

Economic Impacts of Climate Change in Burundi

Project Number CNTR 200707787

Draft Method and Work Plan –submission to
National Advisory Committee for comment

March 2009



Title	Economic Impacts of Climate Change in Burundi – draft Method and Work Plan Report
Client	Department for International Development (DFID)
Client contract No	Project Number CNTR 200707787
DEW Point Ref	DEW 7475
Contact and correspondence	DEW Point, The Old Mill • Blisworth Hill Barns • Stoke Road • Blisworth • Northampton, • NN7 3DB • UK TEL: +44 (0)1604 858257 FAX: +44 (0)1604 858305 e-mail: helpdesk@dewpoint.org.uk www.dewpoint.org.uk
Authors	Paul Watkiss (Email: paul_watkiss@btinternet.com , Tel: +44 797 104 9682) Tom Downing (SEI), Jillian Dyszynsk (SEI), Alistair Hunt (SEI). Bruce Mead (Dewpoint), Jane Olwoch (SEI)
Amendment record	Version 1 Date:
	Method and Burundi Work Plan (this document) March 2009
Task Manager	Paul Watkiss
Quality Assurance	Tom Downing

The Stockholm Environment Institute (SEI) is the main contractor for this resource centre assignment. SEI is an independent, international research institute. Their researchers have been engaged in environment and development issues at local, national, regional and global policy levels for over a quarter of a century. The Institute was established in 1989 following an initiative by the Swedish Government to create an international environment and development research organisation. Since then, they have established a reputation for rigorous and objective scientific analyses of complex environmental, developmental and social issues. They are well known for work on scenarios, sustainability modelling and vulnerability assessments, which improve public policies and catalyse global transitions to a more sustainable world. They seek to be a leader in the field of sustainability science, understanding the interaction between nature and society, and improving the capacities of different societies to move to more sustainable futures.

Disclaimer

This report is commissioned under DEW Point, the DFID Resource Centre for Environment, Water and Sanitation, which is managed by a consortium of companies led by Harewelle International Limited¹. Although the report is commissioned by DFID, the views expressed in the report are entirely those of the authors and do not necessarily represent DFID's own views or policies, or those of DEW Point. Comments and discussion on items related to content and opinion should be addressed to the authors, via the "Contact and correspondence" address e-mail or website, as indicated in the control document above.

¹ Consortium comprises Harewelle International Limited, NR International, Practical Action Consulting, Cranfield University and AEA Energy and Environment.

Executive Summary

This document outlines the proposed method and work plan for the DFID study on *the Economic Impacts of Climate Change in Burundi*. The objectives of this study are to consider the economic costs of climate change in key sectors (market and non-market), the costs and benefits of adaptation, and the costs and benefits of low carbon growth. The project also aims to use this information to stimulate action within government, private sector and civil society, to provide a body of evidence to support government negotiations for COP 15, and to help build long-term in-country capacity on economic assessments of climate change impacts, adaptation and mitigation.

Priority sectors

A key focus of the study to date has been to agree the priorities and work plan for the implementation phase. To advance this, the study held initial meetings in November 2008 in Burundi to seek in-country priorities. It has also completed a literature review to identify any additional potential priorities.

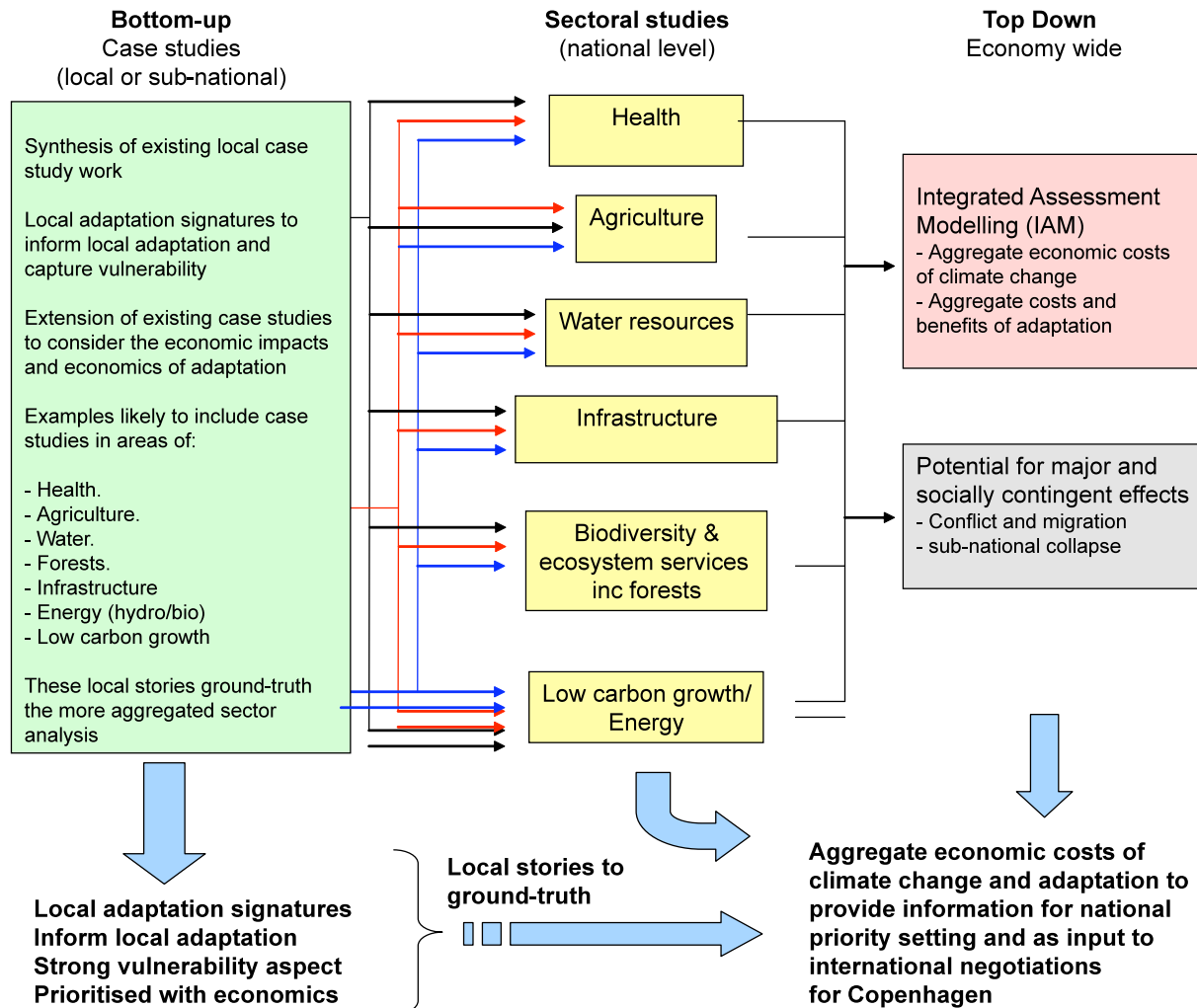
The in-country priorities are strongly shaped by the NAPA. This identifies high vulnerabilities to climate change for the population and the sectors of agriculture, water resources, energy, health, natural landscapes and ecosystems. The NAPA specifically highlights the mutual influences and cumulative impacts of: degradation and exhaustion of soils fuelled by demographic pressure on arable lands and natural resources; the degradation of forestry resources relating also to natural vegetation and artificial woodlots (which are the primary source of fuel); and human environmental degradation relating to underdeveloped and fragile sanitation infrastructure and consequent degradation of sanitary conditions. A high proportion of Burundi's population has high vulnerability because they depend on services that are directly provided by ecosystems (food and energy), and because such a high proportion of the population (and economy) depends on agricultural and livestock sectors (noting previous climate related food crises).

