



## Government of Tuvalu

# Intended Nationally Determined Contributions

Communicated to the UNFCCC on 27 November 2015

### Introduction

In accordance with the relevant paragraphs of Decisions 1/CP.19 and 1/CP.20, Tuvalu hereby communicates its Intended Nationally Determined Contributions (INDC) towards meeting the ultimate goal of the UNFCCC, and provides up-front information in tabular format to facilitate the clarity, transparency and understanding of the INDC. Additional accompanying information, relating to mitigation actions and support for implementation, is provided.

### Intended Nationally Determined Contributions (INDC)

Tuvalu commits to reduction of emissions of green-house gases from the **electricity generation (power) sector, by 100%, ie almost zero emissions by 2025.**

Tuvalu's indicative quantified economy-wide target for a reduction in total emissions of GHGs from the entire **energy sector to 60% below 2010 levels by 2025.**

These emissions will be further reduced from the other key sectors, agriculture and waste, conditional upon the necessary technology and finance.

These targets go beyond the targets enunciated in Tuvalu’s National Energy Policy (NEP) and the Majuro Declaration on Climate Leadership (2013). Currently, 50% of electricity is derived from renewables, mainly solar, and this figure will rise to 75% by 2020 and 100% by 2025. This would mean almost zero use of fossil fuel for power generation. This is also in line with our ambition to keep the warming to less than 1.5<sup>0</sup>C, if there is a chance to save atoll nations like Tuvalu.

Tuvalu considers that the focus of INDCs should primarily be mitigation. Notwithstanding the invitation to Parties in Decisions 1/CP.20, par. 12 to “consider communicating their undertakings in adaptation planning or consider including an adaptation component in their INDCs”, Tuvalu’s vulnerability and the adaptation actions continue to be comprehensively articulated in other national documents such as NAPA, National Communications, National Strategic Action Plan for Climate Change and Disaster Risk Management, National Climate Change Policy. The government plans to develop its National Action Plan in 2016.

### Information to Facilitate Clarity, Transparency and Understanding

Tuvalu		27 November 2015
Parameter		Information
Period for defining actions		Start year: 2020   End year: 2025
Type and level of Commitment		Electricity (power) sector and energy sector
Reference year or period		Base year, 2010, emissions $\cong$ 20 Gg CO2 eq
Estimated, quantified emissions impact		Reduce GHG emissions by 100% from the electricity sector by 2025  Reduce GHG emissions from energy sector by 60% below 2010 level by 2025
Coverage	% National emissions (as at 2015)	Approximately 100%
	Sectors	Energy -Electricity generation -Transport -Other (cooking)  Agriculture Waste
	Gases	Carbon dioxide (CO <sub>2</sub> ) and methane (CH <sub>4</sub> ). Others are negligible
	Geographical	Whole of country (includes all outer islands)

Tuvalu		27 November 2015
Parameter		Information
	boundaries	
Further information, relevant to commitment type, required for the purpose of providing Clarity, Transparency and Understanding		Eg. Annual estimated reductions, methodologies and assumptions for determining BAU or intensity baseline, peaking year
Intention to use market based mechanisms to meet commitments		<b>NO</b>
Land sector accounting approach		N/A
Metrics and Methodology		Consistent with methodologies used in Tuvalu's Second National Communications (currently being finalised) using the 1996 IPCC Guidelines for GHG Inventory.
Planning Process		<p>Tuvalu adopted an all-inclusive process of engaging relevant stakeholders through bilateral consultations and workshops. The first workshop involving key Departments and Ministries provided much needed awareness about INDCs and the provision of additional data/information. It strengthened the whole-of-government process by providing national ownership of the INDC, as well as helped realise the synergies between other processes, including National Communications, National Energy Policy, National Strategic Action Plan for Climate Change and Disaster Risk Management (2012-2016), Master Plan for Renewable Energy and Energy Efficiency in Tuvalu (2012-2020), National Strategic Plan and externally funded development projects in related areas.</p> <p>The second national consultation was used for the validation of the proposed targets contained in Tuvalu's INDC, before it was presented for approval by National Advisory Council on Climate Change (NACCC) and endorsement by Cabinet prior to its</p>

