

ASSESSING THE COST OF ADDRESSING CLIMATE CHANGE IN THE ENERGY AND AGRICULTURE SECTORS IN NAMIBIA



<http://www.undpcc.org/en/namibia>

For these men in the Omusati region of Namibia, drip irrigation brought triple benefits: immediate food on the table, temporary employment during the harvesting season, and a way to address longer-term impacts of climate change. Photo: Martha Mwangingi, UNDP

→ Climatic constraints are one of the main factors that limit socio-economic development in Namibia. Recent droughts have hit Namibia, combined with human activities they have led to degradation of natural resources on which the existence of the majority of the population depends. According to a national assessment of investment and financial flows (I&FF) completed in March 2011, more than US\$ 4 billion is needed through to 2030 for Namibia to implement priority actions to:

- Reduce (or mitigate) emissions of greenhouse gases from the energy sector, including transport; and
- Adapt to the impacts of climate change in the land-use sector (forestry, agriculture).

About two thirds of these funds are needed to implement adaptation measures to improve livestock production (US\$ 3.0 billion). In addition, US\$ 1.2 billion is needed to switch the energy mix towards renewable energy and energy efficiency measures, and promote LPG in the transport sector.

Having completed the I&FF assessment, the government of Namibia is now well placed to discuss the costs of

climate change in the international climate change negotiations, and to identify the most appropriate policy responses. This work was conducted as part of the global UNDP project, Capacity Development for Policy Makers to Address Climate Change, which is funded by the governments of Norway, Switzerland, and Finland, UNDP and the UN Foundation.

Selection of key sectors

Namibia's **energy** sector is of key strategic importance to the country's economy, as the availability and access to reliable and affordable sources of energy is, and will remain, a prerequisite to the country's ongoing development. Mining is a key industry. Namibia's population of some 2 million people is spread over a land area exceeding 800,000 km². In comparison to other developing nations, the country's total annual per capita energy consumption of approximately 7.5 MWh (Megawatt hours), producing a gross domestic product (GDP) of N\$52 billion (US\$ 8 billion), or N\$26,000 (US\$ 3,700) per person, is high. Despite the high potential for renewable energy in the country, liquid fuel consumption constituted over 70% of Namibia's total energy demand in 2006 (Capoco et al., 2007).

Namibia's population of 2 million people is spread over a land area exceeding 800,000 km², making Namibia one of the least densely populated countries in the world. Although the climate of Namibia makes agriculture a somewhat marginal activity, subsistence agriculture is vital for a large number of rural Namibians. The 2003/4 Household Income and Expenditure Survey (CBS, 2005) indicated that 48% of rural households obtain their main source of income from subsistence farming. It is likely that the **landuse** activities including livestock and cropping assessed will be adversely affected by the predicted increases in temperatures and variability of rainfall as a result of climate change.

Institutional arrangements

Namibia's Ministry of Environment and Tourism was the main co-ordinator of the energy assessment. The Ministry of Mines and Energy, the Ministry of Trade and Industry, and the Ministry of Finance also supplied representatives for meetings and were directly involved in all steps of the analysis, along with the UNDP country office, the Renewable Energy and Energy Efficiency Institute, and VO Consulting.

The Adaptation Working Group contained members from the Ministry of Agriculture, Water and Forestry, the Ministry of Environment and Tourism, and the Ministry of Trade and Industry. The UNDP Country Office and Integrated Environmental Consultants Namibia also provided valuable support.

Both teams were backstopped by a regional centre of excellence, the Pan-African START Secretariat, based in Tanzania, and UNDP.

ASSESSMENT OF INVESTMENT AND FINANCIAL FLOWS

Objectives of the Investment and Financial Flows Assessment

The overall objective of the I&FF assessment is to determine the extent and sources of funds needed to address climate change at the national level, and builds directly on national government strategies, plans and programmes. In essence, the assessment seeks to answer the question: *"From a development perspective, what can my country do to address climate change in selected key sectors, and what level of financial contributions will be needed to achieve these objectives?"*

In this context, the I&FF team examined the following questions:

- What are the main adaptation / mitigation measures for the selected sectors in the next 25 years?
- Who is investing in the sector / Who are the main stakeholders and sources?
- What changes / increase in I&FF will be needed in the sectors?
- What additional I&FF are needed to address climate change?

The I&FF assessment covered the time period 2005-2030, using a baseline scenario and a reference scenario. Values are given in constant 2005 US\$ (N\$ 1 = US\$ 6.41). The assessment looks at the changes in investments needed for three different groups: households (families, individual farmers), corporations (private and NGOs), and the government.

For the energy sector (mitigation of greenhouse gas emissions)

The energy sector group concentrated on two energy sub-sectors: electricity generation and transport. Under electricity generation, it was agreed to consider solar, wind and energy efficiency as mitigation measures. Under transport, the working group agreed to focus on liquid fuels, and especially on petrol-powered passenger vehicles.