The in-country discussion and literature review have identified the additional risks and potential impact on infrastructure from extreme events (particularly floods). This area is important in relation to future investment and adaptation funding flows. Energy is also identified as a priority sector, and is also relevant because of the links with land-use and biomass. Related to this, there is interest in positive opportunities for carbon finance, and the advantages of low carbon growth in Burundi, where this also advances growth policies (win-win), development co-benefits, and adaptation –mitigation linkages.

Methodology

This study has a number of different aims and objectives, each prioritised towards different potential stakeholders. These include aggregated information on the economic costs of climate change, the costs and benefits of adaptation, and the economic costs and benefits of a low carbon growth pathway, but at the same time, data and information to inform local priorities and adaptation. There is also a focus on a partnership project and capacity building in-country. Tackling all of these aims in a single study is challenging, but to address this, the study is proposing a multi-level approach that works at different aggregation levels, and builds-up several lines of evidence in relation to impacts and adaptation. The proposed approach combines top-down aggregated economic analysis and sectoral economic impact assessment (for the region and each country) with bottom-up local or sub-national case studies on vulnerability and adaptation (adaptation 'signatures') to provide local context and inform decision making. Importantly, the local studies allows consideration of livelihoods, development and poverty alleviation, which would be missed by a high level economic assessment. A schematic of the overall proposal is outlined below. The advantage of this approach is it will combine local 'stories' with more aggregated

estimates, and so build up a coherent message for policy makers, and it also allows the team to ground-truth national and sectoral economic analysis with local context. This approach balances the need to focus on economic valuation, which would naturally lead to an impact assessment or integrated assessment based approach, with current in-country assessments which are more typically based on vulnerability assessment, and orientated to inform local short-term adaptation. The multi-level framework proposed for the study allows both approaches to be used (as complements).



The inception phase has also compiled detailed proposals for implementing the above outline and produced a communication and dissemination plan. The proposed implementation phase would start in January, after discussion of the proposed approach, methods, and priorities, and the incorporation of any comments from, the national advisory committee meeting. The study would aim to deliver initial results for July and to be completed for COP15 in December 2009.

Table of contents

1. INTRODUCTION AND AIMS	1
BACKGROUND: THE ECONOMICS OF CLIMATE CHANGE IN AFRICA	2
2. PRIORITY SECTORS	5
3. METHODOLOGICAL APPROACH	8
STUDY APPROACH	8
STUDY METHODOLOGY – CLIMATE CHANGE RISKS	8
ADAPTATION	9
ADAPTATION SIGNATURES	11
OVERARCHING FRAMEWORK	12
4. IMPLEMENTATION PHASE PROPOSALS	14
A) TOP DOWN AGGREGATE ASSESSMENT	14
B) NATIONAL SECTORAL ANALYSIS	15
C) LOCAL CASE STUDIES	18
D) POLICY RECOMMENDATIONS	19
PROJECT MANAGEMENT	19

1. Introduction and Aims

This document provides a proposed method and work plan for the DFID study '*Economic Impacts of Climate Change in Kenya, Rwanda and Burundi*' focusing on the Burundi part of the study. The study has a number of key aims, as set out in the Terms of Reference:

- To assess the potential impacts of climate change on key sectors on the economy and non-market sectors (such as health) so countries can understand what is at stake for them.
- To stimulate government, private sector and civil society actions to develop and implement policies to adapt to and mitigate (depending on international incentives) climate change.
- To provide an evidence base to inform and guide government's negotiation position for COP 15.

It also has a number of indirect aims:

- To further alert public opinion to the urgency of the climate change challenge, and its potential socio-economic impacts
- To stimulate national debate on the economic costs and benefits of a range of possible actions on adaptation and mitigation
- To encourage a regional approach to negotiations and promoting dialogue on shared challenges
- To build local capacity to analyse the challenges
- To highlight areas where further work is required to understand impacts and policy responses to climate change

The work is targeted at policy-makers and influencing constituencies (e.g. civil society / NGOs / private sector) within the participating countries. It will, however, have significant wider relevance in stimulating debate in the region. The project also aims to help enhance engagement both between developed and developing countries, and amongst developing countries, on the issue of climate change, (in particular energy efficiency, carbon markets and adaptation R, D&D). Finally, the project will also work towards a regional understanding of the issues by combining findings from the initial three countries in this study and other work underway elsewhere in the region.

More specifically, the study is to include at a country level, i.e. for Burundi:

- Impact Assessment: substantive analysis to develop a comprehensive and quantified assessment of the economic impacts of climate change. The impact analysis should emphasise climate effects both on Burundi's economy and prospects for growth, as well as on the poorer and more vulnerable sections of society (specifically via the MDGs).
- Costed Options for Mitigation and Adaptation: analysis of the costs and benefits of climate change mitigation and adaptation in the short, medium and long term, including an assessment of regional interdependence and its consequential multiplier effect. (Time horizons may be informed by country planning processes, e.g. 2020, 2025 and 2030. For adaptation use of the MDG 2015 target may be helpful).

With the country level aim to:

- Alert public opinion to the urgency of the climate change challenge, and its potential socio-economic impact on Burundi;

- Stimulate debate on the economic costs and benefits of action on mitigation (including opportunities for accessing carbon markets and improving energy efficiency and security) and on adaptation (including investments to minimise risks to key sectors of the economy from climate change impacts)
- Stimulate government, private sector and civil society actions to develop and implement policies and programmes that mitigate and adapt to climate change;

This document sets out the proposed methods for undertaking the study, for presentation to the Country Advisor Committee for comment.

Background: The Economics of Climate Change in Africa

The recent IPCC 4th Assessment (WG II summary, IPCC, 2007²) makes it clear that the impacts of future climate change will be mixed across regions. It is now commonly understood that most climate change damage (at least in the short to medium term) will be felt in developing countries (e.g. Stern, 2006³, IPCC, 2007), with Africa the continent of most concern.

There are several reasons for this: many of the largest changes are projected to occur in these countries; their economies rely more on climate-sensitive activities; many operate close to environmental and climatic tolerance levels; and their ability to adapt may be limited because of technical, economic and institutional limitations (Tol et al, 2004⁴).

In line with this, integrated economic assessments identify high economic costs from climate change for Africa (see Downing et al, 2005⁵). Conservative estimates are that African economies could be facing losses of at least 1–2% of GDP, or US\$10–20 billion, annually (quoted in van Aalst et al, 2007⁶) though some sectors will be much more exposed.

Africa is already very vulnerable to climate variability and extremes, with impacts of current climate variability and weather extremes e.g. floods and droughts, which in turn affect economic growth, food security, livelihoods of the poor, and assets (natural resources and infrastructure). An example is included in the box below for Kenya – similar work is being investigated for Burundi.

The future impacts of climate change will change the pattern of such extreme events, but also lead to change associated with mean temperature change, annual and seasonal precipitation, etc. which will also have significant economic effects.

² Parry, M.L., O.F. Canziani, J.P. Palutikof and Co-authors 2007: Technical Summary. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 23-78.

³ Stern, N., Peters, S., Bakhshi, V., Bowen, A., Cameron, C., Catovsky, S., Crane, D., Cruickshank, S., Dietz, S., Edmondson, N., Garbett, S., Hamid, L., Hoffman, G., Ingram, D., Jones, B., Patmore, N., Radcliffe, H., Sathiyarajah, R., Stock, M., Taylor, C., Vernon, T., Wanjie, H., and Zenghelis, D. (2006). The Economics of Climate Change. Cabinet Office – HM Treasury. Cambridge University Press.

⁴ Tol R.S.J., Downing, T., Kuik, O.J., and Smith, J.B. (2004). Distributional Aspects of Climate Change Impacts. *Global Environmental Change*, 14 (3) 259-272.