Tuvalu		27 November 2015
Parameter	Information	
	submission to UNFCCC.	
Fair and Ambitious	<p>Tuvalu's emissions are <b>less than 0.000005%</b> of global emissions, one of the lowest from any Parties, negligible in the global context. The import of fossil fuels into the country is used as proxy for the GHG emissions. The total fuel imports remained almost constant at around 3500 kL, from 2001 – 2012. It declined by about 14% in 2013, but increased by approximately 23% in 2014 mainly due to the increase in the number of ships servicing the outer atolls. However, the figures for 2015 are showing significant decline in emissions due to the installation of new solar PV systems.</p> <p>Tuvalu is the world's second lowest-lying country and sea level rise poses a fundamental risk to its very existence. Climate change through rising temperatures and irregular rainfall are already impacting on income from fish and crops. In this context, the target of zero dependence on important fossil fuels for electricity generation by 2025, cannot be more ambitious. Moreover, its targets to reduce emissions from the other energy sectors, mainly transport, are significant given that this is one of the most rapidly growing sources of carbon emissions.</p>	

## Background Information on Tuvalu's INDC

### General

Tuvalu archipelago comprises nine small islands, six of them being atoll islands (with ponding lagoons) namely Nanumea, Nui, Vaitupu, Nukufetau, Funafuti and Nukulaelae. The remaining three islands, Nanumaga, Niutao, and Niulakita are raised limestone reef islands. All the islands are less than five metres above sea level, with the biggest island,

Vaitupu, having a land area of just over 524 hectares. The total area is approximately 26 km<sup>2</sup> with an EEZ of 719,174 km<sup>2</sup>.

Tuvalu is a Least Developing Country with a per capita income of less than USD4000, and is the smallest of any independent state. According to a World Bank (2013) report, Tuvalu's gross domestic product (GDP) was estimated at USD 39.7 million in 2013 and was the smallest of any independent state. GDP growth in the past was volatile and this is expected to continue into the future due to Tuvalu's dependence on fishing and internet domain licensing fees, remittances, and trust fund returns, all of which are dependent on exogenous factors beyond the government's control. Due to the small population and lack of land area and resources, the scope for economic diversification, including exports, is minimal. Nearly everything, including skilled services, is imported. Fuel and food constitute nearly half of total imports of goods.

## **Mitigation**

### **Greenhouse Gas Emissions**

According to Tuvalu's draft Second National Communications, the Energy sector is the major contributor to CO<sub>2</sub> emissions (100%). The Waste sector is the main contributor of CH<sub>4</sub> emissions (74.7%) followed respectively by the Agriculture sector (24.7%). On a mass basis, emissions of CO<sub>2</sub> are the most important. This is largely due to the importance of fossil fuel combustion as a source of CO<sub>2</sub>. Land-use change and forestry, is not an important CO<sub>2</sub> source in Tuvalu. In terms of carbon dioxide equivalent, Tuvalu's gross aggregated GHG emissions (not including the LUCF sector), across all sectors, totaled 16.95 Gg CO<sub>2</sub>-e in 2002 and the net GHG emissions (including the LUCF sector) were practically the same figure (16.92 Gg CO<sub>2</sub>-e).

Within the energy sector, emissions from electricity generation contribute to 41%, transport sector 40% and the remaining 18% from other sectors.

One of the many constraints to development is Tuvalu's high dependency on imported energy resources, primarily petroleum products. Tuvalu has no conventional energy resources and is heavily reliant on imported oil fuels for transport, electricity generation and household use. High fuel prices and fluctuations have a destabilizing effect on businesses and households, limiting growth and reducing food security, especially in the most isolated outer islands.

Renewable energy resources such as solar, wind, biomass and ocean energy are recognized as potential energy alternatives in the country. In response to the world oil market and to ensure enhanced energy security, the Government of Tuvalu (GOT)

committed to get 100% of its electricity from renewable energy sources by 2020. The Tuvalu National Energy Policy (TNEP), formulated in 2009, and the Energy Strategic Action Plan defines and directs current and future energy developments so that Tuvalu can achieve the ambitious target of 100% RE for power generation by 2020.

Tuvalu's Master Plan for Renewable Energy and Energy Efficiency (TMPREEE), 2012-2020, outlines the way forward to generate electricity from renewable energy and to develop an energy efficiency programme.