Overall, the incremental costs of the mitigation scenarios for the electricity generation and transport sub-sectors (factoring in the baseline costs) are estimated to be US\$ 1.2 billion over the

time period of analysis. The costs per ton of CO₂ eq. emissions reduced are estimated to be US\$102 per ton. More specifically, the incremental costs were as follows for the measures:

- Replacement of diesel generators with solar technology (-US\$ 1,123.9 million, n.b a saving);
- Replacement of coal power station with wind power (-US\$ 288.3 million, n.b. a saving);
- Increased solar power: expected to replace the electricity provision by local diesel generators (US\$ 1103.1 million);
- Increased wind power: installed capacity of wind power investments are expected to be 42MW by 2030 (US\$ 75.9 million);
- Energy efficiency measures: expected to decrease energy demand by 20% by 2030 (US\$1,363.2 million); and
- Increased use of LPG in transport (US\$42.4 million).

In addition to the benefits from reduced GHG emissions under the mitigation scenario, a reduction of energy imports from 50% to 30% of energy consumed will result with these measures, which would provide greater self-sufficiency.

For the land-use sector (adaptation to the impacts of climate change)

The I&FF assessment in the agriculture sector focused on two aspects: The first being livestock, concentrating on cattle, small stock and game; the second being crops, particularly wheat, maize, mahangu, and sorghum. Taking the two analyzed sub-sectors - livestock and crops - together, the overall incremental costs of the measures are US\$3.0 billion. More specifically, the costs were as follows:

LIVESTOCK SUBSECTOR:

- Extension services (US\$1.7 million);
- Additional extensions services – increasing the level of support provided to subsistence farmers, to share best practices and increase market availability (US\$103.1 million);
- Destocking: reducing cattle numbers in communal areas to sustainable levels (US\$ -10.5 million, a net saving);

- Choice of breeds: encouraging farmers to switch to indigenous breeds of livestock (US\$ 835.3 million);
- Game switching: encouraging commercial farmers to switch to game production from cattle and small stock production (US\$ 601.4 million); and
- Implement a programme on debushing: increasing the area of rangeland for farming (US\$ 914.3 million).

CROPS SUBSECTOR:

- Rain fed subsistence (US\$ -37.5 million, a net saving);
- Rain fed mechanisation: partial mechanisation of communal farms (US\$ 195.1 million);
- Rain fed commercial (US\$ -8.7 million, a net saving); and
- Irrigation commercial – training of farmers (US\$ 441.6 million).

An expected impact of these activities would be the increase of tonnage of meat produced per annum by 40,000 tonnes by 2030.

EVALUATION OF POLICY IMPLICATIONS FROM THE I&FF ASSESSMENT

Climate change is a relatively new item on the national development agenda in Namibia. Many of the legal and policy instruments developed in the past do not necessarily take climate change issues into account. This assessment evaluates various mitigation and adaptation measures for the energy and agriculture sectors, and as such can be a useful tool for policy makers.

Following the I&FF assessments, the Namibian government has developed a national Climate Change Policy, which was officially approved by Cabinet in May 2011. The main purpose of this policy is to provide the legal framework and overarching national strategy for the development, implementation, monitoring and evaluation of climate change mitigation and adaptation activities. The policy will promote the enhancement of synergies amongst sectors, policies and stakeholders for effective and efficient action on climate change mitigation and

SUMMARY TABLES OF INCREMENTAL INVESTMENT COSTS

Table 1: Incremental cumulative discounted I&FF for all investments in each sector, by investment entity and funding source, 2005-30 (million 2005US\$)

Category of Investment Entity	Source of I&FF Funds		Mitigation			Adaptation		
			Energy			Agriculture		
			ΔIF	ΔFF	ΔO&M	ΔIF	ΔFF	ΔO&M
Households	Domestic	Equity and debt	1,633.46	0.00	-1,025.69	13.96	0.00	240.5
	Total Household Funds		1,633.46	0.00	-1,025.69	13.96	0.00	240.5
Corporations	Domestic	Domestic equity (including internal cash flow)	288.79	0.00	15.11	278.39	0.00	1,030.56
		Domestic borrowing (bonds and loans)	224.68	0.00	-5.51	223.44	0.00	0.00
		Total Domestic Sources	513.51	0.00	9.61	501.78	0.00	1,030.56
	Foreign	Foreign direct investment (FDI)	0.00	0.00	0.00	58.4	0.00	0.00
		Foreign borrowing (loans)	212.8	0.00	0.00	223.39	0.00	0.00
		Foreign aid (ODA)	0.00	0.00	0.00	0.00	0.00	0.00
		Total Foreign Sources	212.8	0.00	0.00	281.74	0.00	0.00
	Total Corporation Funds		726.30	0.00	9.61	783.57	0.00	1,030.56
Government	Domestic	Domestic funds (budgetary)	-103.09	24.25	-58.09	496.30	9.41	98.52
	Foreign	Foreign borrowing (loans)	0.00	0.00	0.00	58.4	0.00	0.00
		Bilateral foreign aid (bilateral ODA)	-44.18	10.39	-0.63	246.07	0.00	0.00
		Multilateral foreign aid (multilateral ODA)	0.00	0.00	0.00	58.4	0.00	0.00
		Total Foreign Sources	44.18	10.39	-0.63	362.86	0.00	0.00
Total Government Funds		-147.27	34.64	-58.72	859.17	9.41	98.52	
Total			2,212.49	34.64	-1,074.81	1,656.69	9.41	1,369.58