⁵ Downing, T. Downing, David Anthoff, Ruth Butterfield, Megan Ceronsky, Michael Grubb, Jiehan Guo, Cameron Hepburn, Chris Hope, Alistair Hunt, Ada Li, Anil Markandya, Scott Moss, Anthony Nyong, Richard Tol, Paul Watkiss (2005). Scoping uncertainty in the social cost of carbon. Final project report. Social Cost of Carbon: A Closer Look at Uncertainty (SCCU). July 2005. Report to Defra. <http://www.defra.gov.uk/environment/climatechange/carboncost/aeat-scc.htm>

⁶ van Aalst, M., Hellmuth, M. and Ponzi, D. (2007) Come Rain or Shine: Integrating Climate Risk Management into African Development Bank Operations. Working Paper No 89. African Development Bank, Tunis.

Box 1 – Current economic vulnerability in Kenya⁷

recent study for DFID reviewed the economic effects of these climate extremes in Kenya (Nyangena, 2008) and demonstrated the importance of these events. It is found that climate extremes have very severe impacts and economic costs. The economic impacts of floods cuts across key sectors of the economy, including agricultural production, industrial processing, manufacturing, tourism, infrastructure, and public health. The total costs arising from 1997/98 floods (from damage to infrastructure and communications, public health hazard, and loss of crops) have been estimated at Ksh 70 billion (~USD 1.0 billion) by the World Bank.

Similarly, droughts affect nearly all sectors of the economy. The recent La Niña-related drought particularly affected the agriculture, livestock, energy, industrial production, and tourism sectors. The costs of the 1999/2000 La Niña drought (on loss of crops and livestock, forest fires, damage to fisheries, reduced hydro-power generation, industrial production, and water supply) have been estimated at Ksh 220 billion (~USD 3.2 billion) by the World Bank.

The repeated pattern of droughts and floods leads to longer lasting effects. On average, Kenya experiences a flood that costs it about 5.5 percent of GDP (Ksh 37 billion; ~USD 0.5 billion) every seven years, and a drought that costs it about 8 percent of GDP (Ksh 53 billion; ~USD 0.8 billion) every five years. This translates to a direct long-term fiscal liability of about 2.4 percent GDP (Ksh 16 billion; ~USD 0.23 billion) per annum. The annualised cost of floods largely arises from capital losses (bridges, roads, etc), indicating steady degradation of its infrastructure because of climate extremes. The annualised cost from droughts largely appears as losses of annual production.

Source: summary of Annex Appendix 5: Economic and Cost-Benefit Analysis of Adaptation Options, prepared by Wilfred Nyangena, School of Economics, University of Nairobi, as part of the DFID screening study.

Africa has high existing vulnerability, and climate change will act upon these, for example (Nkomo et al, 2006⁸, Boko et al, 2007⁹):

- Existing developmental challenges such as poverty, complex governance and institutional dimensions;
- The high population growth rate, the prevalence of malnutrition, low literacy rates, a high burden of disease.
- Limited access to capital, including markets, infrastructure and technology;
- Ecosystem degradation and loss of natural resources;
- Complex disasters and conflicts (including environmental disasters such as floods and droughts).
- Poor governance, corruption, conflicts and weak institutions.

Whilst adaptation is needed to address the potential challenges of current variability and future climate change, Africa has low adaptive capacity due to low financial resources, low technical capability, weak institutions and limited awareness of the potential impacts of climate change.

The combined effects (high vulnerability, low adaptive capacity) are likely to be greatest for the poor within Africa, and they potentially exacerbate inequities in health status and access to adequate food, clean water, and other resources. These constraints – linked to low income and poverty – are likely to limit the ability of vulnerable groups to adapt autonomously to climate change, and unless action is taken the

⁷ DFID Kenya Climate Screening and Information Exchange, see <http://www.dewpoint.org.uk/Article.aspx?ArticleID=901>

⁸ J. C. Nkomo, Ph.D. University of Cape Town, South Africa, A. O. Nyong, Ph.D. University of Jos, Nigeria, K. Kulindwa, Ph.D. University of Dar es Salaam, Final Draft Submitted to The Stern Review on the Economics of Climate Change July, 2006.

⁹ Boko, M., I. Niang, A. Nyong, C. Vogel, A. Githeko, M. Medany, B. Osman-Elasha, R. Tabo and P. Yanda, 2007: Africa. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge UK, 433-467.

effects of existing constraints will be compounded. This could involve severe problems for rural livelihoods. Overall, climate change is likely to affect the ability of country governments to meet strategic objectives, hindering progress towards poverty alleviation and pro-poor growth. There is, therefore a need to increase the resilience of livelihoods, reduce their vulnerability and raise capacity to adapt.

Climate change also has implications for the programmes of development agencies as well as for their investments, e.g. for the African Development Bank (AfDB) and portfolio (AfDB, see van Aalst et al, 2007). Climate change could potentially affect the achievement of and long-term progress towards sustainable poverty alleviation and economic development in Africa. Climate change also has the potential to setback development and poverty reduction, threatening the attainment of, or even reversing, the Millennium Development Goals (MDGs).

Recent studies have started to estimate the possible investment in adaptation needed. At a global level, the estimated increase in investment flows needed for adaptation are \$50 billion to \$170 billion a year (UNFCCC, 2007¹⁰) in the short term (2030), of which \$30 billion to \$70 billion are anticipated in developing countries.

Sector	Investment Flow	Proportion in developing countries
Agriculture, forest and fisheries	\$14 billion/yr	
Water resources	\$11 billion/yr	80% in developing countries
Coastal Zones	\$11 billion/yr	Around 50% in developing countries
Human health	\$5 billion/yr	All in developing countries
Infrastructure	\$8 to 130 billion/yr	Public and private financed infrastructure
TOTAL	\$49 to 171 billion/yr	\$28 – 67 in developing countries

Source UNFCCC 2007

For Africa, the global cost of 'climate proofing' new investments (the costs of adaptation) has been estimated (van Aalst et al, 2007) at an annual cost of US\$2–7 billion (around 0.5% of Africa's GDP), see below.

Item	Amount per year (billion US\$)	Estimated portion sensitive to climate change	Estimated costs of adaptation	Total adaptation costs per year (billion US\$)
Official Development Assistance (ODA) and concessional finance	35	40%	10–20%	1.4–2.8
Foreign Direct Investment (FDI)	30	10%	10–20%	0.3–0.6
Domestic Financed Investment (DFI)	200	2–10%	10–20%	0.4–4
Total annual costs of adaptation				2–7

Sources: World Bank, Organization for Economic Cooperation and Development (OECD)/AfDB, United Nations Economic Commission for Africa (UNECA).

Source Van Aalst et al, 2007.

¹⁰ Investment and financial flows relevant to the development of an effective and appropriate international response to Climate Change (2007). United Nations Framework Convention on Climate Change

2. Priority Sectors

During the initial part of the scoping phase of the study (November 2008 to January -2009), the project team has undertaken a series of initial in-country meetings, and a rapid review to identify the potential priorities for the study. A summary of the meetings is written up in the inception site visit document. One of the key aims of this stage has been to identify the priority sectors.

It is recognised that there is already work in Burundi on current climate variability and vulnerability, on climate projections, and on the potential impacts of climate change. The study aims to build on this considerable information and the associated expertise. However, there has been much less focus to date on the economics of climate change and of adaptation.

In order to consider the appropriate priority sectors, the existing material has been reviewed. Much of this material was summarised in the NAPA¹¹ and the 1st national communication¹². The NAPA findings in particular have shaped in-country priorities, identifying key sectors that are vulnerable to climate change below.

The NAPA identifies high vulnerabilities to climate change for the population and the sectors of agriculture, water resources, energy, health, natural landscapes and ecosystems. The NAPA specifically highlights the mutual influences and cumulative impacts of: degradation and exhaustion of soils fuelled by demographic pressure on arable lands and natural resources; the degradation of forestry resources relating also to natural vegetation and artificial woodlots (which are the primary source of fuel); and human environmental degradation relating to underdeveloped and fragile sanitation infrastructure and consequent degradation of sanitary conditions. A high proportion of Burundi's population has high vulnerability because they depend on services that are directly provided by ecosystems (food and energy), and because such a high proportion of the population (and economy) depends on agricultural and livestock sectors (noting previous climate related food crises).