It has two stated goals:

1. To generate electricity with 100% renewable energy by 2020, and
2. To increase energy efficiency on Funafuti by 30%.

According to TMPREE, Tuvalu must develop 6 MW renewable energy electricity generation capacity in the next eight years. The initial capital cost of solar arrays, wind turbines and batteries to replace the current energy demand is estimated to be A\$52 million.

By the end of 2012, the output capacity of renewable energy electricity generation using PV technology totaled a mere 146 kW (peak). There has been a steady increase in installations over the last three years and the country is tracking well in terms of meeting most of its target by 2020. The remaining time will be used to make any shortfall due to production efficiencies, weather conditions (that will affect available renewable resources) and other demands from the consumers.

Large scale implementation of energy efficiency improvements will also help reduce the electricity demand. Given the steady and continuing increase in the price of diesel oil, the renewable electricity and energy efficiency programme will not only be cost effective but will ensure that affordable electricity is available to the people of Tuvalu.

It is estimated that following the completion of the renewable electricity and energy efficiency programme, the use of the diesel generator plant will reduce by up to 95% with a consequent reduction in diesel fuel consumption. Savings in diesel fuel over the 30 year life of the overall programme are estimated to be A\$152 million (2011 dollars) assuming oil prices continue to increase at the current long term trend. After allowing for battery replacements and other maintenance, which are estimated to cost A\$115 million, the net saving over the 30 year programme will be A\$37 million.

Whilst the focus in renewable energy has largely been the solar through PVs, Tuvalu is ready to embrace other technologies, for example harnessing ocean energy, once these become available and affordable.

## **Planned Mitigation Actions**

### **1. Renewable Energy**

To meet the above objectives, electricity will be generated using renewable energy in all the nine islands of Tuvalu. The Outer Islands are being developed as a priority because fuel transportation from Funafuti increases the cost of generation and has environmental risks associated with potential fuel spill. Furthermore, the Outer Islands generate 18 hours a day (rather than 24 hours) and the power systems are less reliable.

On Fogafale, the main island of Funafuti atoll, due to the high population density, available land is scarce and ground-mounting of the proposed photovoltaic (PV) arrays that will form the major component of the renewable electricity system, is not considered practicable. In order to provide the required area for the PV arrays, in 2011 the Tuvalu Electricity Corporation (TEC) announced the “1000 Solar Roof Programme”. In this programme, about half of the current roof space of the buildings in Funafuti will be occupied by PV arrays. In the case of the Outer Islands where more ground space is available, it is likely that a mix of roof mounted and ground mounted arrays will be adopted.

Initially the renewable electricity programme in Funafuti will comprise of the installation of PV arrays with battery storage because this technology is well proven in Tuvalu. In the early stages of the programme, a detailed investigation examined the feasibility of wind turbine generation in Funafuti as wind generation could offer significant technical and economic benefits. Wind measurements in several parts of Funafuti, show good potential for wind energy. Under a World Bank project proposal (described below) wind turbines will be installed from 2016 onwards. A wind-solar mix will optimise the level of battery storage required and the level of diesel generation required.

The system will require standby diesel generation to provide a back-up to the renewable energy when prolonged weather conditions limit renewable energy generation. Conversion or replacement of the existing diesel generators to run on bio-diesel fuel was proposed to take place in the last stage of the renewable electricity programme. It is estimated that 5% of the annual electricity production will be supplied from bio-diesel generation. This, however, is incumbent upon the development of a master plan for the coconut industry.

The following Tables summarises the status of the various Renewable Energy Installations

**Table: Summary of Power systems in Tuvalu**

<b>Stations</b>	<b>Diesel Capacity (kW)</b>	<b>Solar Capacity (kW)</b>	<b>Comments</b>
Nanumea	144	195	actual output approx. 90%
Nanumaga	144	205	actual output approx. 90%
Niutao	144	230	to be online by end 2015
Nui	120	60	actual output approx. 60%
Vaitupu	144	400	to be online by end 2015
Nukufetau	120	77	actual output approx. 60%
Nukulaelae	60	45	actual output approx. 60%
Funafuti	1200	735	connected to grid, no storage
<b>Total</b>	<b>2076</b>	<b>1947</b>	
<b>Proposed World Bank Project 2015/2017</b>			
Solar		925	
Wind		200	
	<b>2076</b>	<b>3072</b>	<b>5148</b>

## **2. Energy Efficiency**

Energy efficiency improvements will be initially targeted on Funafuti. Funafuti has a higher power demand per capita than the outer islands and also consumes 85% of the electricity generated by the Tuvalu Electricity Corporation (TEC). Meeting the 30% target will allow Tuvalu to maintain current generation levels over the next eight years at 2% annual growth of GDP. The energy efficiency programme will include public education, energy audits and technology improvements.

