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An 'agenda for change':

Quantifying climate change impacts on natural resource-based economies

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For climate change adaptation to be beneficial to developing countries, it must begin quickly and this will require domestic political will. The third assessment report of the Intergovernmental Panel on Climate Change (IPCC) made clear that even if the Kyoto Protocol is fully implemented, inertia in climatic systems means that some level of climate change is unavoidable. The countries most vulnerable to CC include many developing nations; while those better-able to adapt and less willing to mitigate are those most guilty of past pollution, including many developed nations.

Namibia is one of the most vulnerable countries in the world. Anticipated climate change impacts include droughts, sea-water inundation of ports, reduced food security and sweeping changes to the composition of its natural resources. It also has one of the most progressive constitutions in the world and some of the world's most advanced biological and socio-economic information – natural resource accounts and a social accounting matrix. Identifying the impacts and developing solutions are necessary. IIED is working with the Namibian government on these challenges.

"Climate change is one of the most serious threats to Namibia's environment, human health and well-being as well as its economic development. The arid environment, recurrent drought and desertification have contributed to make Namibia one of the most vulnerable countries to the effects of climate change. Considering the natural resource based economy and limited technical and financial resources, climate change could potentially become one of the most significant and costly issues that affect the national development process in Namibia."

Ministry of Environment and Tourism, 2006

Climate change impacts, adaptation and mitigation pose complicated political challenges to developing countries. Many African countries are heavily dependent on climate-sensitive sectors. In Namibia over 30% of GDP relies on primary sectors, i.e. natural resource-based production like agriculture, fisheries and livestock. Compounding this are concerns over food scarcity, inequitable land distribution and heavy dependence on rain-fed subsistence agriculture. Namibia is a water-stressed country that needs to manage its domestic adaptation to climate change.

Namibia's environment

Ecosystem: Key climate change impacts for Namibia are forecast to be higher temperatures (2-7°C by 2100), less rainfall (by 30-200mm) leading to shorter growing seasons, sea level rise (30–100 cm by 2100) and extreme localised weather events, which will affect biodiversity more than gradual global or regional changes.

Species: Species can only reproduce, grow and survive within specific ranges of climatic and environmental conditions. Climate change means plants and animals must either adapt or migrate.

- Ranges - By 2085, over 60% of all key species' ranges in Africa will have shrunk, with one-quarter losing all their climatically suitable area. In Namibia, over 30% of threatened plant species will become critically endangered or extinct by 2080. Namibia's endemic species are well-adapted to the arid conditions and will become less threatened as their potential range expands. Yet in-migration of new species will be a new risk.
- Phenology - shifts in the timing of seasonal events are expected - altered reproductive cycles and length of growing season.
- Species interaction or interactions between organisms and their nonliving environment (which are fundamental to functioning ecosystems) will change but the impact of this remains largely unknown. Key likely changes are in competitive ability and mismatches in timing between interdependent species, affecting factors such as pollination.

KEY MESSAGES:

- **Climate change impacts will fall heavily on arid countries in Africa**
- **IIED is quantifying the impacts of climate change on Namibia's economy and natural resources, which currently account for over 30% of GDP**
- **Poverty challenges posed by climate change need to be addressed today**
- **Fostering political will for adaptation is key**
- **Policy needs to link opportunities for economic growth with likely Environmental change**

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- Extinction rates - mass extinction scenarios exist, but the chief new threat is from changed migration patterns through a landscape that is increasingly impassable due to the widespread loss and fragmentation of habitats.

For example, marine fisheries rely on the nutrient-rich upwellings of the cold Benguela current on Namibia's west coast, and are threatened by possible changes in the frequency and timing of this. Over the last decade, a trend of warmer sea surface temperatures has been noted over the northern Benguela region and there is concern that the warming trend might be one of several environmental factors that have contributed to declining fish stocks in recent years.

Namibia's poverty and livelihoods

Wealth distribution in Namibia is unusually inequitable (with a Gini coefficient of 70). This presents special challenges to the government and donor agencies concerned with alleviating poverty. With over half of the population dependent on subsistence agriculture and a recent history of rural food shortages in drought years, the likely impact of anticipated climate change on poverty and rural livelihoods in Namibia becomes clear: higher risk of deepened poverty through greater food insecurity and a long-term erosion of livelihood stability and security. Projected changes in climate bringing droughts and shortage of clean water for drinking and washing will increase the number of deaths of children caused by malnutrition, malaria and acute respiratory infections.

Climate change will hit the poorest hardest. If, as some models predict, the climate of Namibia becomes hotter, drier and more variable in the future, marginalized rural populations and the urban poor will be most severely affected. Although the average population density in Namibia is very low, population pressure is considerable in the north-central and north-eastern regions. Currently, higher average rainfall in these areas than elsewhere in the country makes it possible to survive from subsistence agriculture, but poverty is already widespread and these people are therefore particularly vulnerable to changes in precipitation rates.

Namibian policy needs

Namibia is not in Annex I of the Kyoto Protocol, and as such is not currently required to reduce its carbon emissions. Estimated per capita carbon dioxide emissions in Namibia, at 1.1 tonnes per capita annually are barely one-tenth of UK emissions rates.

Although the need for a national policy that specifically addresses climate change has been recognised, there is no such policy at the moment. But there is considerable work being conducted by NGOs, within ministries and universities on CC impacts, adaptation and mitigation. The political angle needs to be addressed, and as ever, figures that provide a clear message can be powerful motivators of change.

Namibia has many pressing development challenges and struggles to provide for its population with current levels of environmental degradation. Future more intensive environmental impacts would damage the country further. Yet some investments in adaptation today will curtail future climate change costs.

National accounting and climate change

IIED's approach is to use outputs from a Social Accounting Matrix (SAM) together with National Resource Accounting (NRA) for the Namibian economy to build an environmental Computable General Equilibrium (CGE) Model. The SAM is a database that provides information on the economic activity in different economic sectors and is designed to examine policy impacts on income distribution and poverty status of different groups in society.

In Namibia NRA methods have been widely used to develop 'satellite' accounts for natural resources (including fish, forests, wildlife, water and minerals) which are consistent with the traditional national economic accounts. Natural resources are generally not included in traditional national accounting systems, meaning that changes in the national natural resource base do not affect the measure of national income. For a country like Namibia, highly dependent on its natural resource base, the extension of the traditional national accounting system to incorporate environmental accounts has been useful for policymaking.

In order to capture the impacts of climate change on Namibia's GDP-growth, a CGE model, including data from the SAM and NRA together with estimates of how the natural resources will be affected from projected climate change scenarios, will be constructed. The approach is novel in CGE-modelling, examining Namibia's GDP-growth changes through the effects on national natural resources. In addition, poverty and the distribution of/access to natural resources will be examined.

IIED is generating outputs for the Namibian government and donor agencies, that include robust economic growth forecasts under anticipated climate change impacts and jargon-free dissemination of research results. The methodology employed is a pilot and its successful application here will provide governments in other countries a tangible example of how policymakers can use NRA data. Those gathering data can ensure their outputs are relevant to decision makers. Research results will feed into assessments by the international community (for example, the IPCC assessments) on which international decision-making and policy development are based.

Conclusions

Climate change is likely to exacerbate the dry conditions already experienced in southern Africa. And when rainfall does come, it will be in bursts of greater intensity leading to erosion and flood damage. Poverty implications for rural communities will be acute. But these predictions gain little policy traction for change in southern African countries. By investigating the likely economic growth cuts that climate change will make, through an examination of the natural resource implications of climate change, this project is stimulating debate in Namibia on how best to achieve sustainable development in the face of looming risks and challenges.

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