The one additional area that has been raised in relation to impacts, including by the project sponsors, is the need to consider the potential impact of extreme events (particularly floods). This is particularly important in relation to infrastructure, noting that infrastructure development will be essential to achieving the socio-economic development pathway for Burundi as set out in the Vision document. This area is also important in relation to investment flows and funding. Similarly, there is also a priority to consider the potential for low carbon growth in Burundi, with a focus on growth policies (win-win), development co-benefits, and adaptation –mitigation linkages. A key focus of this part of the proposals are to highlight the risks of carbon lock-in and future energy challenges, but also identify opportunities in relation to carbon finance and adaptation funding flows.

¹¹ Republique Du Burundi (2007) Ministere De L'amenagement Du Territoire, Du Tourisme Et De L'environnement. National Adaptation Plan of Action to climate change (NAPA).

¹² Repulique du Burundi. Inistere de L'amenagement du Territoire et de L'environnement Convention Cadre des Nations Unies sur les Changements Climatiques Premiere Communication Nationale Août 2001

Summary of the Burundi NAPA

According to the eight steps of NAPA guide in consideration of socioeconomic aspects and land use that exacerbate current environmental and socio-economic vulnerabilities, to identify most vulnerable population groups, regions and sectors, determine priority adaptation options, select urgent and immediate project activities to be implemented as well as defining their profiles.

Results of this process focused on identification of high vulnerabilities to climate change of the population and sectors of agriculture, water resources, energy, health, natural landscapes and ecosystems. due to mutual influences and cumulative impacts of:

- Degradation and exhaustion of soils fueled by demographic pressure on arable lands and natural resources;*
- Degradation of forestry resources relating also to natural vegetation and artificial woodlots which are the primary source of fuel;*
- Human environmental degradation relating to underdeveloped and fragile sanitation infrastructure and consequent degradation of sanitary conditions.*

This situation is translated into high vulnerability of high proportion of Burundi's population to climate change because it essentially lives on biophysical support and its modes of existence highly depend on services that are directly offered by ecosystems, not only for food but also for energy. This vulnerability was particularly stressed for agricultural and livestock sectors of the economy given past experiences of food crises for both men and cattle resulting from climate shocks.

Based on available data and experiences of climate risks and related impacts in Burundi, the following impacts inventory was compiled in reference to priority sectors identified.

In response to this situation, the NAPA Burundi identified 12 high priority adaptation projects based on extensive stakeholder and expert consultation. Below the projects are ranked according to the results of a multi-criteria analysis:

- 1. Improvement of seasonal early warning climate forecasts;*
- 2. Rehabilitation of degraded areas (e.g., species rich ecosystems, existing woodlots);*
- 3. Safeguarding of natural environments (Protected and vulnerable areas);*
- 4. Rainwater valorization (harvesting for agricultural and/or domestic use);*
- 5. Erosion control in the region of Mumiwa and other sensitive area (install biological devices and anti-erosion practices);*
- 6. Protection of buffer zones in Lake Tanganyika floodplain and around the lakes of Bugesera;*
- 7. Popularisation of short cycle and dryness resistant food crops;*
- 8. Zero grazing techniques;*
- 9. Capacity building to promote energy-wood saving techniques (create new woodlots, improved stoves);*
- 10. Stabilization of river dynamics of watercourses and torrents in Mumiwa, including the city of Bujumbura (enhance meteorological and hydrological observation networks, stabilization techniques, etc);*
- 11. Education on climate change adaptation (decision-makers, communities, and other stakeholders);*
- 12. Increase hydropower micro stations (carry out feasibility studies, proliferate with micro-grants/loans).*

CLIMATE RISKS	Adverse effects and related risks	Economic impact	Losses in human lives	Duration, days	Spatial area, km ²	Frequency	Tendency
Rainfall deficit (Dryness)	Dryness, late rains, famine, deficit of water for various use, decreased livestock and agricultural production, loss of human lives and biodiversity, degradation of vegetable cover, bush fire, migration of population and cattle, drying up or lower level of dams and rivers, reduced hydropower energy.	3	3	3	4	2	Important
Rainfall excess: Pouring rain/Floods, hail	Rain erosion, losses of harvests, losses in human lives, losses of habitats for species, destruction of infrastructures, landslide, wood windfall, eruptions of parasitic diseases, waterborne diseases and nutritional deficiency diseases, the blocking/silting of rivers and lakes, floods of lowlands and marshes, deterioration of water quality	3	2	1	3	2	Important
Excessive temperatures (extreme)	Thermal stress, recrudescence of respiratory diseases and vector borne diseases, high consumption of water, increased evapo-transpiration and evaporation, acceleration of bush fires.	2	1	2	4	2	Average
Flashes, thunders and lightning	Death of people and cattle, fire to forests and woodlots, food shortage, falling of blossoms in crops, destruction of large trees and infrastructures (communication and power), reduced output	1	2	1	2	1	Average

3. Methodological Approach

Study Approach

This study has a number of specific (different) aims and objectives, prioritised towards different stakeholders. To try and address this, the team are proposing an approach that has different aggregation levels, and builds on various lines of evidence, for impacts and adaptation. This involves an approach that has both top-down and bottom-up approaches, including:

- Aggregated economic analysis (top-down), by country and for the region, at a sectoral level. This information will provide relevant material on the overall risks, and likely costs of climate change, the costs and benefits of adaptation, and the costs and benefits of low carbon growth. This will be accompanied by an integrated assessment model (overall economy wide).
- Case studies on impacts and adaptation (bottom-up), along with local in-country studies that build the evidence base. These provide information- rich local narratives. These could focus on providing information in relation to vulnerability, livelihoods and the economy, investigating the ability to meet strategic objectives, local adaptation options, and the implications for poverty alleviation and pro-poor growth.

The advantage of this approach is that it will combine local narratives with more aggregated estimates to build up a clear message for policy makers (i.e. to ground-truth economic studies within the local context).

Study Methodology – Climate Change Risks

The section above outlines the generic approach for the study. However there is still a need to identify the specific approach. In theory, there are a number of alternative approaches that could be used. The main methods have been based on the classification in the IPCC AR4 (WGII, Chapter 2, Carter et al, 2007¹³):

- Synthesis.
- Impact assessment.
- Integrated Assessment.
- Risk assessment.
- Vulnerability assessment.
- Stakeholder and participatory.

The options are summarised in the table below. What is clear is that a focus on assessing the economic costs of climate change is likely to require an impact assessment based approach (though could also include integrated assessment). However, it is also highlighted that this focus generally conflicts with local country assessments, which have adopted vulnerability assessment as the primary approach, and is the form of much of the existing information base.

¹³ Carter, T.R., R.N. Jones, X. Lu, S. Bhadwal, C. Conde, L.O. Mearns, B.C. O'Neill, M.D.A. Rounsevell and M.B. Zurek, 2007: New Assessment Methods and the Characterisation of Future Conditions. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 133-171.

