developing countries. Figure 12 gives an overview of Trinidad and Tobago's economy in 2010 and shows the importance of the service sector for both GDP contribution and employment.

**Figure 12: Trinidad & Tobago's employment (left pie chart) and non-oil GDP by sector (right pie chart) in 2010**



Source: 2010 National Accounts, Trinidad and Tobago Central Statistical Office and Central Bank of Trinidad and Tobago, 2011 Annual Economic Survey

This is not to suggest that Timor-Leste has the amounts of natural resources available to develop like Trinidad and Tobago, or that the Government should adopt similar policies. On the contrary, Trinidad and Tobago has failed to coordinate and develop opportunities outside the energy sector, even in areas with clear potential, such as tourism.<sup>33</sup> Its educational indicators are relatively poor when compared to its income levels, further complicating the process of economic diversification (an objective that the Government of Trinidad and Tobago has recently embarked on). This case does show, however, that an economy does not necessarily need to attract investment in the manufacturing sector to be successful. The services sector can make up a large percentage of GDP and accommodate many employees.

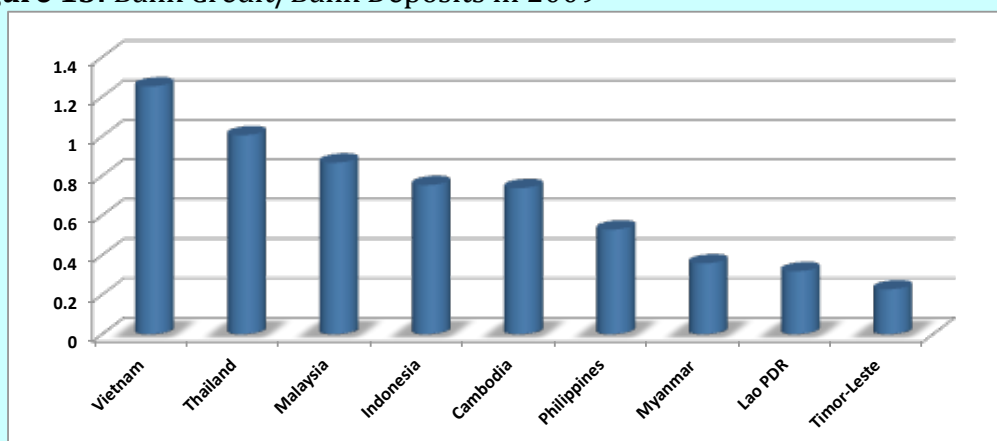
<sup>32</sup> Central Bank of Trinidad and Tobago (2012), 2011 Annual Economic Survey

<sup>33</sup> IADB - Inter-American Development Bank (2007), *Trinidad and Tobago: Economic Growth in a Dual Economy*, CCB

## Box 2: Financial Sector Development

Commercial banks in Timor-Leste have provided few credits to the private sector in recent years and have not intermediated society's savings efficiently. This is shown in figure 13, which compares the bank credit to bank deposit ratios across Southeast Asian countries in 2009. While in Thailand close to 100% of the savings are passed on to borrowers, only 23% of the deposited money in Timor-Leste is made available to the private businesses. The IMF article IV mission (2011) reported that this ratio has not changed significantly between 2009 and 2011.

**Figure 13: Bank Credit/Bank Deposits in 2009**



Source: Thortsen Beck and Asli Demirgüç-Kunt (2009), *Financial Institutions and Markets Across Countries and over Time: Data and Analysis*, World Bank Policy Research Working Paper No. 4943

The resilience to lending can be traced back to the lack of collateral and contract enforcement, as well as high nonperforming loans in the past. By addressing the land law to clarify property rights and improving the judicial system, the GovTL could improve the environment for commercial banks to expand private sector credit.

Based on the sector specific findings and the general economic outlook by 2030 five key findings and policy recommendations can be made:

- I. There is significant growth potential in the agriculture, tourism and petrochemical sectors. The GovTL should therefore prioritise these sectors by preparing sector specific short- and medium-term plans and investment strategies that are based on detailed cost-benefit assessments. Sector specific strategies should be coordinated to avoid conflicting results and budget allocations for these sectors should reflect the Government's priorities.
- II. Apart from the macroeconomic benefits outlined above, a more productive agriculture sector has the potential to lower malnutrition rates, reduce inflationary pressure on food items and control population migration from rural to urban areas. Agriculture should therefore be prioritised in the short-term.
- III. In line with experiences from other resource rich economies, the service sector (including tourism) is likely to play a key role in Timor-Leste's future

economy. Services are based on human capital. Education and training of the future labour force is therefore of utmost importance. Improving labour productivity will also determine whether Timor-Leste can diversify its economy in the long run.

- IV. The petrochemical projects provide high GDP income, but few employment opportunities. Timor-Leste should therefore invest in these projects as long as they have a positive net present value.
- V. To boost private investment, the Government should clarify property rights. Apart from providing collateral for the financial sector, a land law would enable on-shore oil/gas and minerals explorations. The sooner Timor-Leste knows how much natural resource wealth it can rely on to support its economy, the easier it will prove to plan accordingly.

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