A proposed **World Bank project** is aimed at providing additional energy generation from solar PV and will include investment in modest wind-power capacity. Even if, for various reasons, the role of wind in Tuvalu's future power mix is likely to be smaller than solar PV, it will serve as an important capacity building in this technology for TEC. The solar PV investment will provide sufficient battery storage and a power-conditioning system to ensure grid stability, as intermittent RE sources become an increasingly dominant portion of Fogafale's power mix.



In addition, the project will finance strategic EE investments in the largest electricity-consuming sectors. These investments could significantly reduce the need for future investments on the generation side. Moreover, the project will bring a longer-term perspective on RE investments from all sources by including battery storage and grid-forming inverters that represent major investments but are critical for long-term grid stability. Thus, this project will facilitate the planned and other future incremental RE additions without leading to grid instability and other system problems that would seriously set back the country's plans toward achieving the goal of 100 percent penetration of RE in the future.

### **3. Plans, Policies and Regulations**

Under a proposed Energy Efficiency Act, The Government of Tuvalu will introduce legislation to promote energy efficiency, and control the importation, use and sale of inefficient electrical appliances into the country. Under the Energy Efficiency Regulations, 2015, which will come into effect on 1 January 2016, Minimum Energy and Performance Standards and Labelling (MESPL) will determine importation and use of appliances and goods. This is in line with GOT's objective to promote energy efficiency, energy conservation and the use of renewable sources of energy as part of Tuvalu's obligations under the UNFCCC and related conventions.

### **Means of Implementation**

The Government of Tuvalu believes that climate change is real and is the greatest threat to its low lying atolls and people. Negative effects are already taking place and these will gravely undermine efforts towards sustainable development and threaten the survival and the sovereignty of the nation and her people. While longer term impacts such as sea level rise could result in the unavoidable out-migration of some of her people, they have a right to pursue any and all means to ensure their nation survives and the legacy remains, with future generations living productive lives on these islands.

Climate change is a cross-cutting development issue as it affects every aspect of the Tuvaluan way of life and livelihoods. Climate change impacts exacerbate existing cultural and socio-economic vulnerabilities. These impacts threaten the security of the nation. To this end, the people of Tuvalu must collectively build and strengthen the nation's resilience to combat climate change. However, this cannot be done alone and in isolation; regional and global cooperation is imperative to put Tuvalu on a pathway to climate change resilience and sustainable development.

Tuvalu is of the view that the scientific underpinnings of the discussions on climate change are clear in defining impact thresholds. Therefore, international cooperation is required. Any failure to reach an agreement to radically cut emissions would jeopardize Tuvalu's development and survivability.

Tuvalu continues to revise its policies in energy, climate change and the electricity sector in line with its sustainable development as contained in the National Strategic Development Plan. The significant costs of imported fossil fuels are a major factor in Tuvalu's balance of payments. Whilst Tuvalu continues to take actions to reduce its fossil fuel import bill, thereby reducing its carbon footprint, it will underscore the need for support to assist in its ambition for transforming the energy sector to non-carbon sources through greater use of renewables such as solar and wind and use of transformational technology.

Tuvalu's INDC includes unconditional, conditional and aspirational contribution to reducing emissions. The unconditional contribution includes actions that Tuvalu has already undertaken through renewable energy programmes to reduce, significantly, its reliance on imported fossil fuels for electricity generation. It will continue to push, through other measures such as conservation, education and energy efficiency and other measures, recognizing its extreme vulnerability to the impacts of fossil fuel prices. These comprise approximately a quarter of the total imports, and any reduction in the energy bills would assist in diverting development funds to other priority areas such as poverty reduction.

International support is crucial to enable Tuvalu implement further actions enshrined in its Policies and Plans, including at sectorial level. For example, the growing emissions in the transport sector, as evidenced from the increased numbers of vehicles on land and vessel for sea transport, needs to be addressed through technological innovations. The goal to pursue a zero carbon development pathway by 2050 is dependent on availability of finance and technology.