Summary of Approaches

	Strengths	Weaknesses
Synthesis	Reflect outputs from a range of studies, possibly capture a greater range of uncertainty	Limited by availability of the current information and gaps in evidence, lack of consistency between studies.
Impact Assessment	Builds on relatively high degree of sophistication in existing studies over an increasingly wide range of impacts. Potential for use of common money) metric.	Little attention given to current impacts and adaptation in existing studies
Vulnerability Assessment	Centres analysis strongly within existing socio-economic conditions and decision-making structures	Lack of common metrics mitigates against cross-sectoral/regional prioritization. Valuation extremely difficult.
Risk Assessment	Probabilistic approach allows weighting to be given to likelihoods of impacts occurrence.	Extra dimension of complexity may significantly increase resources required for analysis.
Integrated Assessment	Realism significantly increased by recognition of cross-impact and cross-sectoral linkages.	Extra dimension of complexity may significantly increase resources required for analysis.
Stakeholder / direct participatory	Stronger elements of building adaptive capacity and raising awareness	Does not produce a consistent and scientifically robust evidence base covering all impacts and sectors

Adaptation

From Impacts to Adaptation

An important aspect of any study is to feed into adaptation needs over a range of policy and planning horizons for specific activities and regions. This requires a focus on adaptive capacity and adaptation measures to improve the resilience or robustness of a system exposed to climate change, rather than treating adaptation as an output where the risks prompt identification of possible adaptation options that currently exist.

This is an important issue, and several studies identify why impact driven assessment may have been of limited use in informing adaptation policy (Füssel and Klein, 2006; Burton et. al. 2002¹⁴).

As identified in Nkomo et al, 2006, the need for a vulnerability approach to assessing the implications of climate change in Africa is needed, rather than an impacts approach, because the vulnerability to climate variability and change is compounded on existing vulnerability, such that the impacts of climate variability and change are greatly exacerbated. Nkomo also reports that most studies that have assessed the impacts of climate change in Africa have used large-scale GCMs which provide very little information that

¹⁴ Burton I., Huq, S., Lim, B., Pilifisova O. and E. L. Schipper (2002) From Climate Assessment to Adaptation Priorities: The Shaping of Adaptation Policy. *Climate Policy*, 2, 145-149

Füssel H. M. and R. J. T. Klein (2006) Climate Change Vulnerability Assessments: An Evolution of Conceptual Thinking. *Climatic Change* 75: 301-329

is of practical use to decision makers on the specific extent and impacts of climate change, especially for any specific location within a country in Africa.

The Economics of Adaptation

The focus of the current study is on valuation, i.e. on economic costs and benefits. Adaptation has a cost, e.g. as defined in the TAR as the “*cost of planning, preparing for, facilitating and implementing adaptation measures, including transition costs*”, but also a benefit, expressed as “*the avoided damage cost or the accrued benefits following the adoption and the implementation of adaptation measures*”.

In simple terms, if the economic benefits of adaptation such as the reduction in climate change impacts (or the potential positive consequences) outweigh the costs, then there are net benefits. If not, then this potentially leads to mal-adaptation. Note that while adaptation reduces impacts, it does not reduce them completely.

Several studies have shown that there is a low evidence base for the economics of adaptation. The IPCC AR4 reported the literature on adaptation costs and benefits as ‘*quite limited and fragmented*’ (Adger et al, 2007 in IPCC WGII¹⁵). Moreover, the studies that do exist were found to be mostly in OECD regions, with the evidence base for Africa particularly low.

The previous DFID work in the region¹⁶ also considered the role of economics in adaptation. It reported that because of the uncertainty of the future climate in any one location, lower cost options, particularly ‘no regret’ options that improve current climate resilience and have wider ancillary benefits, will be more economically attractive than adaptation options that involve large sunk costs (infrastructure) whose levels of future benefit are difficult to ascertain.

Activities that build capacity are especially attractive, as, in addition to being less costly than infrastructure solutions, they are a necessary precursor to improving current climate resilience (the ‘adaptation deficit’). Adaptation programmes and policies that are effective at addressing climate change impacts where the type and degree of magnitude is as yet imperfectly understood will require a sequential approach informed by a gradually improving evidence base. The following stepwise approach to programmatic adaptation thus optimises economic effectiveness:

- Start by building capacity and awareness of climate change. Plans should initially focus on identifying and testing a range of adaptation actions based on current levels of knowledge, and on building capacity to analyse climate and climate impact trends and projections;
- Identify and start implementing early adaptation activities, concentrating on win-win, no regrets or low cost options, justified by current climate conditions (i.e. improving current climate resilience), or based on projected climate change, but involving minimal cost;
- As and when the evidence of climate change and climate change impacts unfolds, other possible adaptation options, which involve higher costs, can be considered. These may include technical options (e.g. hard adaptation). This kind of adaptation action will require a more detailed analysis and appraisal, which will consider the costs and benefits of adaptation, and carry out a sensitivity analysis against levels of climate change uncertainty, so as to prevent mal-adaptation.

¹⁵ Adger, W.N., S. Agrawala, M.M.Q. Mirza, C. Conde, K. O'Brien, J. Pulhin, R. Pulwarty, B. Smit and K. Takahashi, 2007: Assessment of adaptation practices, options, constraints and capacity. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 717-743.

¹⁶ DFID Kenya Climate Screening and Information Exchange, see <http://www.dewpoint.org.uk/Article.aspx?ArticleID=901>

As highlighted by van Aalst et al, 2007¹⁷, many of the most effective measures to adapt to future climate change coincide with those that can reduce vulnerability to current climate risks. Therefore there is a focus on the integrated management of current climate variability and extremes with adaptation to climate and this approach offers immediate benefits to economic development in Africa, as well as longer term security in the face of changing climate.

Finally, a number of issues are highlighted in the economic assessment of adaptation, and in relation to the proposals for the current study:

- Outcomes of economic analyses are highly sensitive to the assumptions and uncertainties. This is particularly true for projected combinations of socio-economic and environmental scenarios. Model outputs are highly uncertain and need to be complimented by local experiences. For these reasons, of a combination of economic tools and methods are needed.
- *Analysis must consider both market and non-market costs, in physical impacts as well as economic metrics*, i.e. recognising that sectors such as health or ecosystem services may be poorly captured in existing studies, and particularly in economic valuation. This allows the analysis of rural livelihoods, whose economic contribution maybe low, but may be dis-proportionately affected by climate change.
- *Adaptation is a process of social and institutional learning*, to produce adaptation outcomes and processes that are robust against a wide range of future situations.

These concepts are included in the potential use of 'adaptation signatures', outlined below.

Adaptation Signatures

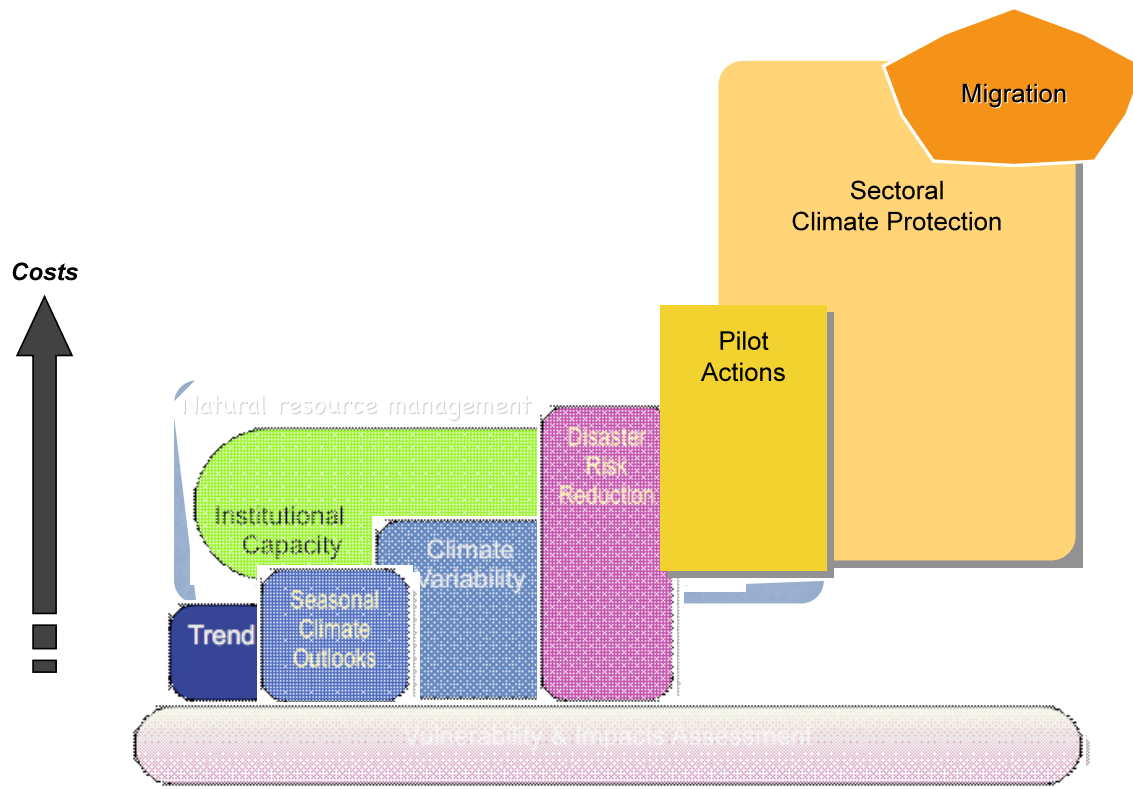
One approach to understanding climate change adaptation is to focus on types of adaptation responses. For instance, many of the NAPA projects are direct investments to improve livelihood security, through income diversification, education and social mobilisation. Other NAPA projects fall into a general category of increasing competence to assess vulnerability, monitor climate changes and support adaptation decision making.