IF = Investment Flow; FF = Financial Flow; O&M = Operation & Maintenance costs
 ΔI&FF = incremental changes of Investment and Financial Flows; ΔO&M = incremental changes of Operation and Maintenance costs
 Negative values mean net savings
 Source: National I&FF assessment

adaptation. The outcomes of the I&FF assessment provide guidance on needed adaptation and mitigation actions for the policy. The government identified the sectors water and fisheries as priority sectors to conduct further financial assessments for.

For the **energy** sector, policy recommendations include: Expanding the share of wind and solar power generation in the national energy mix, as in spite of their higher up-front cost they have comparatively low operation and maintenance costs. Improving energy efficiency will reduce the overall costs of energy consumption and therefore be a win-win solution. No-regret options are available in the diesel and coal sectors as

the implementation of measures will lead to net savings of I&FF.

For the **agriculture** sector, the suggested policies include: A programme to mechanize subsistence farming, providing communication, advisory and training services to communal farmers to increase drought preparedness and response, implementing an awareness raising campaign to sensitize farmers regarding their choice of breeds and number of livestock, promoting improved agriculture and water management practices including timing of farming activities, tillage practices, inter-cropping etc.

Table 2: Incremental annual I&FF for all investments in each sector, 2005-30 (million 2005US\$)

Years	Mitigation			Adaptation		
	Energy			Agriculture		
	ΔIF	ΔFF	ΔO&M	ΔIF	ΔFF	ΔO&M
2005	163.39	0.00	0.00	0.00	0.00	0.00
2006	156.23	0.00	0.00	0.00	0.00	-0.05
2007	149.11	0.00	0.00	0.00	0.00	-0.08
2008	142.08	0.00	0.00	0.00	0.00	-0.11
2009	135.16	0.00	0.00	0.00	0.00	-0.14
2010	289.18	5.25	-7.31	81.7	0.01	18.45
2011	245.17	0.93	-8.31	79.36	0.01	30.73
2012	231.6	1.11	-9.55	76.84	0.30	39.6
2013	219.09	1.31	-11.05	74.84	0.19	48.38
2014	219.76	1.56	-12.85	72.76	0.90	54.91
2015	49.45	1.85	-20.29	69.44	0.84	62.75
2016	203.09	2.13	-22.41	67.11	0.77	67.79
2017	196.01	2.45	-24.99	64.68	0.72	69.40
2018	189.58	2.82	-28.11	62.41	0.66	72.39
2019	181.6	7.79	-31.84	60.21	0.61	74.63
2020	179.32	4.51	-36.44	58.08	0.57	76.22
2021	175.96	5.18	-41.65	56.03	0.53	77.24
2022	173.83	5.94	-47.77	54.05	0.49	77.77
2023	179.13	6.80	-54.95	52.15	0.45	77.87
2024	180.89	7.79	-63.36	50.32	0.42	77.62
2025	183.85	8.91	-73.18	48.57	0.39	77.06
2026	188.11	10.19	-84.65	46.9	0.36	76.23
2027	194.33	11.62	-98.01	45.31	0.33	75.19
2028	201.26	16.21	-113.58	43.8	0.31	73.98
2029	213.71	15.54	-131.71	42.36	0.28	72.62
2030	227.84	17.61	-152.8	40.99	0.26	71.14

IF = Investment Flow; FF = Financial Flow; O&M = Operation & Maintenance costs
 ΔIF & ΔFF = incremental changes of Investment and Financial Flows; ΔO&M = incremental changes of Operation and Maintenance costs
 Negative values mean net savings
 Source: National I&FF assessment



Knowledge Platform
 The project website www.undpcc.org contains information on activities in Namibia, the I&FF methodology, and many other resources in French, English, Spanish and Russian.

March 2011

More information on activities in Namibia

Olimpio Nhuleipo
 National Project Focal Point
 Namibia
olimpio@met.na

Martha Mwangi
 Head Environment
 UNDP Namibia
martha.mwangi@undp.org

Rebecca Carman
 Global project coordinator
 UNDP New York
rebecca.carman@undp.org