These are distinct approaches to adaptation: each involves different stakeholders and decision frameworks, they respond to climate change in different ways either from reducing current vulnerability to increasing risk-resilience in the future, and they involve different costs, as well as benefits and outcomes. This is termed a signature. We propose to develop a typology of adaptation responses, or signatures, to explore the different costs of climate adaptation.

These signatures will be developed based on secondary sources, such as the NAPA and international adaptation data bases. Importantly, the unique signatures of local communities and national action plans will be documented through participatory exercises and engagement with key stakeholders.

The baseline is formed by an understanding of current vulnerability and prospective impacts. This is reasonably widespread, but probably not all that expensive. Using climate information (e.g. seasonal climate outlooks) and expanding the capacity to cope with current climate variability is worth-while now, and also provides additional benefits through the anticipation of climate change. Disaster risk reduction improves coping with current conditions and the potential (and increasingly expected) increase in future hazards. Pilot studies can help provide information, leading to full sectoral protection. Finally, migration is a planned strategy already being utilised, which may be increasingly essential.

¹⁷ van Aalst, M., Hellmuth, M. and Ponzi, D. (2007) Come Rain or Shine: Integrating Climate Risk Management into African Development Bank Operations. Working Paper No 89. African Development Bank, Tunis.



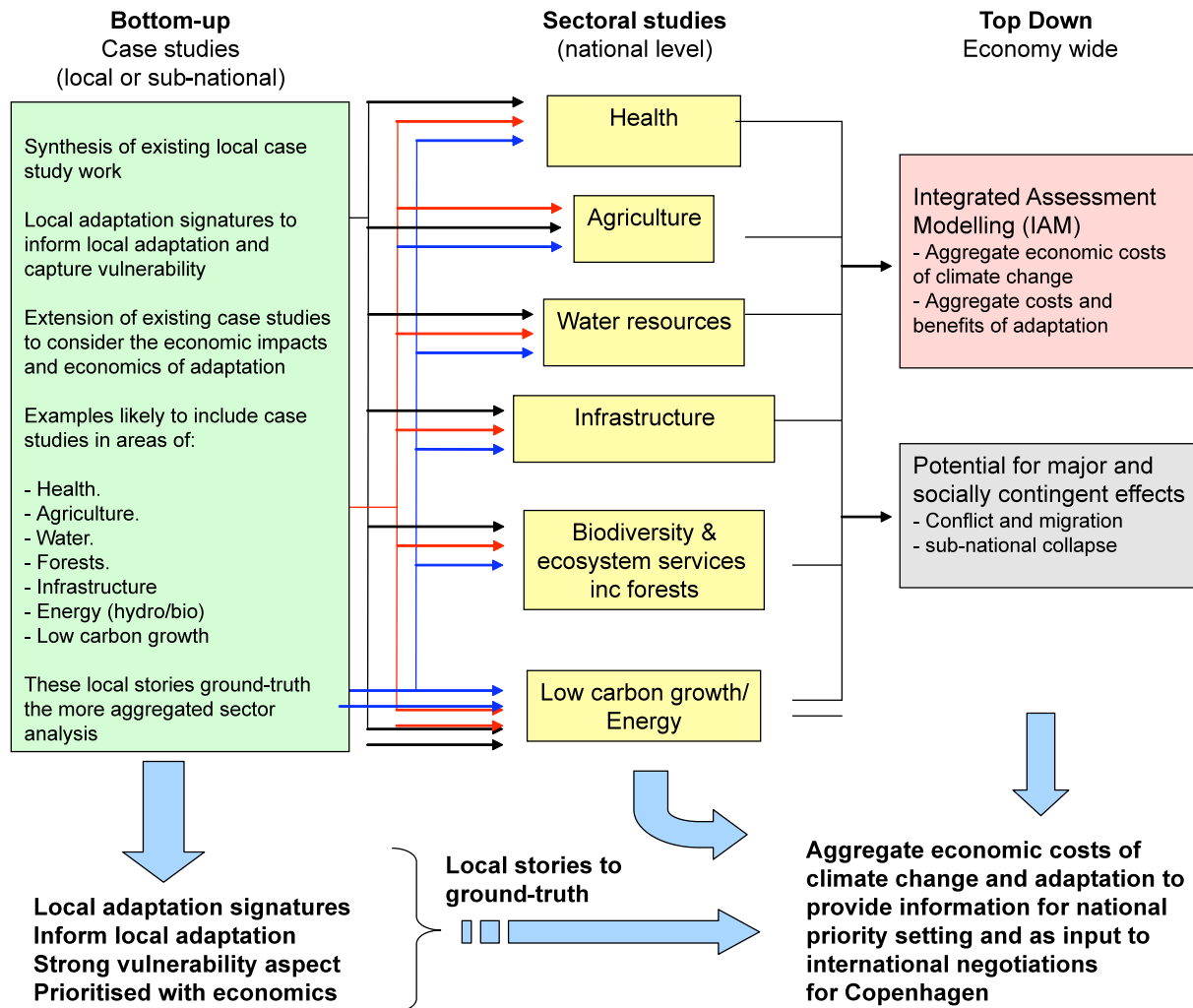
Copyright: weADAPT group

Toward adaptation signatures

Key: The width of each type corresponds to the coverage within a country and economy. The height is the relative cost of each type of project.

Overarching framework

The overall framework proposed is outlined below, showing how the linkages will provide the necessary information to meet the study aims.



4. Implementation Phase Proposals

The implementation phase is comprised of a number of key tasks. Following the framework in the previous chapter, these are:

- A) Aggregate top down analysis (including regional estimates).
- B) National sectoral economic studies.
- C) Bottom-up case studies.

There is also an additional major task undertaking a synthesis of the study findings:

- D) Policy recommendations

The work plan is set out below.

A) Top Down Aggregate Assessment

The part of the study will develop aggregate regional and country estimates of the economic costs of climate change, and the costs and benefits of adaptation.

Integrated Assessment (aggregate)

This task will assess the aggregated economic costs of climate change and costs and benefits of adaptation. It is proposed to use the PAGE model, run by Chris Hope, which was used in the Stern review. The model can provide estimates of the total cost of climate change in future periods (with or without global mitigation), and the costs and benefits of adaptation. At present, the model has Africa as one region, but it is proposed to work up an East Africa region in the model, and if time, specific country values. The current model would be run with the current parameters for the Africa region. The study would then update and re-run the PAGE model with the results from the national sectoral studies, as these are finalised at the end of the study. These values would be used for headline estimates for the preparation of material for the African Environment Ministerial Meeting (July) and to provide briefing material for the Copenhagen (December) COP meeting.

Proposed team members: Chris Hope, Paul Watkiss, Alistair Hunt, IIED, local partners.

Adaptation limits, Tipping Points and Socially Contingent Effects

One of the key issues driving international concerns on climate change is the potential for large-scale irreversible events. A number of these large-scale effects are relevant for East Africa with the potential for an increase in the El Nino Southern Oscillation, which would have a major impact on the East African climate, and the risk of extreme climate sensitivity, i.e. leading to sub-national or even national economic collapse for the region. Most of these effects are longer term (post 2100). The study will undertake a small review to investigate these effects. The task will also explore the potential for socially contingent effects, related to human values and equity that are poorly represented currently, e.g. regional conflict, migration, famine and poverty. This will explore the potential for sub-national large-scale events (e.g. humanitarian crisis from climate), based on the information generated from the national sectoral studies and local case studies.

Proposed team members: Tom Downing, Jillian Dyszynski, in country partners.

B) National sectoral analysis

The national sectoral studies will focus on providing economic estimates of the costs of climate change, the costs and benefits of adaptation, and the benefits of low carbon growth scenarios. The key steps are:

1. Climate science and socio-economic data projections.
2. Impacts and adaptation analysis, covering the mix of sectors and impacts of Health, Agriculture, Infrastructure, Water, other economic sectors (Energy and Tourism), Biodiversity and Ecosystem Services. This will include consideration of adaptation signatures for each of these sectors.
3. Analysis of low carbon growth scenarios.
4. Synthesis of results and policy recommendations.
5. Dissemination and communication.

Climate projections

The task will first examine existing climate science available nationally and in the region. A key part of the approach will be to recognise the assumptions and uncertainties in forecasts and how they can affect subsequent results. The team will work with local climate teams as part of this task. To enable this, we propose to:

- Review the existing climate projections, for example in the NAPA, from the wider number of projections in-country, and in recent literature sets (e.g. DFID East Africa, UNDP Climate Change Profiles).
- Overlay the map of climate station data included in weADAPT climate change explorer tool and scenario archive to highlight the range of envelopes for future climate scenarios.
- Work with local partners to develop and demonstrate the regional data sets.

Proposed team members: Tom Downing, Fernanda Zermoglio, Ruth Butterfield, in country partners.

Socio-economic projections

The future effects of climate change are strongly influenced by socio-economic change (economic growth, population, etc). An important part of the study is to develop specific socio-economic scenarios. There is far less experience of using socio-economic scenarios in vulnerability, impact or adaptation assessments. However, any assessment is seriously flawed if it does not include them, as this implies that projected future climates will take place in a world similar to today. In practice, future impacts will be determined by these scenarios, as much as by future climate. The study will build on the existing IPCC Special Report on Emission Scenario projections (SRES), and build up scenarios consistent with the planned development pathways including the Poverty Reduction Strategy Paper (PRSP)¹⁸ and the Burundi Vision document. It will also consider various programmes that might reduce vulnerability in the near future, e.g. WHO programmes on health protection.

Impacts and economic costs

The main part of the work plan is to assess the economic costs of climate change, and the costs and benefits of adaptation. Where possible the study will assess physical impacts as well as economic values, and adopt a spatial mapping platform /GIS (AWhere). Consistent with the overall terms of reference, this will consider the short, medium and long term. The approach by sector is outlined below. The work will be

¹⁸ PRSP. 2007. IMF Country Report No. 07/46 Burundi: Poverty Reduction Strategy Paper

undertaken by partner teams in-country working with UK based experts. We also propose in country workshops to build up impact assessment, identify adaptation options and costings.

Health

Methods are available to estimate the aggregate physical effects of climate change from vector borne disease (e.g. as adopted in WHO global burden of disease, McMichael, 2004¹⁹). It is proposed to such methods to look at Burundi, employing mapping of vector borne disease risk. If possible, the task will also use a similar approach to consider waterborne diseases. The analysis will also be extended to estimate the economic costs. Estimates of the costs of various adaptation strategies will be identified and scoped, and the potential benefits in terms of the reduction in impact assessed and monetised. The potential risks of disasters caused by extreme weather events, such as inland floods and landslides, will also be considered.

Proposed team members: Sari Kovats (London School of Hygiene and Tropical Medicine) with support from SEI Alistair Hunt (valuation), and in country partnership teams

Agriculture

Agriculture is a climate sensitive sector and one of the key areas for analysis. The agriculture sector accounts for around a large proportion of GDP and sustains a large proportion of the population. A very high percentage of the population is engaged in subsistence farming. The proposals are to look at several approaches, including data/GIS maps from the Stanford/NCAR (FAO CropWat model²⁰), to undertake analysis of crop impacts (change in yield and area for multiple crops) at aggregated scale. The assessment will link through to economic costs through the use of crop prices. Alternative approaches will also be considered, and specific work looking at the effects of climate change on subsistence farming will be undertaken. The study will also build on the considerable amount of work on adaptation. These range from the development and deployment of early warning systems, better agricultural management systems, improved crop cultivars, more efficient irrigation systems and good grain storage systems. It will identify a range of options, work up costs, and scope out the potential benefits of adaptation. It is proposed to take this forward through a local workshop with regional agricultural experts.

Proposed team members: Tom Downing, Ruth Butterfield, Muyeye Chambwera (IIED), in country partnership teams.

Water Availability, Resources and Quality

Water resources are important for Burundi, and have potential effects across sectors. This task will analyse water resources and availability, using the Global Water System Partnership Digital Water Atlas²¹. These data sets will be complemented with African observatory runs. The task will also consider the potential economic costs of changes in water resources. The potential adaptation options will be considered, and costed, i.e. from community based responses, drought responses, and engineered options, and the potential benefits they provide quantified where possible.

Proposed team members: Tom Downing, Ruth Butterfield, Alistair Hunt in country partnership teams.

¹⁹ McMichael, A.J., Campbell-Lendrum, D, Kovats, R.S., Edwards, S., Wilkinson, P, Edmonds, N, Nicholls, N., Hales, S., Tanser, F.C., Le Sueur, D., Schlesinger, M, Andronova, N. (2004) Climate Change. In Comparative Quantification of Health Risks: Global and Regional Burden of Disease to Selected Major Risk Factors. Edited by Majid Ezzati, Alan D. Lopez, Anthony Rodgers and Christopher J.L. Murray. World Health Organisation. http://www.impetus.uni-koeln.de/malaris/literature/hoshen_and_morse_2004.pdf

²⁰ http://www.fao.org/nr/water/infores_databases_crowat.html

²¹ see <http://atlas.gwsp.org>.

Land-use, Built environment and Infrastructure (extremes)

The task will look at extreme events particularly focusing on flood events, and the potential for infrastructure damage (though it will also consider droughts). It will identify critical infrastructure, e.g. transport (roads, bridges, airports, ports), energy (including hydropower, and transmission and distribution systems), water and sanitation systems, etc. also how this infrastructure might change in the future. It will estimate the potential risks to this infrastructure, considering the current level of impacts on infrastructure and future changes in the risk of extremes, in combination with socio-economic development. The analysis of adaptation costs and benefits will be included as part of this task. This will also investigate the linkages with investment (and climate proofing of infrastructure investment).

Proposed team members: Alistair Hunt, Paul Watkiss, Tim Taylor, in country partnership teams.

Biodiversity and Ecosystem Services including Forestry

Biodiversity provides many ecosystem services, which provide various economic value. These include services to other sectors such as agriculture, health, tourism and water. Many of these ecosystem services are already under threat, as highlighted by the recent UNEP work in East Africa²². Climate change is likely to add a significant additional impact on top of these existing pressures. The task will consider potentially significant changes to the natural environment from climate change and map these over the region, at an aggregated level, building on existing work in the region. These changes will be isolated from those brought about by existing climate variability and socio-economic change.

Ecosystem services

It is now widely recognised that ecosystems provide multiple benefits to human society, that these in turn have economic benefits (although these are rarely captured by markets). These benefits are generally known as 'ecosystem services' (Millennium Ecosystem Assessment, 2005) and can be divided into provisioning, supporting, regulating and cultural services

- The provisioning services include ability of ecosystems to provide food (agriculture, fisheries), fibre (timber) and fresh water to the population.
- The supporting services include soil formation, photosynthesis, and nutrient cycling.
- The regulating services affect climate regulation, flood protection, disease regulation, and water quality regulation (water purification);
- The cultural services provide recreational, aesthetic, educational and spiritual benefits.

Human are dependent on the flow of these ecosystem services. Provisioning services can be valued at market prices. Other services, such as regulating and cultural services, such as the ability of an ecosystem to provide natural habitat for flora and fauna and biodiversity loss, have no direct market price, though it is possible to approximate the value of these functions by the use of direct or indirect valuation methods. Conversely, while these services have an economic value, loss or degradation of such ecosystem services has economic costs.

The quantification, and especially valuation, of biodiversity and ecosystem services is challenging. The value of the changes identified will be assessed using a variety of economic techniques.

One particular focus will be on forestry, which provides energy for much of the population, as well as wider ecosystem services. Deforestation is already a major issue in the country, and climate change will act as an additional pressure. The analysis will look at the potential impact of climate change, on top of other resource pressures.

²² http://www.unep.org/roa/Projects_Programmes/Biodiversity/Activities/index.asp

The assessment will then consider adaptation costs, derived from adaptation options that have a cross-sectoral perspective. Other economic values (e.g. non-use) will be represented as far as is possible. The task will also consider ecosystem services payments.

Proposed team members: Alistair Hunt, Tim Taylor, Tahia Devisscher, Muyeye Chambwera (IIED), in country partnership teams.

Adaptation

In each of the sectors above, the project will consider the adaptation costs and benefits, using the same framework. This will be easier for some sectors than others. For all sectors, the study will also progress analysis around the adaptation signatures approach, using the typology outlined in the previous chapter, and developing up adaptation options and costs by sector and type of adaptation.

Proposed team members: Alistair Hunt, Tim Taylor, Paul Watkiss, Ruth Butterfield, Muyeye Chambwera (IIED), in country partnership teams.

Energy, Low Carbon Growth and Carbon Finance Opportunities

This task will cover the energy sector and low carbon growth pathways. The aim of this task is to investigate the benefits of low carbon growth policies (and adaptation-mitigation linkages), negative cost options, and development co-benefits (win-win), rather than mitigation.

It will consider the effects of climate change on energy supply, using emissions from future energy, land-use and agriculture, building on the data in the 1st national communication. Biomass currently comprises the major source of energy. At present, greenhouse gases emissions in Burundi are largely compensated by sequestration capacity of forests. It will also consider alternative scenarios focusing on low carbon growth scenarios and development. This will include planned development consistent with the Vision proposals, and the implications for emissions, and consider options to ensure future growth trajectories avoid getting 'locked' in to high emissions. The task will also include consideration of ancillary benefits. These include air quality and energy security.

Finally, the task will also consider relevant aspects in relation to low carbon finance opportunities. The task will consider issues around forest, and deforestation and degradation, linking through to ecosystems services sector analysis, and opportunities for carbon investment flows. It will consider the country capacity that will be needed to be potential part of any future market in relation to REDD, and where this also might be useful as capacity for adaptation, as well as income generation and sustainable livelihoods. It will also include consideration of other financing (e.g. renewables) through CDM opportunities and the voluntary market. The task will include discussion with relevant stakeholders, noting the potentially different groups that may be relevant (e.g. Department/ministry of energy, as well as the emission estimates from Department/ministry of environment).

Proposed team members: Paul Watkiss, Alistair Hunt, Tahia Devisscher, Adriaan Tas, in-country teams.

C) Local Case Studies

A focus on local case studies is important for a number of reasons:

- The case studies provide information-rich, local narratives, which can link the sectoral studies with practical examples, and thus link the different parts of the overall framework.

- These local studies allow a greater focus on existing vulnerability, local adaptive capacity and local adaptation options. This is important in identifying distributional effects, climate vulnerability, and the local nature of adaptation.
- They allow consideration of the non-formal economy

The choice of studies will be determined by available information, existing studies, and in-country priorities.

Review and synthesis of existing case studies

This part of the work will collate the existing case study information and synthesis the results. These will be used to help provide specific context for the national sectoral studies. The task will start with a detailed literature review, and discussion with in-country institutions. It will consider the priority areas identified in the NAPA and investigate relevant information. The review material will then be used to highlight additional issues (e.g. informal sectors), and testing the robustness of the national assessments.

Extending existing case studies with economic analysis

The second part of this task will be to progress a number of case studies and assess the economic costs of climate change, and the cost and benefits of adaptation. A number of potential case studies have been identified in the NAPA. It is anticipated that several case studies could be undertaken, the number determined by the available information and complexity.

Proposed team members: Tom Downing, Jillian Dyszynski, Adriaan Tas, in country partners.

D) Policy Recommendations

The information from the above tasks will be compiled to produce an overall summary, i.e. a synthesis of the study by country and overall. The information from the tasks above and the synthesis will be used to provide policy recommendations at country level. This will include a summary of the economic costs of climate change, the costs and benefits of adaptation and low carbon growth. It will also provide key messages in relation to the need for (urgent) action, to reconfirm the need for action, but also the potential win-win options and opportunities. It will highlight key barriers and how these could be overcome.

Project Management

Study deliverables

The proposed study deliverables are outlined below:

Deliverables (D2.1): report outlining climate and socio-economic projections.

Deliverables (D2.2): Initial output of results for Copenhagen COP 15.

Deliverables (D2.3, 2.4, 2.5): A report which sets out clearly:

- Environmental, economic, social and other impacts of climate change.
- The costs and benefits of adaptation.
- The costs and benefits of low carbon growth.
- Appropriate policy recommendations on the above.

- Other recommendations as relevant based on work undertaken (e.g. these might relate to institutional/coordination aspects, capacity issues, ongoing research and analytical priorities, knowledge management and communication etc)

Deliverables (D2.6): A regional report, highlighting the regional impacts and policy implications.

Linkages with other studies

There are a number of other studies which are undertaking similar analysis, in other regions, and the project team highlights that links should be made with these studies. These include:

- **The Defra Stern team studies of Regional Economics of Climate Change Studies (RECCS).** There are five mini-Stern assessments currently underway, looking at regional economic studies of climate change (Mexico, Brazil, SE Asia and C. America).
- **The World Bank Adaptation Study.** The World Bank is undertaking a study focusing on the economics of adaptation in 6 countries (probably Ethiopia, Mozambique, Vietnam, Ghana, India, and Peru). It would be extremely useful to share information with this team.
- **UNEP: AdaptCost.** UNEP have asked for further assessment and capacity building in Africa on the cost of climate adaptation, with work led by Tom Downing.

Contact will be made with these research groups, and sharing of information and knowledge exchange is planned. Of particular relevance will be the sharing of draft outputs from the study (by sector, and overall) with the Stern team early in the implementation phase, and again as final results emerge. This will be important in ensuring the consistency of this study with the other Stern RECCS, and providing a means for participation and review.

Timing and sequencing

An initial analysis should be ready by end of April 2009, including key sectoral information, which will begin to show stakeholders the implications of climate change on their economy.

Prioritised impacts and cost-benefit analysis will be completed by July 2009, for presentation and discussion in each country and at regional level.

Policy recommendations and options will then be examined and the entire project completed by September 2009.